

UTTARAKHAND: DEVELOPMENT AND ECOLOGICAL SUSTAINABILITY

RAVI CHOPRA



ऑक्सफैम इंडिया

OXFAM

India

Author: Ravi Chopra

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E-mail: policy@oxfamindia.org/

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EXECUTIVE SUMMARY

Massive floods and landslides in June 2013 led to what most believe to be Uttarakhand's worst disaster in living memory. The devastation was statewide, with estimates of anticipated revenue losses in the tourism sector alone being over Rs. 120 billion for 2013–14 rising to Rs. 200 billion in 2014–15 and an estimated Rs. 250 billion in 2015–16 (PHD Research Bureau 2013). Uttarakhand's economy may take a few years to recover. The biggest challenge will be to restore the lives and livelihoods of thousands of families who have lost their basic livelihood resources.

The disaster led to a nationwide debate on whether anthropogenic activities in the name of economic development aggravated the impact of the disaster. This paper is a comprehensive contribution to the debate. It analyzes Uttarakhand's current development pattern in terms of ecological sustainability and equity.

Uttarakhand, India's newest Himalayan state, has nine mountains and four plains' districts. Its inner mountain region is pristine, remote, rich in biodiversity and fragile. The entire state is disaster-prone, but successive state governments have promoted an economic growth model that totally disregards Uttarakhand's disaster-prone character.

Industrialization in the southern plains has been the engine of economic development after statehood in 2000. It has generated wealth in Uttarakhand, but the development is neither equitable nor sustainable as underlined by the impacts of the June 2013 disaster.

A majority of the working population in the state is engaged in agriculture, whose income growth, however, is the slowest of all the sectors since statehood. It has impoverished mountain farming families, with the SC community in the mountain areas being the least benefitted. Impoverishment has led to heavy out-migration from the mountain districts.

Uttarakhand must implement the indigenous sustainable development vision emphasized during the statehood agitation. Expanding forest cover with livelihoods enhancement has to be the first priority. People are more likely to enhance forest cover if they are assured of tangible benefits. New legislation must be

passed to give villagers ownership of their local forests. Community based institutions like the *Van Panchayats* and *Mahila Mangal Dals* (MMDs) can expand and manage village forests (*Gram Vans*). Compensatory Afforestation Fund Management and Planning Authority (CAMPA) and Green India Mission funds should be spent through these institutions. The state government also needs to take a pro-active approach to the implementation of the Scheduled Tribes (Recognition of Forest Rights) Act, 2005.

Ensuring remunerative ecological livelihoods for mountain dwellers must be the second priority of economic development in Uttarakhand. Mountain agriculture needs to be revived in a sustainable manner. It can be done by integrating high value crop cultivation, basic agro-processing at the farm level, dairying, horticulture and floriculture with adequate market linkages. 'Voluntary Organizations (VOs) can provide value chains development support to community based organizations. The Agro Vision Uttaranchal 2020 plan needs to be reviewed, modified and implemented.

Funds and activities under schemes like Rashtriya Krishi Vikas Yojana, Agricultural Technology Management Agency, and National Food Security Mission should focus more on promoting integrated farming systems development to yield significant results. Involving VOs with proven track records in the field can lead to effective use of these funds. Major rural development schemes like Mahatma Gandhi National Rural Employment Guarantee Act, National Rural Livelihood Mission, and Integrated Watershed Management Programme can enhance the productivities of common pool resources and help improve food and livelihoods security for the rural people.

Marginal land holders or landless should be re-skilled for off-farm income generation activities. VOs can be encouraged to establish demonstration centres in Uttarakhand for new livelihood development approaches and build training programs around them. Community-based tourism needs to be promoted in a big way so that the visitors can be dispersed all over the state and the revenues directly benefit the local communities.

Special efforts must be made to ensure that development benefits reach members of small

communities in Uttarakhand like the Buksa, Tharu and Van Raji tribals. The basic human rights and living conditions of migrant laborers from other states and Nepal require special attention.

Safety and sustainability have to be built into all physical infrastructure development. Safe and sustainable hydropower production in Uttarakhand requires a new State Power Policy with fresh strategies from planning to approvals, construction practices and regulation. The state must also develop a strategy for energy conservation. Implementation of adaptive resilience and mitigation measures proposed in the draft State Action Plan for Climate Change (SAPCC) will also create many sustainable developmental opportunities

In disaster-prone Uttarakhand, a constant state of disaster preparedness at every level has to be integrated with development. Uttarakhand needs to strategically implement the Disaster Management Act, 2005. Technology-based approaches like early warning systems should be supplemented by community-based disaster preparedness (CBDP). The State Disaster Management Authority must involve VOs in CBDP activities on a programmatic basis.

Uttarakhand has to be prepared to effectively manage disaster emergencies at tourist locations where large numbers congregate regularly. Guidelines for building safer, green roads in the mountain regions need to be followed rigorously. Also, earthquake-safe building construction must be promoted in rural areas for safer habitations.

Establishment of effective disaster management systems and procedures at the community, district and state levels will require good governance. Governments and administrations cannot do everything by themselves, and civil society must be engaged by the state as an active partner in disaster management.

The June 2013 disaster is a warning bell for the economic growth model being pursued in all the Himalayan states. Himalayan mountains are too fragile to sustain rapid and intensive development. Moving away from it is essential since climatologists have repeatedly predicted that global warming will make destructive weather events more frequent in the future. Ecologically sustainable development is the

basic necessary condition for disaster mitigation. Equitable development will reduce the vulnerable populations.

CHAPTER I: INTRODUCTION

Massive floods and landslides in June 2013 led to Uttarakhand's worst disaster in living memory. Official estimates of the dead and missing people's toll were over 6,000 people (www.economictimes.indiatimes.com), though public perception put the numbers at over 10,000 persons (www.ndtv.com). The dead included pilgrims and tourists from various parts of India. Thousands of cattle, horses and ponies also perished. Economic losses for the tourism sector alone were put at around Rs. 120 billion for 2013–14 (PHD Research Bureau 2013).

Across and outside the state, people and media began to debate whether anthropogenic activities in the name of economic development had aggravated the impact of the disaster. This report is a comprehensive contribution to the debate.

METHODOLOGY

The present report is primarily based on desk study, involving compilation and analyses of information and data from official documents, research papers/reports, media reports and articles. This was supplemented by two field tours to (i) Rudraprayag district, mainly the worst-affected Mandakini valley, and (ii) Pindar valley in Chamoli district, and (iii) the Saryu valley in Bageshwar district. The tours provided opportunities to meet with affected people in their homes and at village meetings and with relief workers/organizations besides observing the destruction caused during the disaster. They were also helpful in framing discussions held later with a few officials at the state level.

The information, ideas and analysis presented here were also discussed at several workshops, all conducted in 2013. These included two workshops primarily with activists at the national level in New Delhi in July, and the state level in Nainital in August the same year. Thereafter, two workshops, primarily with researchers, academics and media representatives in New Delhi in September, and Dehradun in November gave opportunities for peer responses while the draft report was being prepared.

A draft report was reviewed by the research team at Oxfam in November as well. A revised draft was circulated to a larger group of officials, activists, intellectuals, voluntary organization

representatives and others. Oxfam organized a workshop with them at Dehradun in February, 2014. Inputs received at the workshop were incorporated before finalizing the report.

This report analyzes Uttarakhand's current development pattern in terms of equity and sustainability. The first chapter elaborates the inequitable nature of the state's present development model. The next chapter describes the nature and extent of the June disaster. Chapter III argues that development activities aggravated the impact of the floods and landslides. The following chapter outlines development actions that can enhance ecological sustainability, equity and reduce regional imbalances. The final chapter recommends desired development actions for the state and voluntary organizations.

I.1 State Profile

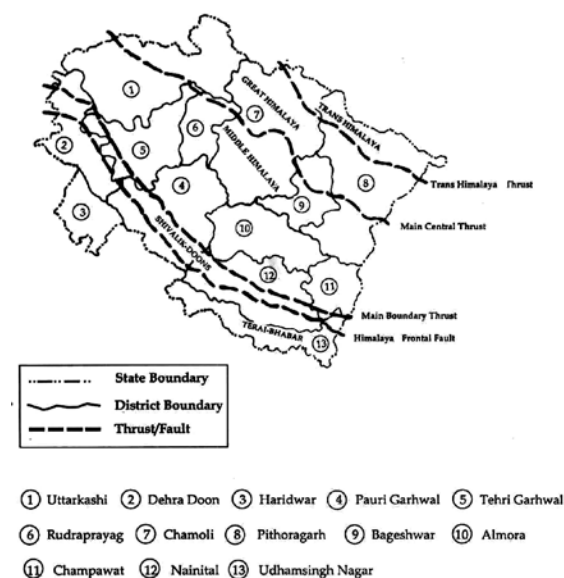
India's newest Himalayan state, Uttarakhand, came into existence on November 9, 2000. It was carved out of the mountainous northwestern corner of Uttar Pradesh. It stretches across an area of 53,485 sq km. Nine of its 13 districts are mountainous while the remaining four southern districts have substantial portions that are plains. Its inner mountain region is remote, fragile, marginal but rich in biodiversity.

Local folklore refers to Uttarakhand as '*dev bhoomi*' or the land of the gods. This was due to its earlier remoteness and pristine environment. The remoteness declined after the 1962 Indo-China border war, with national highways being pushed right up to the Tibetan border to facilitate movement of troops. This decline of remoteness has accelerated since the formation of Uttarakhand as a separate state. Rapid extension of roads, new airports, helipads and ropeways has significantly increased accessibility.

Nature has gifted Uttarakhand with abundant resources. It is blessed with bountiful rainfall, averaging about 1550 mm annually. Rain and snow feed thousands of rivers and streams in the state. Almost two-third of its area is designated as forest land although dense and moderately dense forest cover is limited to only 35 per cent of the geographical area (FSI, undated).

Uttarakhand is a part of the Western Himalaya physiographic division. Geographers divide the state into five transverse zones (Figure 1).

FIGURE 1: GEOLOGICAL DIVISIONS OF UTTARAKHAND



- (a) The *Terai*: South of the Himalayan Frontal Fault.
- (b) The Doons: Between the Main Boundary Fault (MBF) and the Shivalik (Outer Himalayan) range.
- (c) The Middle Himalaya: Between the MBF and the Main Central Thrust (MCT) with ridges as high as about 3000 m.
- (d) The Inner (or Great) Himalaya: The zone north of the MCT including the permanently snow-clad peaks at heights ranging up to just under 8000 m.
- (e) The Trans Himalaya to the north of the snow clad ridges.

The state's climate varies tremendously from the sub-tropical humid climate of the *Terai* region to the tundra-like climate of the Great Himalaya ridges. The variation is even more dramatic along the slopes of the mountain ranges. These variations give rise to tremendous biodiversity, particularly in the forest areas.

The total population of Uttarakhand in 2011 was 10.12 million according to the 2011 Census. It is primarily a rural state with 69.5 per cent of the people living in 15,761 villages. The urban population is mostly settled in the southern *Terai* region and the Doon valley.

More than 90 per cent of the people in the mountain districts live in rural areas. The Middle

Himalaya region between the MCT and the MBF is the most densely populated Himalayan zone. The Great Himalaya region remains largely remote, sparsely populated and unspoiled. Over a million pilgrims and tourists annually visit the five prominent shrines – Yamunotri, Gangotri, Kedarnath, Badrinath and Hemkund Sahib – in this region. Other tourists visit the state for adventure, its wilderness and scenic vistas.

Rajputs are the dominant caste in Uttarakhand. The SC and ST population in Uttarakhand is just under 18 per cent (see Table 1). The small ST population is unevenly distributed in the state. The Tharu, Buksa and Jaunsari tribes mainly depend on agriculture (Pant, undated). Bhotias have traditionally engaged in cross-border trade with Tibet. The Buksa (about 15 per cent of the tribal population) and the Van Rajis (0.6 per cent) are among the poorest people in the state.

Mountain villages generally have a high proportion of women to men as compared to plain areas. This is due to high levels of out-migration of men in search of jobs and cash incomes. Typically a mother in a rural mountain family works for 12 hours a day, of which 3.5 hours are spent on gathering fuel, fodder and water, 3.5 hours are spent on livelihood related work and 4.75 hours on daily household tasks (Chopra & Ghosh 2000).

TABLE 1: A BRIEF PROFILE OF UTTARAKHAND

Area (in sq km)	53, 485
Population (in 2011)	10,116,752
Rural (%)	69.44
Sex Ratio (F/1000M)	963
Density (per sq km)	189
SC Population (%)	15.17
ST Population (%)	2.56
% Designated Forest Area of Geographical Area	64.79
% Pasture Land of Geographical Area	3.51
% Net Sown Area	13.29
% Total Fallows	1.87
Rainfall (mm)	1550

Sources: Census of India 2011, State of Forest Report 2011, Uttarakhand State Perspective and Strategic Plan 2009–27

A healthy forest cover is critical for livelihood and ecological security in the mountain region (See

Box). Forests provide the local population with food, fruits, fuel wood, fodder and fibres along with a variety of ecological services.

Once forests are cut down in the mountain areas, there is increased surface runoff and soil erosion. Fodder and year-round water availability decreases. As fodder becomes hard to get, mountain families tend to reduce their livestock, leading to reduction in farmyard manure, loss of soil fertility and reduced agricultural production. When a family's food grain production falls below sustenance levels, a typical response is the migration of an able-bodied male family member. The reduced availability of labor in the family increases women's burdens. They react by further reducing the number of cattle, sending the family's agricultural production into a downward tailspin.

Visitors to Uttarakhand in the eighteenth century were amazed by the immensity of its forests (Guha, 1989), but in the last 150–200 years, there has been large-scale deforestation – first due to the rapacious demand of the British for timber and after Independence due to the construction of dams, roads and habitations, over-grazing and green-felling.

Over 51 per cent of the state's working population is involved in agriculture even though the cultivable area is less than 15 per cent of the total geographical area. Poor to moderate soil fertility on the mountain slopes limits agricultural production. Groundwater irrigation and tube wells are largely restricted to the southern plains. The state's industrial production is also almost entirely limited to the southern districts.

Finally, Uttarakhand is highly disaster-prone. The areas around the MCT and north of it fall in zone V, the most earthquake-prone zone in India. The rest of the state is in zone IV. Uttarakhand also witnesses landslides, flash-flooding and forest fires almost every year. Rain shadow areas are prone to droughts. While forests cannot prevent all these disasters from occurring, their presence can attenuate the probability and intensity of occurrence of landslides, flash-floods and sheet erosion of the topsoil.

I.2 Uttarakhand's Economy

Pre-independence economic growth

The traditional economy of Uttarakhand was largely dependent on natural resources. It was based on subsistence agriculture, forest resources, artisanal crafts, some mining, and cross-border trade with Tibet by the Bhotiya communities in the northern districts.

Prolonged struggles for the control and use of Uttarakhand's natural resources, particularly forests, influenced the nature and growth of the traditional economy. The kind of institutional control determined the use of Uttarakhand's forests – whether they were exploited by the state for commercial purposes or whether they provided livelihood resources to the community and protected the environment.

British lawmakers enacted Forest Acts in 1865 and 1878 to establish their monopoly over forests in the territories ruled by them. Simultaneously, the customary rights of local communities were curtailed. Thereafter the ruler of Tehri state also asserted his sovereign rights over forests and reduced the rights of the communities.

Between 1911 and 1917 local peasants strongly opposed the reservation of forests in the Kumaon region. Consequently a large proportion of fir, spruce and oak forests were returned to the revenue department. Commercial species like deodar, pine and sal stayed with the forest department.

Kumaon's forest reforms led to the establishment of Van Panchayats, a unique experiment in community management of the forests handed over to the revenue department earlier. Van Panchayat lands met the village community's household needs for forest products while the reserved forests under the forest department were exploited for commerce.

Post-independence mountain economy

The laws and institutions devised by the British for management of forests in Uttarakhand were largely retained after independence. Commercial interests replaced colonial interests. Forests became major revenue generators for the state and the powers of the Van Panchayats were gradually reduced.¹

The declining autonomy of local communities increased impoverishment. Deforestation reduced access to fodder and agricultural productivity suffered. Since the mountain areas did not generate agricultural surpluses, development planners did not invest in mountain agriculture, but almost 90 per cent of the mountain work force was involved in agriculture as late as 1971 (Guha, 1989). The inability to produce enough food grains for subsistence needs in the mountain districts led to increasing out-migration of able-bodied men and greater burdens for the women left behind.

Commercial exploitation of Uttarakhand's forests benefitted 'outside' contractors more than the local people. In the early 1970s, Dasholi Gram Swarajya Mandal (DGSM), a Sarvodaya organization established by Shri Chandi Prasad Bhatt, planned to manufacture essential wooden agricultural implements and sell them to local farmers at modest prices. But the Forest Department refused to provide trees for the purpose even as it gave lucrative contracts for clear-felling to large companies from outside the region. Such discrimination was one of the major causes for the well-known Chipko movement to save Uttarakhand's forests (Guha, 1989). It raised national and international awareness that a harmonious people-forests relationship was essential to sustain the mountain environment.

Protests against the Tehri dam and the despoliation of the Doon valley by limestone

mining during the 1980s made it increasingly clear that the needs of the mountain regions would not be met in a large plains-dominated state like Uttar Pradesh. Thus in the 1990s the demand for a separate mountain state gained momentum.

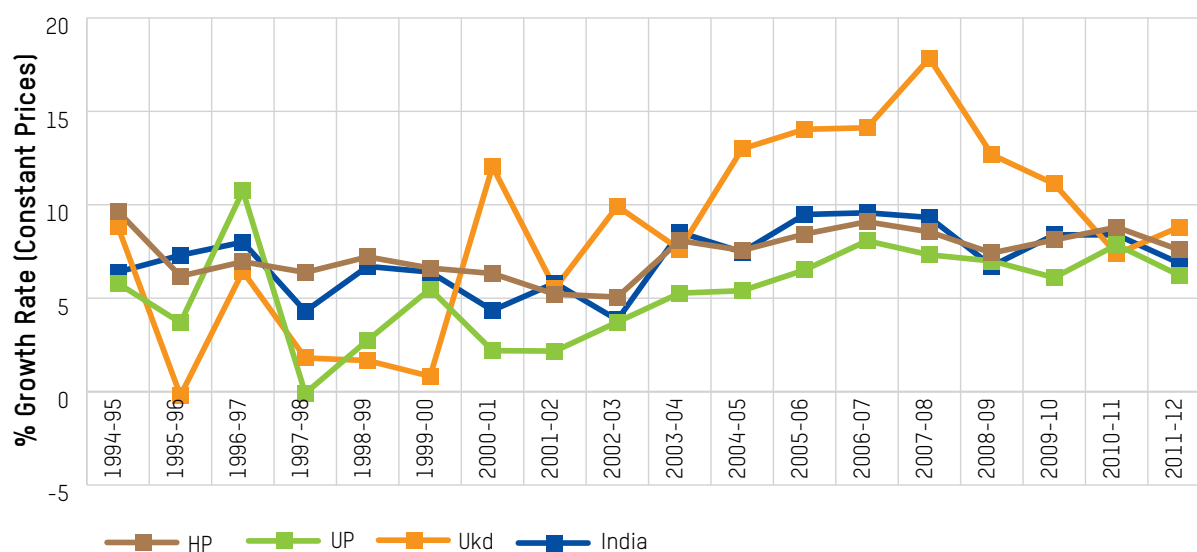
During the statehood agitation, Uttarakhand's people repeatedly highlighted the mountain character of the region. Consciousness created by the Chipko movement encouraged village women to demand that their new state pursue a green development path so that denuded slopes would be reforested, fuel wood and fodder could be plentiful in their villages, community ownership of these forests would provide them with forest products-based employment in their villages instead of forcing them to migrate to the plains, afforestation and watershed development would revive their drying springs and rain-fed rivers.

Throughout the region women led demonstrations demanding a mountain state. They wanted development that would first enhance their human, social and natural capital.

Post statehood economic growth

Successive governments in the new Uttarakhand state, however, put their faith in the conventional model of development with the single-minded goal of increasing monetary wealth through industrialization. It is the same model that is followed throughout the country. It does not

FIGURE 2: ANNUAL GSDP GROWTH RATE



Source: Databook for use of the Deputy Chairman, Planning Commission, Gol, New Delhi, April 2012, p.103

TABLE 2: QUALITY OF LIFE INDICATORS (AS PERCENTAGE OF HOUSEHOLDS)

Category	Uttarakhand		All-India	
	2001	2011	2001	2011
Amenities				
Drinking water in premises	44.8	58.3	39.0	46.6
Electricity	60.3	87.0	55.9	67.3
Toilets in premises	45.2	65.8	36.4	46.9
Assets				
Television Sets	42.9	62.0	31.6	47.2
Computers	-	11.0	-	9.5
Telephones	9.9	74.6	9.1	63.2
Two Wheelers	11.9	22.9	11.7	21.0
Four Wheelers	2.7	6.2	2.5	4.7

Source: (Mohanty, 2012)

recognize the special characteristics of the mountain region.

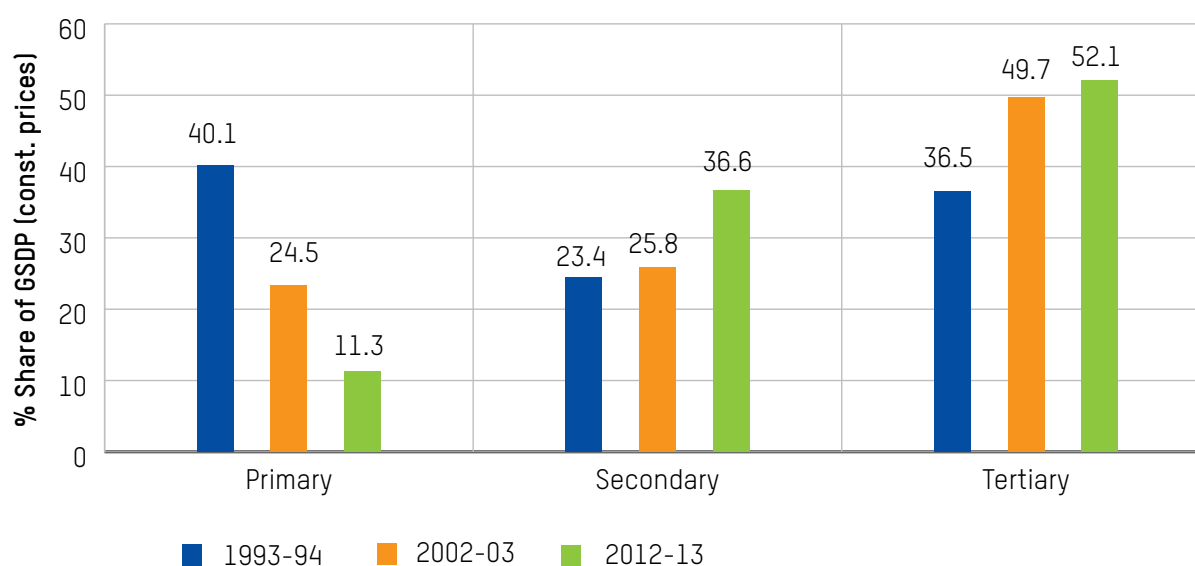
Union governments also supported this approach. The Union government bestowed a Special Category State status on Uttarakhand in January 2003 (along with the neighboring mountain state of Himachal Pradesh), and announced economic concessions to promote industrialization.

These policy measures resulted in double-digit annual growth of Uttarakhand's macro-economy for most of the last decade. Figure

2 shows that after the formation of the new Uttarakhand state its annual economic growth rate generally exceeded the national rate, that of its parent state, Uttar Pradesh, and its more developed neighbor, Himachal Pradesh. 16,012 new industrial units were set up in Uttarakhand with an investment of Rs. 23,905 crores by March 2010. (Tomar 2012). The corresponding figures for Himachal were 7,606 units and Rs 10,104 cr. New employment was created for 161,610 persons in Uttarakhand versus 95,618 persons in H.P.

Per capita income in Uttarakhand increased from Rs. 19,457 in 2001-02 to Rs. 52,125 by 2011-12

FIGURE 3: SECTOR-WISE SHARE OF GSDP



Source: 1993-94: Trends in Agriculture & Agricultural Practices in Ganga Basin, Part 1: Uttarakhand. 2004-05 and 2012-13: Directorate of Economics & Statistics, GoU, Report on June 15, 2013

as compared to an increase from Rs. 20,943 to only Rs. 37,851 at the national level in the same period (Mohanty 2012). This was accompanied by better performance of the indicators for the quality of life compared to the all-India figures (Table 2).

Despite these impressive macro numbers, Uttarakhand also reports very high poverty incidence (Mohanty 2012). Its life expectancy rate is below the national average. The gap between the male and female literacy levels remains stubbornly high at about 18 per cent, and the state's Human Development Index ranks 14th in the country. The paradox of rapid economic growth and high incidence of poverty can be understood by analyzing disaggregated economic data.

Structural Imbalance: Disaggregated time series data of GSDP shows a serious imbalance in the structure of the state economy. In about two decades from 1993–94 to 2012–13, the share of the primary sector in Uttarakhand's GSDP has declined by almost 72 per cent (Figure 3).

Almost all the growth in the state's economy has been in the secondary and tertiary sectors. In absolute terms the real growth in the primary sector was 22.5 per cent between 2004 and 2013. The corresponding figures for the secondary and the tertiary sectors are 245 and 168 per cent respectively.

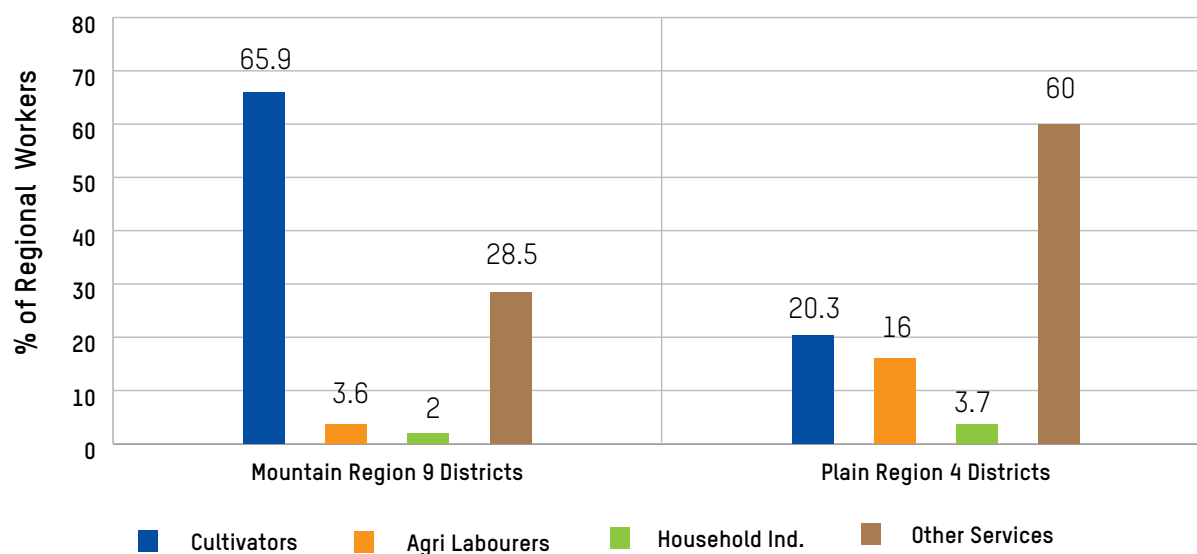
The impact of government policies is further

revealed by analyzing sub-sector growth in real GSDP between 2004–05 and 2012–13. It shows slow growth in agriculture (20 per cent), forestry (28 per cent), fishing (57 per cent), mining (34 per cent), real estate (plus ownership of dwellings and business services, 42 per cent) and other services (44 per cent).² Manufacturing (414 per cent), construction (86 per cent), electricity and water (167 per cent), transport, storage and communication (191 per cent), trade, hotels and restaurants (272 per cent), banking and insurance (274 per cent) and public administration (132 per cent) grew rapidly.

Agriculture showed the lowest growth rate among all the sub-sectors during 2004–13. Its share in the state GSDP (at constant prices) fell from 16.7 per cent in 2004–05 to a mere 7.8 per cent in 2012–13. But according to the Census 2011, more than 51 per cent of the state's work force is employed in agriculture.³ Hence the per capita GSDP share of the households that are mainly engaged in agriculture is much lower than those working in the secondary and tertiary sectors.

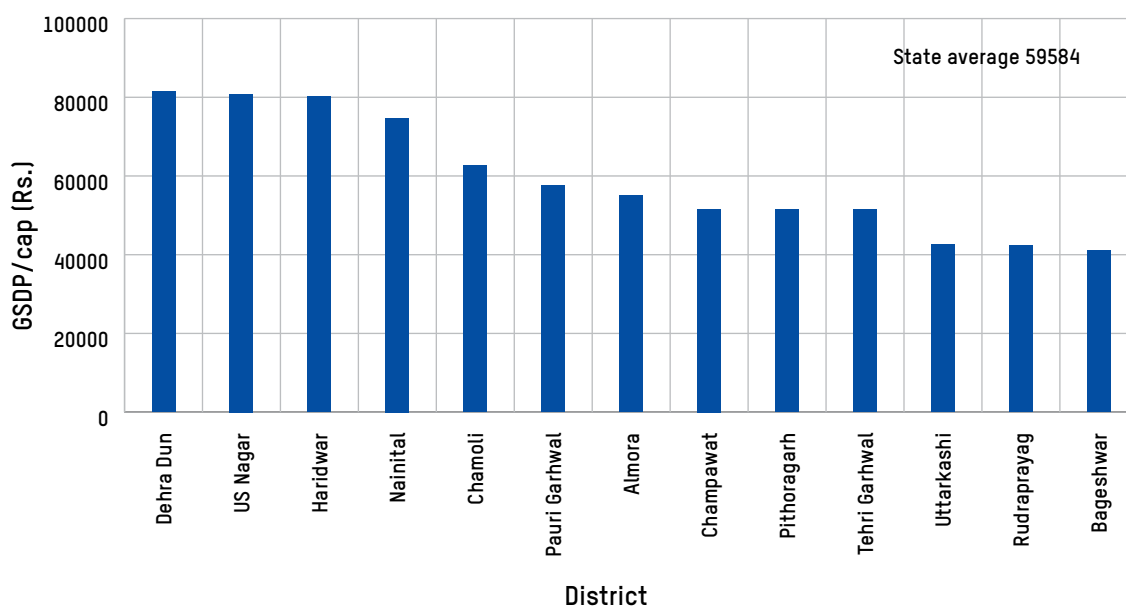
Regional Imbalance: The distortion in the economic structure is accompanied by a strong regional imbalance. Most of the secondary and tertiary sectors' economic activities are located in the plains districts. There are no major manufacturing units in the mountain region. The employment structure in the state reflects the regional growth imbalance (Figure 4).

FIGURE 4: SECTORAL DISTRIBUTION OF REGIONAL WORKERS (MAIN & MARGINAL)



Source: Census 2011

FIGURE 5: DISTRICT-WISE PROVISIONAL PER CAPITA GSDP 2010-11



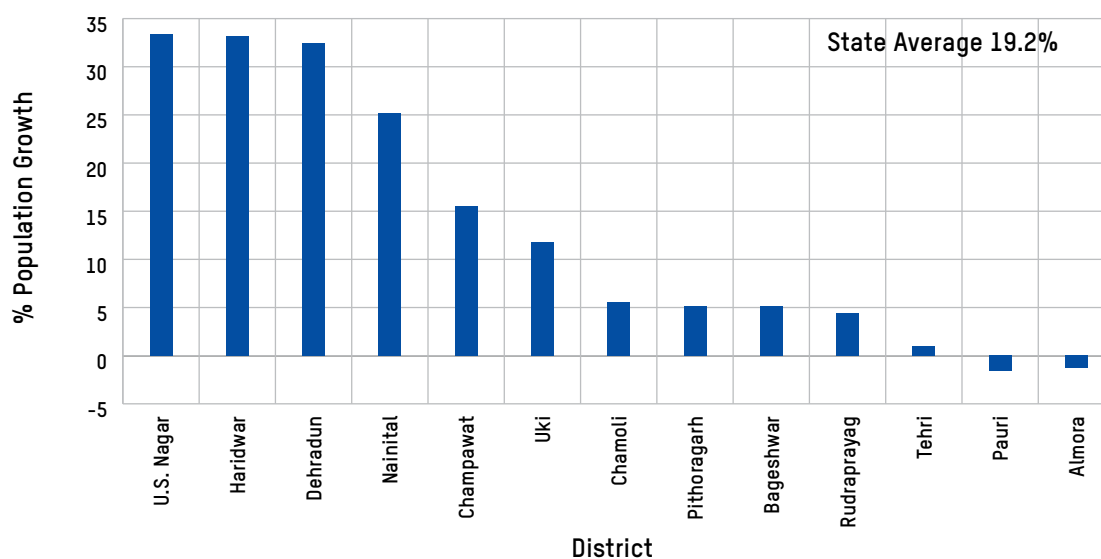
Source: Uttarakhand Statistical Diary 2011-12, Directorate of Economics & Statistics, Dept. of Planning, GoU, Dehradun, p. 58

In the mountain districts, almost 70 per cent of the working population is employed in agriculture as cultivators and agricultural labor. In the plains districts the corresponding figure is 36 per cent. Thus a very large fraction of the households in the mountain districts have a low per capita GSDP. Figure 5 shows that except for Chamoli, the per capita GSDP of all the other mountain districts is below the state average.

Social Imbalance: Mountain cultivators are largely marginal (76 per cent) or small (17 per

cent) land holders. The average net irrigated area in the mountain districts is just 10 per cent of the net sown area, as against 83.5 per cent in the plains districts. Among the mountain farmers, the worst off are the SC farmers. According to the 2005-06 Agricultural Census in Uttarakhand, their average holding size is only 0.51 ha versus 0.83 ha for all mountain cultivators. SC cultivators in the plains are only slightly better off with an average holding of 0.65 ha against 1.09 ha for all the plains' farmers.

FIGURE 6: DISTRICT-WISE DECADAL (2001-11) POPULATION GROWTH RATE



Source: Uttarakhand Statistical Diary 2011-12, Directorate of Economics & Statistics, Dept. of Planning, GoU, Dehradun,

Migration: With moderate to low fertility soils and poor irrigation facilities, most mountain families are unable to grow enough food grains to meet the annual household requirements. Therefore many farming families have given up farming in the last quarter century or so.

Earlier, able-bodied men from impoverished mountain families migrated to other parts of the country in search of jobs or joined the army. Now entire families are migrating out of mountain villages to the four southern districts. This is reflected in the 2001–2011 decadal population growth data shown in Figure 6. The population in Pauri Garhwal and Almora has actually declined during the decade.

A news report states that 1,065 villages in Uttarakhand have become 'ghost villages' because hardly anyone lives there (Umar 2012). The situation is so desperate that when someone dies, there are not enough people to carry the dead body to the cremation grounds.

Environmental Problems: The manufacturing subsector recorded the highest growth rate (414 per cent) between 2004 and 2013; but it also caused widespread pollution. In 2010, the Uttarakhand Environmental Protection and Pollution Control Board (UEPPCB) issued closure notices to 52 manufacturers for causing pollution (Prashant 2011). Later it cited 374 industrial units for environmental pollution in the state. These included manufacturing giants like Tata Motors, Hindustan Unilever, ITC, Hero Honda, Bajaj Auto and Nestlé among others.

Paper and pulp industries, sugar mills, distilleries and other industries routinely discharge effluents directly into important tributaries of the Ganga like the Western Ramganga, Kosi and Dhela. In January 2010, the Central Pollution Control Board (CPCB) was compelled to direct the UEPPCB to monitor and curb such pollution.

The massive growth of tourism and commercial activity in Haridwar city has caused serious air pollution and concomitant problems due to particulates emission from motor vehicles (Joshi & Semwal 2011). Construction of hotels, restaurants and commercial centres has expanded rapidly to cater to tourists in different parts of the state. This has led to large-scale illegal construction of hotels and buildings on river banks and river bed sand mining to

meet the construction industry's demand (Chakravarty 2013).

Hydropower development is another thrust area of economic growth in Uttarakhand. According to data recently made available by the Government of Uttarakhand, it has identified an installed potential of 27,039 MW at 450 hydro-electric projects (HEPs) in Uttarakhand.

Generally speaking, the main factors in deciding the size of a dam are the discharge and head available. Big dams are usually built on big rivers and small dams on smaller rivers or streams. All HEPs have the same kinds of environmental impacts. The only difference is that small projects have impacts that are more easily mitigated. In Uttarakhand an HEP of 5 MW installed capacity may be considered large enough to have serious environmental impacts. Out of the 450 HEPs identified by the GoU, 253 have installed capacities of 5 MW or more. Currently 92 HEPs (3,624 MW) are operational, 38 (3,292 MW) are under construction and 37 (3,318 MW) are in various stages of obtaining clearances. Most of them are in the mountain districts. Many rivers have multiple projects on them but no real cumulative impact assessments have been done.

HEPs cause a variety of environmental and social problems throughout their life cycles. They fragment rivers, alter their ecosystems and reduce riverine biodiversities. There is significant deforestation in the pre-construction and construction phases when roads are built and colonies established for housing and offices. Quarrying for construction materials, blasting for tunnels and muck disposal all cause air, water or noise pollution. Roads and tunnels often destabilize mountain slopes, endangering lives and livelihoods. Displacement of local populations and loss of access to local livelihood resources add to the environmental dimensions. Hence dam building is a hotly contested development activity in Uttarakhand.

Many of these effects are already visible in Uttarakhand. The Union Ministry of Environment and Forests (MoEF) estimates that almost 45,000 ha of forestland have been diverted to non-forest uses in Uttarakhand since 1980 (www.downtoearth.org). About 40 per cent of this has been for road construction, HEPs and transmission lines. Two-thirds of the forest

diversion has occurred after the formation of the state.

While the mountain dwellers have to bear the brunt of the ill-effects of dams, they have hardly benefitted from the power produced. An industry document states that the mountain districts consumed barely 1.5 per cent of the power produced in the state (PHD Research Bureau 2011). Daily power outages in the mountain districts remain a common feature. Annual per capita consumption of less than 100 kwh in the mountain districts of Rudraprayag, Uttarkashi, Bageshwar and Almora was much below that of southern Dehradun (936 kwh) and Haridwar (416 kwh) districts.⁴

Climate change has emerged as a critical issue in this disaster-prone state. Uncertainty of rain and snow appears to be increasing. Winter rains have almost disappeared and inner Himalayan peaks sport much less snow than earlier. The frequency of extreme weather events seems to be increasing. 2009 was a drought year in Uttarakhand but 2010 saw heavy rains and landslides in the Kumaon region during the monsoon season. In 2012, a cloudburst deluged the Assiganga valley wiping out three small HEPs. Hence resilience against unpredictable weather and its consequences has to be built into development planning in Uttarakhand.

1.3 Conclusions

The agitations for a separate state of Uttarakhand had demanded a mountain state, but successive state governments have neglected Uttarakhand's predominantly mountain character and adopted the conventional model of development followed in the rest of India. They have ignored the people-centered green development path hoped for during the statehood agitations.

Economic development after statehood has generated wealth in Uttarakhand. Industries and jobs have increased, but mainly in the plains. The chief beneficiaries of economic growth are in the towns and cities of the southern districts where production investments have concentrated.

The neglect of Uttarakhand's mountain character has doubly jeopardized its mountain communities. Agriculture is their main livelihood source, but agriculture income growth has been

the slowest after statehood. Given its generally marginal farm lands, the SC community in the mountain areas is among the least benefitted. Sustainable regeneration of mountain agriculture deserves high priority in Uttarakhand's development planning.

The faster growing economic sectors of the state economy have brought some growth to the mountain areas but have also seriously endangered ecological sustainability and livelihood security in the process. Uttarakhand's governments have pushed roads, dams, tunnels, bridges, mining and unsafe buildings even in the most fragile mountain regions. These activities have aggravated the destruction due to the 2013 disaster. Barely 10 per cent of the net sown area in the mountain districts is irrigated. Highly variable weather in recent years has increased the vulnerability of agricultural production in the rain fed cultivation areas. Unless climate change impacts and disaster mitigation are built into development planning, weather-related disasters will affect mountain farmers and farm laborers the most. They could also erode economic growth in the near future.

CHAPTER II: NATURE AND EXTENT OF THE UTTARAKHAND DISASTER

The origin of the 2013 Uttarakhand floods and landslides disaster can be ascribed to an extreme rainfall event.⁵ The devastation was statewide though the main death toll occurred between Kedarnath and Gaurikund in the uppermost reach of the Mandakini valley in Rudraprayag district (See Box: The Catastrophe at Kedarnath). The lack of road connectivity and inclement weather made rescue and supply of relief materials very difficult at many places. More than 100,000 pilgrims, tourists and service providers were left marooned near various shrines in the upper reaches of major rivers.

The destruction due to the 2013 disaster was multidimensional and continuing. Floods and landslides battered different parts of the state during the entire monsoon season after repeated spells of heavy rainfall.

II.1 June 15–17, an Extreme Rainfall Event

Meteorology officials explained that collision of warm moist air from the southeast with cold air from the northwest created a low pressure region above Rajasthan and Haryana. "It sucked in moisture laden monsoon clouds from the Arabian Sea and moved in a northeast direction. When the latter collided with cold air above the mountain ranges in Uttarakhand and eastern Himachal Pradesh, they quickly dumped all their moisture over the region," explained Dr. Anand Sharma, Director, Meteorological Centre, Indian Meteorological Department (IMD) in Uttarakhand.⁶

The dynamic monsoon trough in the west also pulled the normal low-pressure southwest monsoon system from eastern India to rapidly traverse the entire state of U.P. in only 24 hours on June 14–15. The monsoon season thus arrived several days early.

On June 14, Dr. Sharma, issued a warning of heavy rainfall in all the agro-meteorological zones of the state. "On June 15th I forecast the possibility of heavy to very heavy rainfall on June 17 and the possibility of rain on June 18 and 19. I informed the state government that char dham pilgrims be advised to postpone their yatra by four days," said Dr. Sharma.⁷

Intense rain blanketed almost all of Uttarakhand between June 15 and 17. The Dehradun Meteorological Centre reported 129 and 162 mm rainfall for 24 hrs ending at 8:30 a.m. on June 16 and 17 in Uttarkashi town in the west. The corresponding figures for Dehradun city were 220 and 370 mm, breaking an 88 year-old record. Nainital in the east recorded 176 and 170 mm on June 17 and 18 mornings respectively. Though greater rainfall over a 24-hour period has been recorded in the past in Uttarakhand, sustained heavy rainfall for nearly three days over the entire state is rare.

The maximum rain fell in the Inner Himalayan region, but it varied from sub-basin to sub-basin. The most deluged parts were around Badrinath–Hemkund Sahib–Kedarnath–Gangotri shrines, which are about 60 km apart as the crow flies, and the Gori Ganga and Darma valleys in the eastern Pithoragarh district.

The early arrival of the monsoons and the intensity of rain over the mountain region from eastern Himachal Pradesh to western Nepal totally surprised almost everyone. It was the peak of the annual tourist season in Uttarakhand. Well over 100,000 tourists, pilgrims and service providers had ventured into the upper reaches of the major rivers to visit religious shrines.

II.2 Impact of the Disaster

The ensuing disaster was statewide. Big and small rivers and mountain streams throughout the state burst their banks wreaking havoc in nearby villages. The heavy rains destabilized mountain slopes causing landslides at thousands of locations. The main impact was felt near the more fragile high ranges. Table 4 gives the preliminary assessments data compiled by different agencies. Though some of the numbers were not definite, they revealed the scale of the catastrophe. The following paragraphs briefly describe the nature of the impacts.

Floods: Flash floods are a common occurrence in the Himalayas but the destruction at many locations this year was very unusual. Large rivers like the Ganga, Kali, Saryu and Ramganga (E) breached their danger marks. The Ganga inundated Rishikesh and Haridwar. Its tributary, River Bhagirathi, flooded parts of Uttarkashi while the Alaknanda drowned parts of Srinagar under 30 feet of water, mud and silt. The Mandakini

TABLE 4: PRELIMINARY ASSESSMENT OF THE UTTARAKHAND DISASTER 2013

S No	Nature Of Damage	Numbers
1	Affected persons	5 lakhs (approx)
2	Affected villages	4,200
3	Severely affected villages	over 300
4	Persons injured	4,463
5	Number of dead persons	over 900*
6	Number of missing persons	5,748
7	Number of pukka houses damaged	2,679
8	Number of kuccha houses damaged	681
9	Number of animals lost	8,716
10	Number of roads destroyed	2,302
11	Number of bridges washed away	145
12	Number of drinking water schemes damaged	1,418
13	Number of villages without power	3,758

Source: DMMC, IAG, UNDMT, Internet.

Note: *These are government figures. Most unofficial estimates of dead and missing are much higher.

THE CATASTROPHE AT KEDARNATH

A tragedy of massive proportions took place in the uppermost reach of Mandakini river. Immense destruction occurred all along its length up to its confluence with the Alaknanda at Rudraprayag.

Kedarnath town (3,546 m asl) lies less than a kilometer from the origin of the Mandakini river at the snout of the Chorabari glacier (3,895 m asl). The town is built on a terrace on either side of which are steep mountain slopes covered with snow and moraines (mud and rocks) left behind by receding glaciers in the past.

A meteorological station established by Wadia Institute of Himalayan Geology (WIHG) at Chorabari glacier camp recorded 325 mm rain in 24 hours from 5 p.m. onwards on June 15. Nearly 210 mm fell in the first 12 hours (Dobhal et al 2013). The combination of intense rainfall and the melting snows opened up a number of landslides on the eastern slopes on June 16th. Rambara village (2740 m asl), downstream, was inundated by the afternoon of June 16 (Petley 2013). Up in Kedarnath the edges of the terrace on which the town stood began to erode causing buildings to collapse.

On the evening of June 16, around 6 p.m. a huge landslide laden with boulders, rocks and mud

from the companion glacier to the northeast of Kedarnath slammed into the town with the flood waters. It devastated the upper part of Kedarnath town.

The flood water with its bed load then sped down the steep slope and demolished small settlements including Rambara village a few minutes later. Many people lost their lives at Rambara that evening. All night long the valley resounded with the thunderous claps of big boulders and rocks crashing down the slopes.

Meanwhile the Chorabari lake filled up with rain and snow melted from the glacier. On the morning of June 17, swollen waters in Chorabari lake overtopped its old moraines-filled dam. The barrier breached catastrophically and a wall of water rushed down the slope collecting more debris and water en route. Soon it hit Kedarnath town, carrying away people, buildings and shops. The rest got buried in several feet of sand. Everywhere there were dead bodies. Lifeless hands and legs stuck out of sand-packed windows and doors.

Further down-slope at Rambara nothing remained.

level rose 30 to 50 feet in its lower reach, near Rudraprayag.

Floods affected every part of the state; rural and urban areas alike. The Yamuna inundated Vikasnagar. The swollen Bindal and Rispana rivers rendered scores of families homeless in Dehradun, the state capital. The usually tranquil Kosi overran the market town of Someshwar in Almora district. Many villages in the Pinder valley were washed away.

Small mountain streams became torrents eroding their banks and causing landslides. A small feeder stream of the Aglar river in Tehri Garhwal district swept away houses, schools, farms and livestock. Heavy floods in the Painagad, a small tributary of the Gori Ganga, destroyed two hydroelectric projects (HEPs) on June 17 evening.

Landslides: In a preliminary assessment, Indian Space Research Organization (ISRO) identified 2,395 landslides in various parts of the Mandakini, Alaknanda and Bhagirathi watersheds (www.bhuvan-noeda.nrsc.gov.in). Almost 200 of them were between Kedarnath and Gaurikund. Road and telecommunication links were severely affected.

Fatalities: The official human death toll was over 900 and 5748 persons were recorded as missing (www.economicstimes.indiatimes.com). Their families became eligible for death compensation. The unofficial estimates were much higher, at above 10,000 fatalities (www.ndtv.com).

Survivors described horrific scenes of Kedarnath littered with dead bodies, of arms and limbs sticking out of thick layers of sediments. At Rambara dead bodies were hanging from trees when rescuers reached there.

According to a news report about 12,000 Nepalis were working in the floods affected valleys as porters, palanquin bearers and manual laborers (www.ekantipur.com). Hem Bahadur Khadka, a palanquin bearer, said that around 7,000 Nepalis had permits to work as palanquin bearers this season. Thousands of them may have lost their lives. Another palanquin bearer, Kul Bahadur BK, said "I witnessed many of my villagers and other Nepali friends drown in the floodwaters." The official estimate of about 300 missing Nepalis included about 100 workers only.

Deaths due to house collapses or drowning were reported from Uttarkashi, Rudraprayag, Tehri Garhwal, Dehradun, Haridwar, Chamoli, Pithoragarh and Almora districts.

Thousands of mules and ponies were present on the trek routes to Kedarnath and Hemkund Sahib shrines. In addition there were a number of buffaloes and cows. Thousands perished. The Uttarakhand government began to airdrop fodder bundles for them in the second week of July after People for Animals, a voluntary organization, began their rescue.

Loss of infrastructure: Infrastructure in Uttarakhand was badly hit. Roads, bridges, power lines, irrigation canals, drinking water supply systems, telecommunication towers and hotels and houses were destroyed or damaged. Officials valued the lost structures at tens of billion rupees (www.tehelka.com). The consequent business losses were similar. Most of the severe damage was in the northern districts of Uttarkashi, Rudraprayag, Chamoli, Bageshwar and Pithoragarh.

Roads and Bridges: Government data showed that 145 bridges had been swept away and that roads were damaged at over 2300 locations (Table 4). Landslides blocked various sections of national highways to Gangotri, Kedarnath, Badrinath and Hemkund Sahib. Toe-cutting also washed away many riverside sections of these highways. In Pithoragarh, Pauri Garhwal, Almora, Bageshwar and Champawat districts state highways and smaller access roads to village were blocked or washed away.

The loss of road connectivity posed problems in providing relief immediately after the disaster. Villages in the upper reaches of the affected river valleys ran out of rations. Injured people in many locations could not get medical attention.

Air force and private helicopters air dropped supplies at Kedarnath, Badrinath, Ghangaria and northeast Pithoragarh. Newspapers reported that disaster victims in the Johar and Darma valleys situated near the Indo-Tibet-Nepal border in Pithoragarh district were on the verge of starvation. Adequate rations and other essential commodities could not be dropped there for the first 10 days due to inclement weather and the collapse of roads and bridges in the area (www.tribuneindia.com).

Flooded rivers washed away many bridges reducing connectivity. A rampaging Mandakini river swept away most bridges across it. The over 100-years old bridge connecting India to Nepal at Jauljibi was washed away by the Kali river. In some places people drowned trying to cross swollen mountain streams on makeshift bridges.

Power Supply and Hydroelectric Projects (HEPs): Nineteen small HEPs were destroyed (Basu 2013) Half a dozen large extant or under construction projects suffered severe damage. At several locations the local people held HEPs responsible for severe downstream damages. Electricity supply was hampered to an estimated 3,758 villages (Table 4). Kedar valley in Rudraprayag district was the worst affected.

Some areas lost power supply due to damage to the distribution system, others suffered due to destruction of HEPs. The Alaknanda river damaged a 400 MW HEP at Lambagad.

The Maneri Bhali-I (90 MW) and Maneri Bhali-II (304 MW) projects on the Bhagirathi river in Uttarkashi district had to suspend power generation due to heavy accumulation of silt and debris in their tunnels.

In the east the powerhouse of the 280 MW Dhauliganga project of NHPC in Pithoragarh was submerged on June 16th. It stopped generating power completely. Company officials expect it to resume power production only after six months (www.economictimes.indiatimes.com).

The boulder-laden Mandakini buried the 76 MW Phata-Byung dam and severely damaged the 99 MW Singoli-Bhatwari HEP.

Many small hydropower projects were destroyed in the Gori Ganga catchment in Pithoragarh district. Painagad, a tributary of the Gori Ganga, smashed Himalaya Hydro's 5 MW Tanga Phase I HEP. Mudslides damaged the 6 MW and 4 MW Kaliganga I and II HEPs on the Kaliganga, a tributary of the Mandakini river.

Irrigation Canals: A total of 1976 canals in the state, built by its Irrigation Department, suffered breaches. Of these 521 canals were in Kumaon division and 1,455 in Garhwal. The official damage estimate was Rs 37.31 crore in Kumaon and Rs 182.29 crore in Garhwal. (Sharma 2013)

Drinking Water: Officials confirmed that 237 drinking water supply schemes had been

damaged during the disaster (www.timesofindia.indiatimes.com). They affected supplies to 1418 villages (Table 4). Drinking water being a basic need, the state government speedily addressed their repair.

Tourist Hotels and Buildings: The floods destroyed tourism infrastructure like hotels, lodges and restaurants and abruptly ended the main annual tourist season. Scores of hotel buildings and residential houses collapsed into the swirling flood waters in Uttarakashi, Rudraprayag and Chamoli districts. GMVN, the state-owned corporation, lost popular tourist rest houses at Syalsaur, Chandrapuri, Birahi and Kaudiyala among other sites. Revenue losses in the tourism sector alone for 2013–14 are estimated at over Rs. 120 billion (PHD Research Bureau 2013). These are expected to rise to about Rs. 200 billion in 2014–15.

In Dhanaulti tehsil of Tehri Garhwal district, landslides destroyed houses in several villages. Livestock died tethered in sheds. The Bhagirathi swept away more than 180 houses, shops and hotels in Uttarkashi. Many buildings collapsed in the swirling waters of the Assi Ganga.

Life and Livelihoods: The human tragedy resulting from the disaster is grimmer. Without homes, lands and livestock, the basic livelihood assets of thousands of rural families, restoring livelihoods will be a major challenge.

The abrupt end of the yatra season and its unlikely resumption on this scale in the near future will impoverish thousands of families whose men service pilgrims and tourists on the yatra routes. They operate taxis, buses, lodges, dhabas and stalls; some guide people who ride their horses or ponies while others are porters carrying the young, old and infirm on their backs or in palanquins on their shoulders. Thousand of these people and the animals were simply swept away by the deluge at Kedarnath.

Manmendra Singh of Mandakini-ki-Awaz, a community radio station in the Mandakini valley, says, "All-women households are numbed by the thoughts of coping with the future."⁸ Aid agency workers have expressed fears of trafficking of women and children in this region by anti-social elements preying on such vulnerable families (www.in.reuters.com).

The scheduled resumption of many schools after the summer break was delayed. Many school buildings in the badly affected villages were washed away or damaged beyond immediate use. According to news reports about 100 schools in Uttarkashi and Rudraprayag districts were affected (Trivedi 2013).

Access to medical facilities was significantly cut off in the badly affected districts. Injured people and pregnant women were the worst sufferers. A number of voluntary organizations like Oxfam India, Himalaya Institute Hospital Trust, member organizations of the Uttarakhand Inter Agency Group, Doctors For You, Americares and others were active in providing emergency health care in remote or badly affected locations.

II.3 A Continuing Disaster

Almost all through the 2013 monsoon season there were several spells of heavy rainfall. Areas where the soil was saturated with water became vulnerable to repeated landslides. The human and animal death toll continued to rise steadily.

In mid-July, six persons lost their lives in Nainital district, when heavy rains in Bhimtal triggered a landslide. A downpour in Kapkot block of Bageshwar district on July 31st killed several members of a family and washed away many homes. Moderate to heavy rains caused landslides and house collapses in Sunali village of Chamoli district (www.economictimes.indiatimes.com).

Continuous rainfall in the second week of August led to a landslide in Kot village, Tehri Garhwal district. The debris demolished a house killing an old woman and her granddaughter. The same rains washed away a large land area near Chinyalisaur in Uttarkashi district. The Pindar river changed its course near Narayanbagar village in Chamoli district and washed away fields, buildings and roads.

Three persons died in separate incidents in Tehri and Chamoli districts after a spell of intense rainfall on August 17th. Seventeen houses collapsed in Tehri district while the Char Dham highways remained blocked due to falling debris at various locations. A flash flood swept away 55-year old Prema Devi and her land in Sensari village, Tehri Garhwal on August 20.

II.4 Conclusions

The monsoon rains arrived a fortnight early in the form of a 48-hour deluge across the state. The ensuing disaster was perhaps the worst in living memory. It also enhanced the instabilities of mountain slopes in many parts of the state. Landslides continued to devastate rural areas during the rest of the monsoon season. Thus the disaster was an extended one.

Estimates of anticipated revenue losses in the tourism sector ran to over Rs. 120 billion for 2013–14 and about Rs. 200 billion for 2014–15 (PHD Research Bureau 2013). The state economy may take a few years to recover. The biggest challenge will be to restore the lives and livelihoods of thousands of families who have lost members, homes, animals and lands – their basic livelihood resources.

CHAPTER III: CAUSES OF THE DISASTER

The Uttarakhand 2013 disaster raises important questions for discussion. Was the disaster an unprecedented natural phenomenon or was it a typical impact of climate change? Was the resulting destruction only due to intense rainfall or was it exacerbated by human activities? Could the state government have managed the disaster response better and minimized the impact? This chapter analyses the causes of the disaster to answer these questions.

III.1 A Rare Natural Occurrence or Climate Change Impact?

Extreme rainfall events in the south Asian sub-continent are becoming more and more frequent. The Uttarakhand rainfall is the fourth in a series of similar events in the western part of the sub-continent in eight years and the third in the northwestern part. The earlier events were the deluge in Mumbai, July 25–27, 2005, the ‘freak’ floods in Barmer in the last week of August, 2006 and then the massive flooding in the Indus basin at the end of July 2010.

The meteorology of the 2010 Indus basin floods and the 2013 Uttarakhand extreme rainfall is very similar. The description of the Indian event given in Chapter II can be compared with the following description of the event in Pakistan by scientists at the University of Twente (Netherland), “In certain areas, more than 4 times the normal monthly rainfall fell within 3 days. The instant rain intensity reached 300 mm over a 36-hour period according to the Pakistan Meteorological Department.... The 2010 monsoon season had a slow start, but made quicker progress northward than normal during June–July. In Pakistan, the onset of the monsoon was about 10 days earlier than normal,” (www.itc.nl).

At this stage it is very difficult to ascribe a particular weather event only to climate change. Abnormal weather is usually due to a combination of several factors. The IPCC Fourth Assessment Report (2007) had, however, warned that despite uncertainties, global warming would lead to ‘a tendency for monsoonal circulation to result in increased precipitation due to enhanced moisture convergence.....the type, frequency and intensity of extreme events are expected to

change as Earth’s climate changes’ (www.itc.nl).

The emerging pattern of frequent extreme rainfall events in the sub-continent therefore appears to confirm the above guarded prediction of disastrous global warming impacts.

III.2 A Consequence of Anti-Environment Development

Since the formation of Uttarakhand as a separate state, successive state governments pushed by an assortment of special interests, have promoted an economic growth model that totally disregards the state’s mountain character and the associated environmental frailties. They have doggedly promoted deforestation, dams on large and small rivers, lengthy tunnels inside fragile mountain slopes, construction of road, hotels and resorts by riversides and massive sand mining of river beds.

Leaders of the major political parties in the state have displayed an anti-environment attitude. The Uttarakhand legislature has twice passed resolutions against the notification by the Union government of a 100 km stretch of the Bhagirathi river, from its source at Gaumukh to the town of Uttarkashi, as an eco-sensitive zone (Bannerjee 2013). The notification allows environment-friendly development activities like watershed development or afforestation in the eco-sensitive stretch and restricts environmentally damaging projects like dams. State Chief Ministers and politicians from various parties have railed against forest conservation laws and the eco-sensitive zone.

Expansion of physical infrastructure is required in the state. But minimizing the damage done in the process requires a commitment to sustaining the environment through environment friendly approaches. Such a commitment is lacking on the part of the state’s decision-makers.

Deforestation: Deforestation is a major cause of landslides. Field research and documentation by Shri Chandi Prasad Bhatt, a progenitor of the Chipko movement, and Dr. Navin Juyal of the Physical Research Laboratory (PRL) have established a good correlation between deforestation, intense rainfall events and devastating landslides (Bhatt, 1992). Analysis of satellite images shows a decrease in landslides in Chamoli district after intense rains in areas

that have been reforested by women of the Chipko movement (Kimothi, 1984).

Since independence there has been a steady decrease in the extent and quality of forest cover in Uttarakhand. The Forest Department sees forests more as a source of raw materials for industries and as a source of revenue for the state. Large tracts of broad-leaved *banj* (oak) or oak and burans (rhododendron) forests were replaced by *chir* pine plantations. Pine is a source of industrial timber and resin. But it does not provide the same quality of environmental services.

Mira Behn, the well-known follower of Mahatma Gandhi, while living in Rishikesh at the foothills of the Uttarakhand Himalaya wrote, "Year after year the floods in the North of India seem to be getting worse, and this year they have been absolutely devastating. This means there is something radically wrong in the Himalaya, and that "something" is without doubt, connected with the forests" (Mira Behn 1950). She urged the forest department to change its policy, and promote oak instead of pine.

After the Indo-Chinese border war in 1962 highways were built across the state up to the border to facilitate troop movements. Heavy forest-cutting followed with the availability of road transport. Clear-felling of forests above an altitude of 1000 metres was eventually halted in Uttarakhand in 1981, mainly in response to the efforts of the Chipko movement.

Almost 30,000 ha of forests have been diverted to non-forest use in Uttarakhand since the formation of the state (Shrivastava 2013). The maximum diversion has been for road construction (9,500 ha) and power generation and transmission (8,600 ha). Most of the diversion for roads and hydropower has been in Uttarkashi, Rudraprayag, Chamoli and Pithoragarh districts, the ones most affected by the present disaster. This is while a vast majority of the planned hydropower projects are still to get off the ground.

Hence it may be surmised that deforestation due to neglect of environmental imperatives in development planning could be a major contributor to the destruction caused in June 2013.

Hydroelectric projects (HEPs): Hydropower projects appear to have added to the destruction in June 2013.

In 2009 a CAG performance audit of HEPs in Uttarakhand warned that, "The adverse consequences of such floods are acute as they can not only damage the project structures but can cause loss of life in low-lying downstream areas" and "No specific measures had been planned in any project to cope with the risk of flash floods" (CAG 2009).

According to local residents, a lake formed behind the Jai Prakash group's 400 MW Vishnuprayag HEP on the Alaknanda river. Huge boulders and debris brought down by a heavily swollen Khirao Ganga river, barely a couple of kilometers upstream of the dam, choked its gates. The flood water carved a fresh channel through the left embankment of the dam's pond. It swept away a portion of the road to Badrinath, a helipad and others structures of the company. Further downstream the river wiped out the local market at Lambagad, washed away parts of Govind Ghat and Pandukeshwar towns, a bridge and a part of the road to Joshimath. In Govind Ghat scores of cars in a parking lot were swept into the river when the retaining walls collapsed due to toe-cutting by the swollen river (GSI, undated)

NHPC operates a 280 MW HEP on the Dhauliganga (E), just upstream of Tawaghat, where it meets the Mahakali on the Indo-Nepal border. Emmanuel Theophilus, a veteran naturalist in Munsiyari, walked through the Gori Ganga valley and the mid-reaches of the Mahakali and the Dhauliganga (E) to study the aftermath of the heavy rain and floods. His report is based on field observations, analysis of weather and river flow data and conversations with district officials and the staff of the National Hydro Power Corporation (NHPC) (Theophilus 2013).

Theophilus states that the NHPC authorities, fearing a breach, released a massive amount of water from the dam late at night on June 16th even though they knew that the Ellagad just downstream from its tail race tunnel and the Mahakali were already in flood. He reports that the district authorities had denied permission to NHPC to release the water fearing flood damage downstream by the Mahakali. He alleges that NHPC officials had been reckless in allowing the

dam to become dangerously full when it rained heavily since June 15th.

In its 2009 report on HEPs in Uttarakhand the CAG had pointed out that, "The projects seemed oblivious of the gross negligence of environmental concerns." This lack of concern is reflected in the routine flouting of mandatory environmental construction rules. Such criminal neglect may have added to the destruction.

The June flash floods were the first flood in Uttarakhand's rivers in 2013. At several places where HEPs were being built river beds had most likely been raised by the routine, but illegal, dumping of debris and muck. This could have aggravated the downstream damage.

Srinagar town was flooded by the Alaknanda river between June 16 and 17. Over 30 feet of sand and silt buried the Sashatra Seema Bal (SSB) Academy main building, campus and large parts of the town. Damage at the Academy was initially assessed at over Rs. 90 cr. Local residents blame the thousands of cubic metres of muck piled downstream of the 330 MW Alaknanda Hydro Power project for the disaster that hit Srinagar town (Upadhyay 2013).

Safety and security concerns appear to be minimal in Uttarakhand's hydropower development program. The present approach to hydropower development in the state is driven by a perceived national demand, the developers' goal of maximizing profits, the state ignoring environmental imperatives to generate maximum revenues, lucrative contracts for a number of local players and by other vested interests. It is short-sighted, destructive of the environment and neglectful of the security and livelihoods of mountain communities.

Projects have been sanctioned to companies that have no experience in the hydropower sector, let alone working in the fragile Himalayan region. The CAG report lists some of the more glaring examples of inexperienced developers, including a textile manufacturer, an agro-product exporter, an engineering company, a steel producer and a polyester film production company (CAG 2009). They have been allotted projects in the 7.70 to 63 MW range in the disaster-prone inner Himalayan ranges.

"No lessons have been learnt from the floods disaster that struck the Assiganga basin in

Uttarkashi in August 2012 and the landslides that hit Ukhimath in September 2012", says Himanshu Thakkar of South Asia Network on Dams Rivers and People (SANDRP), New Delhi. An analysis of the 2012 disasters by the Uttarakhand Disaster Management and Mitigation Centre concludes, "It is therefore highly important to regulate developmental initiatives in close vicinity of rivers and streams... Use of explosives in the fragile Himalayan terrain for infrastructure developmental works introduces instability in the rocks and therefore use of explosives should necessarily be banned" (SANDRP 2013).

Thakkar has listed the following reasons for the adverse impacts of dams in the June 2013 disaster (Thakkar 2013):

- Non-requirement of environmental and social impact assessments or preparation of environmental and disaster management plans (DMPs) or monitoring of operations for projects with installed capacities of less than 25 MW;
- Many EIA reports are dishonest and DMPs are not included or are grossly inadequate;
- There are no cumulative impact assessments for river basins where a series of projects are planned on a river;
- Inadequate compliance monitoring systems to check the fulfillment of conditions imposed while approving projects;
- No climate change impact assessment;
- Pro-dam biases of the appraisal, regulatory and monitoring agencies.

The collapse of so many small dams is most likely because they are designed with inadequate past hydrological data. Ideally 100 year flows data are desired. But about 30 years data may also be deemed as acceptable because of paucity of data. A review of many EIA reports shows that projects in Uttarakhand do not have adequately long term data, especially for the smaller mountain streams that feed large rivers. Dam designers often base their analysis on whatever data is available, which may be as low as 15 to 20 years. Hence it is quite likely that the maximum flood levels for which the failed dams were designed were much below the high floods of 2013, leading to their collapse.

Ill-planned tourism: Ill-conceived expansion of tourism in Uttarakhand magnified the death toll.

The most number of deaths and major destruction occurred around the Kedarnath–Badrinath–Hemkund Sahib–Gangotri shrines and the highways to these sites. The shrines are located in the uppermost reaches of the Bhagirathi, Mandakini and Alaknanda river valleys north of the MCT. Geologically it is an extremely fragile, hazard-prone region. When extreme rain fell here, the mountain slopes literally crumbled, blocking highways and obliterating trekking paths. Toe-cutting of mountain slopes and riverside roads by flooded rivers also wreaked havoc.

The intense rain fell at the peak of the tourist season. A population of well over 100,000 tourists, pilgrims and people providing them hospitality services present in the area was exposed to the hazards. Many among them were women, children, the old and infirm and therefore vulnerable.⁹ A combination of these factors increased the risk. Once the trekking routes and highways collapsed the people were stranded with no easy escape routes. Eventually tens of thousands had to be air lifted out of the region.

In the past decade a large hospitality infrastructure in the form of hotels, resorts, lodges, restaurants, roadside eateries, houses, markets and townships had sprung up along riverfronts on the routes to the shrines. Flash floods in the major rivers washed away such infrastructure at many locations.

Shoddy road building: The rapid growth of hydropower projects and tourism in Uttarakhand created a need for more and wider roads for the big machines required at dam sites and the tourist traffic. To speed up the process corners are routinely cut. A former civil engineer from Rudraprayag told a reporter, “While the widening was earlier done by men and machines, now we use dynamite to do it quickly. There are several roads that have become landslide-prone because blasting leaves cracks inside the mountains,” (Mazoomdar & Langer 2013).

Earlier roads were built higher up the slopes on firm rock. Now they are built by the riversides on easily erodible slopes.

Sustainable road building in Uttarakhand’s fragile mountain regions requires extra care and

expenditure. But critical features are usually ignored. Padma Shri Dr. K.S. Valdiya, Uttarakhand’s most well-known geologist, identified three major problems of road construction in the state.¹⁰ Firstly, active tectonic fault lines are usually ignored. “Micro seismic movements in active fault lines make roads in these stretches susceptible to cave-ins and slides,” says Dr. Valdiya. Lack of adequate drainage also weakens the slopes. Finally, many roads are simply built over old landslides’ debris to cut costs.

Illegal building construction: Where roads go, people, homes, shops and businesses follow. Habitations along riverside roads become vulnerable to flash floods. All along riverfront roads in Uttarakhand buildings have been built illegally right by the banks and sometimes in the middle of the river bed itself!

In February this year, the Uttarakhand High Court ordered the state government to demolish illegal structures built within 200 metres of river banks (www.indlawnews.com). But the state government’s response was tardy. The state’s reluctance to move was obvious: its own Vidhan Sabha building, the state’s premier Doon University and a residential colony for government employees are all at least partly located on the Rispana river bed in Dehradun.

Unlike the state government, the rivers did not wait to act. Uttarakhand’s rivers implemented the Court’s order, destroying an estimated 100 hotel buildings, dozens of homes and weakening hundreds more. The now-buried SSB Academy’s main building and barracks were also built on the Alaknanda’s bed in Srinagar.

The High Court while delivering a judgment in a PIL case on July 4 ordered that all structures on or along the Ganga river-front in a part of Haridwar district be demolished within 60 days. Later the Chief Minister, Mr. Vijay Bahuguna, issued a verbal order banning construction within 200 m of river fronts throughout the state (Basu 2013b).

Unbridled and illegal construction occurs not only on the banks of large rivers but also along small streams. In small towns where space is sometimes even more limited, hotels and shops are often illegally constructed in the middle of stream beds! In Gauri Kund, the initial stretch of the trek to Kedarnath is like a tunnel, hemmed in

between haphazardly built multi-storey buildings on either side.

Indiscriminate construction on mountain slopes is another major hazard. Geologists have warned that a popular tourist destination like Nainital faces the threat of large landslides due to ill-planned – and probably illegal – constructions on endangered slopes.

River-bed sand mining: A construction boom in Uttarakhand has led to large-scale sand mining from river beds. Large-scale or unscientific sand mining increases the flow velocity and erosion of river banks with negative effects on the river ecosystem. Groundwater recharge to the flood plains reduces. Local people in Uttarakhand have periodically protested that river bed mining leases are often exploited for commercial profits, like construction of illegal buildings.

Geologists say that sand mining should only be done without the use of heavy machinery and only in very small pockets of less fragile stretches in Himalayan rivers. But the politically powerful sand mining mafia in Uttarakhand, with several past and present ministers and legislators said to be involved in it, flout all rules and regulations. Their pressure is so effective that river bed mining has often been allowed even in protected forest areas.

A study on the impact of sand mining in Gaula river in Nainital district done by Wildlife Institute of India (WII) showed negative effects on the river ecology, flora and fauna.

III.3 Poor Governance

Analyses of the state government's management of the disaster have revealed systemic failures.

Weather alert not heeded: State officials have claimed that they could not take timely disaster mitigation action because they did not have adequate or specific advance warning, but Dr. Anand Sharma, Director, Meteorological Centre, Indian Meteorological Department (IMD) in Uttarakhand had informed the concerned officials on June 14, 15 and 16 of very heavy rains and recommended that the Char Dham yatra (pilgrimage) be suspended and people at sensitive locations be moved to safer places (Doval 2013).

The warnings were sent to the state's chief secretary, the district magistrates of the Char

Dham yatra districts, the Disaster Management and Mitigation Centre, the officer-in-charge of the Char Dham yatra and other senior authorities, but hardly anyone responded seriously enough to them.

In all likelihood, Dr. Sharma's advisories were not acted upon because the state did not have a disaster management plan as required by the DM Act, 2005, nor was a functional communication system in place. A CAG report reviewing the performance of the state's disaster management systems had warned in April 2013 that, "The communication system was inadequate", (Varma 2013).

The proper response to these warnings, particularly the specific one on June 15, would have been to set up police road blocks and halt the pilgrims and tourists wherever they were, turn them back or move them to safe locations. There was enough time to empty out Gauri Kund at the start of the trek to Kedarnath. People could have been moved up slopes, away from the river's edge.

In fact some action was taken by the police in the last stretch of the Kedarnath route. As the Superintendent of Police, Rudraprayag, Mr. Birenderjeet Singh told Tehelka magazine, "There was a Met warning for high rainfall and we were watching the water level. But this happens each year. In Rudraprayag town, we shifted people. In Gaurikund, people were asked to climb up and some were shifted to Rambara (which was eventually wiped out) and the police kept people awake through the night. All the people alive today are those who were evacuated to higher ground. But no one expected a mountain to crumble and fall into the lake (in Kedarnath)" (Mazoomdar & Langer 2013).

Dr. Anand Sharma's parent organization, the Indian Meteorological Department (IMD), did not respond seriously to the warning either. It could also have alerted the Government of India in Delhi and the state government of the danger.

A dysfunctional state disaster management apparatus: Senior administrators at the time of the formation of Uttarakhand state were acutely aware of its hazard-proneness. They established the first state level department for disaster management in India. It was provided with a think-tank, that is, the Disaster Mitigation and Management Centre, but the department hardly functioned.

“The state authorities were virtually non-functional,” said the CAG report referred to earlier (Varma 2013). It said that the State Disaster Management Authority (SDMA), formed in October 2007, had never met. Nor did it set any procedures, rules, regulations, policies or guidelines for its own functioning. The negligence was deadly. Between 2007 and 2012, 27 major landslides in the state claimed almost 360 lives. The CAG report also revealed that the state had taken no action to rehabilitate 101 villages identified as vulnerable by the Geological Survey of India.

The non-performance is not surprising because the SDMA did not have almost half the personnel in place. In 2011–12 the central government did not release funds to Uttarakhand for disaster management because its earlier releases had not been accounted for.

Research and practice disconnect: Following the Malpa and Monsoona (Ukhimath) landslide tragedies in 1998, the Department of Space prepared a Landslide Hazard Zonation Atlas in 2001, covering other important pilgrim routes in Uttarakhand and Himachal Pradesh.

Besides mapping severe to low risk landslide threats it outlined management practices for different hazard zones. It highlighted the Varunavrat landslide that occurred later in 2003. Dr. R.S. Tolia, a former chief secretary of Uttarakhand, has argued that the Atlas was kept semi-secret, as a ‘For Official Use Only’ document and then quietly forgotten. It may not even have been used during the rehabilitation of the Varunavrat landslide (Tolia 2013a).

III.4 Conclusions

There is reason to believe that the disastrous impact of the intense rainfall between June 15 and 17 was magnified by human actions in the name of ‘development’. For 13 years after the formation of Uttarakhand, successive state governments have recklessly pushed an economic growth model that totally disregards Uttarakhand’s disaster-prone character. The state must rethink its entire approach to development.

The disaster is a warning bell for the economic growth model being pursued in all the Himalayan states. Himalayan mountains are too fragile to

sustain rapid and intensive development. Moving away from it is essential since climatologists have repeatedly predicted that global warming will make destructive weather events more frequent in the future.

In June 2013 no one in Uttarakhand – central government agencies, the state government or the society at large – was prepared for an extreme rainfall event. Such preparedness is necessary in areas like the inner Himalayan region in the summer when the presence of hundreds of thousand tourists, pilgrims and service providers enhance the disaster risk and vulnerability.

Uttarakhand must establish effective disaster management systems and procedures at the state, district and community levels. Serious doubts, though, have been expressed by no less than a former Chief Secretary of the state about the government’s ability to do so at present (Tolia 2013a)

An effective disaster management system in Uttarakhand will require a change in its official work culture. Soon after the disaster, the Prime Minister’s liaison officer in Uttarakhand filed an adverse report on the functioning of senior officials of the state government and the utter lack of coordination between different government agencies. (Bhatt 2013)

CHAPTER IV: THE ROAD AHEAD: WHAT IS TO BE DONE

The preceding chapters have highlighted several critical aspects of Uttarakhand's development. They include:

- Uttarakhand's adopting a model of rapid economic growth that is neither equitable nor sustainable.
- The benefit is concentrated in the southern plains districts, and impoverished a large fraction of the mountain population engaged in agriculture and related activities.
- Despite the state's disaster-proneness, disaster preparedness has not been built into development programs. Poor governance has impeded disaster preparedness, mitigation and response.
- Newly emerging climate change patterns, predicted by global warming studies, need to be factored into the state's development programs.

The present chapter focuses on desired development thrusts in Uttarakhand.

IV.1 Pursuing Ecologically Sensitive Development

The statehood struggle had demanded a development model that would be specific to its mountain character. Village women had hoped that their new mountain state would follow a green development path.

The need now is to implement this indigenous development vision.

Afforestation: In a mountain region forests are the backbone of healthy ecosystems. They also provide productive livelihood resources. Dense and moderately dense forests survive on only half of Uttarakhand's forest lands. Therefore the first priority must be to expand forest cover in a manner that enables livelihoods to grow. It will also sustain river ecosystems and protect wildlife and wilderness.

Local politicians often blame India's Ministry of Environment and Forests for delaying environmental and forest clearances and thus

retarding developmental projects – especially road construction. With little access to resources in reserved forests, people have also begun to regard forests as a curse rather than a blessing. To change such thinking the local people must receive direct and tangible benefits from forests, as in the past.

Himalayan states deserve to be paid a fair fee for protecting existing forests and providing other ecological services to the rest of India. In recognition of forests as national wealth, the 12th Finance Commission did recommend an incremental grant of Rs. 1,000 crores for the 2005–10 period for maintenance of forests (GBPIHED, undated). This sum, however, is too paltry when spread over all the states and a five-year period.

Payments for ecosystems services ought to directly benefit the people who forego the use of their forests and other environmental resources. Direct payments to Van Panchayats will encourage them and local communities to conserve, protect and expand their forest cover. Such payments can also be in the form of free cooking gas cylinders delivered at the homes of village women who protect and nurture their forests. It will also bring down the demand for fuel wood from forests.

The issue of access to forests is linked to the system of natural resources management. A fresh look at the way we manage our forests is required. Since independence, forest departments have been singularly ineffective in enhancing Uttarakhand's – and India's – forest cover. Local communities can tend to forests using traditional knowledge, but they will only do so if they have a sense of ownership of the forests. They must be made the custodians and managers of their local environmental resources. Agriculture departments in India do not grow crops but only facilitate farmers to grow them. Similarly forest departments should only facilitate communities to husband their local forest resources.

As a member of the National Forest Commission, Chandi Prasad Bhatt had proposed the concept of a Gram Van (village forest). He proposed that village common land, or civil or reserved forests lying within a 5 km radius of a village, should be developed as Gram Vans. They should be managed by the village MMDs.

Van Panchayats should be independent of the government. The latter's role should be limited to providing financial and technical assistance when requested. The state government can channel newly available CAMPA funds to the Van Panchayats and the Green India Mission funds to the MMDs.

The state government must reconsider its attitude towards implementing the Forest Rights Act, 2005. This Act bestows several important rights to Scheduled Tribes and Other Traditional Forest Dwellers, including land rights for dwelling inside forests, rights of ownership, collection and use of minor forest produce from forests, rights to fish or graze animals among many others. It can be argued that all rural dwellers in Uttarakhand where Van Panchayats have been established are covered by this Act. Till May 2012, the state had rejected all land rights claims from forest dwellers before it (Trivedi 2012). Uttarakhand topped the list of rejections among all the Indian states, with 100 per cent rejections till May 2012.

The worst hit by the rejections are those communities who live inside notified forest areas. Their settlements/villages are not recognized in revenue records. Consequently they have no Gram Panchayats, no Gram Sabhas and no Van Panchayats. Hence they are unable to access basic schemes of education, health or rural development, for example, drinking water supply, irrigation, Indira Awas Yojana (IAY), and others.

Ecological Mountain Livelihoods: Ensuring remunerative livelihoods for mountain dwellers must be the second priority of economic development in Uttarakhand.

Mountain agriculture has been grossly neglected since India's independence because it does not generate large surpluses. Many farming families have given up agriculture and migrated away, but given its geography and climate Uttarakhand has a tremendous potential to produce remunerative niche crops.¹¹ Women are engaged in all farming operations in mountain villages. They must also be recognized as owners of family lands.

High value crop cultivation – medicinal and aromatic plants, organic farming – combined with basic processing like grading, sorting and packaging at the farm level, dairying, horticulture and floriculture can be the basis for remunerative

ecological livelihoods in mountain villages if adequate market linkages are developed simultaneously. The Agro Vision Uttaranchal 2020 plan formulated in the last decade needs to be reviewed, modified and implemented (Chopra 2013).

A combination of village forests that can supply plentiful fodder and, therefore, dung to fertilize the fields, irrigation, credit and new knowledge inputs like the system of crop intensification (SCI) are required together to ensure food and livelihoods security to farming families. Support for these inputs is available from schemes like the Rashtriya Krishi Vigyan Yojana (RKVY) and the Agricultural Technology Management Agency (ATMA). They need more focus to provide significant results.

The National Food Security Mission (NFSM) provides funds for extension of SCI. They are under-utilized in Uttarakhand. More effective use of funds in all these schemes can be done by involving VOs with proven track records in the field.

Integrated farming systems which develop agriculture, forests, horticulture, animal husbandry, pastures, water resources, fisheries along with appropriate village institutions can make farming remunerative again. Some Gramya projects of the Uttarakhand Decentralized Watershed Development Program have been able to demonstrate the potential of integrated farming systems development.

Integrated natural resource management using Integrated Watershed Management Program (IWMP) funds can be used to enhance the productivities of common pool resources like forests, pastures, wastelands and springs. IWMP and MGNREGS also fund rain water harvesting and construction or renovation of irrigation facilities – like check dams and guhls (diversion channels).

A typical mountain farmer in Uttarakhand owns about 15 to 20 *nalis* (20 *nalis* = 1 acre), up to 5 *nalis* being irrigated. Cultivation of a combination of food grains and cash crops can provide them food and livelihood security. Farmers who have less land or unirrigated land need to supplement their income. In Uttarakhand, VOs have shown successful examples of significant income additions through fodder and dairy development and household poultry farming (See Box: Milk Route to Prosperity).

Most rural producers get low returns due to poorly organized markets for their products and uncertainty of demand. Value chain development – including better processing, branding, certification and collective marketing – can lead to higher price realizations. Marginal land holders or landless persons can be re-skilled for off-farm income generation activities. These

can include community-based tourism, weaving high-end fabrics; assembly, marketing and repair of solar panels, solar lamps, mobile phones, TVs; stitching garments; establishing call centres in small towns; and upgrading skills like masonry, carpentry, plumbing and electrical wiring. Uttarakhand has several examples of successful non-farm enterprises run by women and youth.

MILK ROUTE TO PROSPERITY

Livestock rearing is an integral part of Uttarakhand's traditional farming systems. Almost every rural household tries to keep at least a cow or a buffalo to meet its requirements for milk or compost. Forests are the main source of green fodder. Livestock rearing is, however, severely handicapped in many villages by acute seasonal fodder shortages. They impact livestock health, milk availability and dung production. Village women spend several hours every other day to collect fodder from forests.

In 2008, the Dehradun based Himmotthan Society collaborated with different state government departments, local voluntary organizations and international research agencies to initiate an "Integrated Fodder and Livestock Development Project" (IFLDP) to address these issues in a comprehensive manner. The focus was to produce and supply quality fodder from village lands, improve breeds, diversify dairy products and establish sustainable value chains.

IFLDP now involves over 15,000 families across 250 villages in six mountain districts. Fodder regeneration extends over 1200 ha of under-productive village commons and about 200 ha private lands.

The project has established fodder banks in each project area. The average reported fodder productivities are 61 t/ha on sub-tropical plots and 43 t/ha in temperate (higher altitude) villages. The fodder plots now supply about two months fodder. This figure is increasing with time. It has led to increased stall feeding and reduced grazing pressure on the adjoining forests.

Over 1,500 farmers have established small decentralized fodder nurseries. The sale of

planting material to different organizations is a major source of income for the village communities. Ganora village in Pithoragarh district, for example, suffered from a huge fodder shortage. The villagers planted fodder on 15 ha of community land. Due to their protection, production rose to 25 t per year. The village is now selling fodder to other villages. The village women have pledged to cover all their wastelands with fodder species using MGNREGA funds.

With technical support from the Uttarakhand Livestock Development Board (ULDB), 20 local village youths have been trained as para-vets, to provide livestock related services at the farmer's doorstep. They also work with the ULDB as part-time assistants and build business plans around each area. About ten para-vets have started earning about Rs. 60,000 annually, and are gradually becoming self-dependent.

Almost 1,050 families are involved in running 10 micro-dairies. Since their federations began marketing the milk, the incomes of milk selling households have risen by almost Rs. 1,000 a month. In 2011, the 10 women's milk federations purchased small vehicles to transport milk twice a day.

With regular interventions on feed and breed improvement, milk production is likely to increase to 250 to 500 liters per day in each cluster of villages. The technical capabilities of the micro-dairies are being enhanced by giving them appropriate testing equipment and training. Bulk milk coolers are being installed to ensure safe storage and a sustained supply of quality milk to consumers. Two mini-chilling plants are also being established.

--Text based on information provided by Himmotthan Society, Dehradun.

ENVIRONMENTAL CONSERVATION PROVIDES LIVELIHOODS WITH DIGNITY

In 2003 the Van Panchayat of Sarmoli village near Munsiyari in Pithoragarh district, led by its Sarpanch, Malika Virdi, decided to initiate a family homestay programme. Its goal was to combine environmental conservation with a source of livelihood for the women and their families. Today the programme is also supported by Maati Sangathan, a women's collective in the Munsiyari region and Himal Prakriti, a local ecological research and advocacy organization.

Sarmoli's homestay programme is a cooperative venture managed by the women in whose houses the guests stay. It now includes 15 households in Sarmoli. Guests are invited not just into peoples' homes but also their lives. They are welcome to join in the daily livelihood activities of the host families whether it is farming or collecting the daily fodder and fuelwood.

The participating families host annual summer programs organized by Himal Prakriti where students and other interested people from India and abroad learn about mountain ecology or go on treks to nearby valleys and glaciers.

The Maati Sangathan group has an outlet for selling homemade products like mats and carpets made by them, knitted sweaters and shawls of local spun wool, angora and pashmina, and jams, fruit preserves, rajma (kidney beans), squashes and marmalades.¹

Community-based tourism encourages the villagers to preserve and look after their forests, rivers, flora and fauna. Beautiful surroundings attract more visitors. Sarmoli's homestay programme has also enhanced the dignity of women in their families; a woman who earns money has a greater say in a family's decision-making.

¹ Anita Roy (2011): 'Homestay Is Where the Heart Is', Outlook Traveller, April 01.

Uttarakhand's educated youth are often unwilling to pursue farming and related activities because of poor economic returns. Tourism has grown rapidly in recent years. Servicing tourists is emerging as a more desirable home-based alternative for the youth and their families. Sarmoli Van Panchayat in the Gori Ganga valley in Pithoragarh district has pioneered the concept of homestays as a sustainable livelihood option. (See Box: Environmental Conservation Provides Livelihoods with Dignity)

IV.2 Sustainable and Safer Infrastructure Development

Post-disaster relief, reconstruction and rehabilitation measures are expensive. They divert scarce resources meant for development purposes. This understanding led to a conceptual shift in the official thinking on disaster management. The National Policy on Disaster Management, 2009 made a change from the earlier "relief-centric response to a proactive prevention, mitigation and preparedness-driven approach for conserving developmental gains and to minimize loss of life, livelihood and property" (NDMA, undated).

Hydropower development and tourism are major sources of revenue for Uttarakhand state. But they can also imperil large populations. Hence safety and sustainability have to be built into hydropower development, tourism and related infrastructure development activities.

Sustainable hydropower: Hydropower projects are usually fiercely contested between local communities and the developers. The opposition is due to perceived resource losses, threats to life and livelihoods, little or no direct benefits to local communities and cultural issues. The damages caused downstream of many HEPs after the June disaster has further aggravated the opposition.

For safe and sustainable hydropower production in Uttarakhand, the entire approach to hydropower development, from planning to approvals, construction and regulation needs to be reviewed. The major issues that require reconsideration and redress include:

- A conceptual shift is required from maximum power production to sustainable or optimum power production. The hydropower potential of the state needs to be reassessed keeping in mind that extreme weather events are likely

to become more frequent, increasing the disaster risks posed by dams. The changing weather pattern will undermine the relevance of the past hydrological data. In the absence of reliable data, scenario-based dam designs must be prepared, leading to changes in the way we assess a river basin's hydropower potential. There is also a need to reassess the hydropower potential from the social and cultural viewpoints.

- It is often argued by hydropower proponents that given the large demand for hydropower in the country, Uttarakhand must install its full generating potential. A report prepared by a Planning Commission Task Force, though, warns that, "The needs of the rest of the country should not overshadow or unduly influence our view on the needs and vulnerabilities of the IHR (Indian Himalayan region)" (Planning Commission & GBPIHED 2010).
- A reassessment of the hydropower potential should be accompanied by evolving a publicly accepted hydropower policy which also takes into account demand management and greater reliance on alternative sources of energy. Priority should be accorded to community-owned micro and mini hydro projects. They are more likely to supply their power locally.
- Certain pristine river stretches must be maintained as protected zones in order to sustain the aquatic biota on the river beds, banks and flood plains. From the disaster point of view, the MCT region and areas of north of it should be designated as an eco-sensitive zone. This region falls in the most sensitive seismic zone V. It is also the region where most of the river stretches are still in a near-pristine condition. Glacial rivers in this region are known to be very destructive when in flood.
- Scientifically determined environmental flows (eflows) downstream of dams must be guaranteed. All existing projects must be redesigned within one or two years to ensure desired eflows regimes. Real-time flow data should be available in the public domain. Monitoring of eflows should be done by independent agencies with a 50 per cent representation of local community members.
- Adequate free flow has to be ensured between two consecutive projects on a river which has multiple projects.
- Only those projects should be sanctioned that do not cause irreversible impacts. In keeping with the spirit of Panchayati Raj, prior approval for a project should be obtained from the affected Gram Sabhas, in addition to other mandated agencies. Communities should be compensated for the loss of Common Pool Resources (CPRs) in addition to compensation for private lands. Resettlement and rehabilitation plans must be approved by Gram Sabhas prior to construction related activities. Resettlement must be completed before commissioning of the projects. Where multiple projects are developed on a single river, basin level impact assessments and management plans must be approved in advance before any construction is started.
- The process of sanctions and approvals of projects must be transparent. An independent state commission should evaluate dams' proposals, conduct public hearings mandated for the EIA process and monitor construction activities. At least half the members of the monitoring committees must be from the affected communities. The approvals must ensure use of good practices and safe technologies like tunnel boring machines, insurance coverage, new dam designs and the use of the Precautionary Principle.¹²
- In the hurry to achieve power development targets, the entire EIA process has been deliberately mutilated and rendered ineffective. It needs to be strengthened so that hydropower sustainability, environmental conservation and public acceptance can be achieved.¹³ EIAs must be mandatory for all HEPs with installed capacities greater than 1 or 2 MW. They must be prepared by selected independent agencies with a good track record of independent functioning. Involving the potentially affected communities in the assessment process and making public hearings mandatory and honest can enhance public acceptance.
- Usually the terms of reference of any EIA are in the context of the specific project. In the case of multiple projects on a river, cumulative impact assessments must be done.

- Compensatory afforestation using CAMPA funds must be done locally through Gram Panchayats or Van Panchayats rather than by the state forest department.

Ultimately it must be recognized that global warming and climate change are consequences of a consumption driven economy and heightened commercial energy use. These crises demand that we all begin to consume less and thereby reduce energy demands. It also requires an official strategic focus on energy conservation.

Safer Tourism: Uttarakhand is known as Dev Bhoomi or the Land of the Gods. Hence the State has vigorously pushed religious tourism to generate large revenues.

Haridwar on the banks of the sacred river Ganga is one of India's holy cities. During major festivals it attracts millions of pilgrims. Each year, about a million people visit the five major shrines located in the fragile and highly eco-sensitive Inner Himalaya.

Each location becomes a potential disaster risk due to the congregation of very large numbers in limited spaces. Hence the State needs to be prepared to effectively manage any disaster emergency at these locations. Efficient disaster management systems have to be put in place.

After the June 2013 disaster, there were numerous calls for limiting the number of pilgrims to the shrines. It is easier to develop safe facilities for fewer numbers. In 2008, faced by the challenge of a receding Gangotri glacier, the State government set a limit of 150 persons and 20 ponies or horses a day for the trek from Gangotri to the snout of the glacier at Gaumukh, but curtailing religious tourism is a political hot potato. Thousands of families depend on the annual Char Dham yatra season for most of their annual cash income. The horrors of the June 2013 disaster may possibly discourage many visitors in the next two to three years. It is also possible that local families who depend on the Char Dham yatra will seek safer livelihood options. The government can use this interregnum to set up reliable and effective disaster management systems.

Tourists should be dispersed throughout the state and across the year by promoting more

tourism choices and locations. Uttarakhand offers many opportunities for cultural tourism, nature tourism and adventure tourism.

Alternate livelihoods can be generated through community-based tourism where local families host visitors. Their youth can act as guides, introducing the guests to scenic locations, local history, culture and foods. It can replace building massive hotels and resorts. Community-based tourism is a good model for sustainable and equitable tourism. In Uttarakhand, Mountain Shepherds in the Dhauliganga (west) valley has established formal training programs for community-based tourism (See Box: Mountain Shepherds: A Tourism Based Community Enterprise).

Significant non-farm employment can also be generated from nature tourism. It can take advantage of Uttarakhand's very high quality landscapes like snow covered peaks, alpine meadows, sub-alpine forests, wildlife parks, sanctuaries and pristine river stretches. The preference of nature lovers for trekking over automobiles also diminishes the need for highways in perilous terrains.

Cultural tourism can be designed to attract visitors to enjoy fairs and festivals or local customs and foods. Ecotourism demands responsibility of the visitors for sustaining the local environment and communities. It suits tourists who are environmentally conscious. Wildlife enthusiasts can be encouraged to visit the National Parks and Sanctuaries.

In recent years, adventure sports in the form of river rafting, rock climbing and para-gliding have also picked up. Adventure tourism, however, needs to be regulated to prevent accidents.

Safer Green Roads: Roads are essential for improving accessibility and economic growth, but in the Himalayan region road construction is hazardous. It causes deforestation and increases slope instability. Safer roads mean increased construction costs.

The Govind Ballabh Pant Institute of Himalayan Environment and Development (GBPIHED) has proposed guidelines for building safer, green roads in the Himalayan region (GBPIHED, undated). Such basic concepts of building safe roads need to be followed rigorously.

MOUNTAIN SHEPHERDS: A TOURISM BASED COMMUNITY ENTERPRISE

Mountain Shepherds (MS), based in the Dhaulti Ganga (W) valley at the edge of the Nanda Devi National Park, has successfully combined environmental conservation with sustainable livelihoods. It was started in 2002 by Sunil Kainthola and Dhan Singh Rana to improve the living standards of the local Bhotiya people.

Tourists stay in traditional village homes and taste the local cuisine prepared by their hosts. The organization arranges treks that offer breathtaking vistas of the Himalayas in the deodar and birch forests of the national park. Its young guides are well versed with the local flora and fauna.

Tourist camps provide additional income for the villagers besides the sale of handmade carpets and woolen products and mule services for treks. MS has started an e-commerce portal called 'Angwal' through which it sells ethnic handicraft products, local spices and herbs. It has also set up systematic garbage management systems.

Mountain Shepherds has evolved a business model where the community is also a stakeholder in the enterprise rather than just its beneficiary. It chose to become a private company rather than an NGO. In 2011--12, it

hosted over 100 tourists and had revenues of Rs. 27 lakhs with a profit margin of about 40 per cent.

MS has had 70 local boys and girls trained at the Nehru Institute of Mountaineering (NIM) in Uttarkashi to become trekking guides, porters and technical experts in search and rescue operations besides learning skills like yoga and cooking. Recently MS established 'The Nandadevi Institute' to impart international standards training to the local youth as well as outsiders.

Harshmani Bhatt who trained at the Nehru Institute of Mountaineering (NIM) earns about Rs. 15,000 annually. He is a full timer at MS and owns a small part of the company. Narendra Singh from Lata village makes Rs. 500 a day when he works as a guide and earns more as a trainer. He is also a shareholder in the company.

- *extracted from (1) Anusha Subramanian (2013): "Mountain Shepherds: Leading Community-Backed Tourism in The Garhwal Himalayas", The Better India, May 9 and (2) G. Seetharaman (2013): "Eco-adventure: Naturism, Travellism, Tourism", Business Today, January 6.*

In the recent disaster it was noticed that there were only single access routes to the major shrines. Once these were blocked by landslides or washed away, rescue of people at the shrines or en route was delayed. Hence there is a need to develop safe trekking routes as alternatives.

Ropeways are useful alternatives to roads, particularly in short stretches that are steep.

Safer Habitations: Habitations and commercial structures generally follow roads. In recent years riverside road alignments have been preferred over ridge alignments, but riverside slopes are of a sedimentary nature. They are easily eroded by flood waters. Hence riverside settlements were simply swept away at many locations during the 2013 floods.

Ridge alignments of roads, therefore, also increase the safety of habitations. Riverside

construction may only be permitted at safe distances from the rivers on solid rock.

Many structures have been built on the flood plains of the broader river valleys and the southern plains of Uttarakhand. Floods inflict very heavy damages at such locations. The Uttarakhand High Court order banning construction within 200 m of all rivers in Uttarakhand needs to be enforced.

The basic facilities for transport, accommodation and sanitation at important tourism locations are unable to keep up with the rapid growth of annual visitors. In mountain towns it has encouraged unscrupulous people and officials to build in dry stream beds. These are clearly risky and illegal structures. The state government must take swift action to demolish them and to punish the erring officials.

Earthquakes also destroy buildings. Urban building codes promote safe designs in cities. The Uttarakhand government must promote low cost earthquake safe building construction in the rural areas. VOs can play a major role in raising the awareness of villagers about earthquake safe construction features and in training masons to build earthquake safe houses.

IV.3 Disaster Preparedness

Given Uttarakhand's hazardous mountain terrain and the likelihood of frequent extreme weather events with rising global temperatures, constant readiness is an imperative for the state. Preparedness requires event prediction, warning, risk-avoidance action, hardware, emergency plans (EPs) and the activation of EPs. These factors minimize losses when they work together (Dhara 2000). Good governance is a pre-condition for a constant state of preparedness.

There are numerous studies by official and non-government agencies on disaster preparedness policies, activities and programs. There is a need to review them, formulate disaster preparedness strategies at the village panchayat, district and state levels and implement them effectively.

Often there is a preference for technical fixes in the form of early warning systems and gadgets like Doppler radars, seismographs' networks, etc., but an early warning system is only as useful as the response system, as discussed earlier.

One approach that needs to be implemented is community based development preparedness. The survivors of a disaster are always the first to be available for search, rescue and relief, as others take time to reach the site of a disaster.

Dr. Indrajit Pal of the Centre for Disaster Management at the Lal Bahadur Shastri National Academy of Administration told Down to Earth, "When all means of communication break down, especially in the mountains where the connectivity is usually only through a couple of roads, a trained force of locals can save people" (www.downtoearth.org.in).

People's Science Institute and Centre for Development Initiatives tried such an approach with the support of Oxfam on an experimental basis in 54 villages of a small watershed in the Mandakini valley in 2004–07. It involved

awareness raising campaigns, identification of hazards, preparation of village-level disaster mitigation plans, forming institutions and task forces in each village for implementation of the plans, conducting mock drills, training masons to build earthquake safe houses, etc. An evaluation of the program revealed a significant impact in terms of awareness, plan preparation, preference for trained masons over untrained masons and incorporation of earthquake safety features in new houses, among other benefits. In the absence of government support, however, such activities are hard to sustain or replicate.

Once hazards are identified at the village level, their risk potential can be determined. Low risk hazards can be treated at the local level. The moderate ones can be treated under block mitigation plans and the severe hazards under district-level disaster mitigation plans. Once the plans are ready, good governance is required to implement them effectively.

Good Governance is an Imperative: The first step for Uttarakhand is to implement the provisions of the National Disaster Management (NDM) Act of 2005 in letter and spirit. The State Disaster Management Authority (SDMA) has to frame its rules, regulations, policies and guidelines. Its structural components like the State Executive Committee and the District DMAs must become functional.

The next step is the preparation of a State Disaster Management Plan as required by the NDM Act. Its starting point must be disaster management (preparedness and mitigation) plans prepared by each Gram Panchayat. These must be successively coalesced at the block, district and state levels.

The State Disaster Management Plan must be strategic in character. It must prioritize the different tasks, identify responsibilities and define the timelines and processes or procedures. Given the lackadaisical approach to disaster management in the state so far, it may also specify penalties for acts of omission or wrongdoing.

The implementation of the disaster management plans must be practical. For example, training programs should target people who will be actually available during a disaster. Dr. Tolia cites the case of the June 2013 disaster when the trained

search and rescue persons simply refused to go on rescue missions (Tolia 2013b). He argues that only physically fit and willing local village youth must be selected for training in search and rescue methods. In this, priority must be given to young people from hazard-prone villages.

The district and state level plans must prioritize capacity building, identification of major hazards that cannot be handled by individual Gram Panchayats and their treatment.

Traditional knowledge can be used for hazards identification and their treatments in the Gram Panchayat plans. These plans must be in Hindi and placed in the public domain.

Dr. Tolia recommends establishing a rivers management division for collecting data, time-series observations, analysis and sharing of data (Tolia 2013c). He proposes that Uttarakhand's Watershed Management Directorate and its Space Applications Centre provide technical support for river management. The division can monitor river flows with community participation and develop community-based floods warning systems as in Nepal. It could also follow the example of Himachal Pradesh and establish protected river zones.

Media attention on regulating tourism has focused mainly on the Char Dham yatras. But far bigger crowds collect in Haridwar annually for the *kanwar* season in July–August and at the times of the *Kumbh* and *Ardh Kumbh melas*. The *kanwar* season comes at the height of the monsoon season when the Ganga can be in flood. Here crowd management must be reviewed and strengthened.

Forest fires occur frequently in Uttarakhand. In recent years villagers have become totally alienated from the forest management regime. They have to be pursued and cajoled to help the Forest Department in managing major forest fires. Sometimes the local people simply withhold their support. As an alternative, the Forest Department has begun to rely more on expensive fire-fighting equipment. A better approach would be to minimize or end the alienation of the people by giving the local communities a sense of ownership of their local forests. Only then can they be expected to look after the well-being of the forests.

Earthquakes are less common than forest fires, landslides or flash floods, but they can unleash

deadly destructive energy. It is well-known that earthquakes rarely kill people, collapsing structures do. Hence it is critical to promote earthquake-safe housing construction. This requires training of masons and educating homeowners. All IAY houses for the rural poor must be mandatorily built in an earthquake-safe manner in Uttarakhand since it lies in the two most earthquake-prone zones – IV and V.

It is extremely unfortunate that state governments in Uttarakhand have not tried to involve civil society organizations in disaster management. Fortunately, the latter do get involved in disaster response efforts. VOs in particular possess very valuable human resources. They must be made an integral part of the disaster management structure of Uttarakhand. The state can identify experienced, dedicated and competent VOs and make them active partners in facilitating and implementing disaster management plans. They have rich experience in community mobilization, micro-planning and capacity building besides other areas.

IV.4 Climate Change: Opportunities Amidst Crises

The June 2013 disaster could be a harbinger of the onset of climate change (CC) in Uttarakhand. It is generally known that CC will manifest in increased variation in temperatures and precipitation. Growth and yields of crops, fruits and flora will be affected. In the Himalayan region it will impact springs' discharges, cause glacier recession and thereby alter river flows.

Climate change will escalate Uttarakhand's existing vulnerabilities. There are indications that the daily temperature extremes are likely to intensify in the 2030s and that intense rainy days are likely to increase (Government of Uttarakhand 2012).

The draft SAPCC proposes to build adaptive resilience and support mitigation measures. The broad approach includes research on climate change impacts and adaptation measures, disseminating the research findings, improved governance through decentralization, capacity building of relevant institutions and devising appropriate investment policies. The SAPCC recognizes the need to evolve gender sensitive approaches and involve women in decision-making at various levels.

The SAPCC has recommended sectoral strategies for building resilience against climate change. Several developmental opportunities that may result are mentioned below.

Agriculture: Revitalization of rain-fed agriculture; development of integrated farming systems for different agro-ecological conditions; relocation to more productive areas or cultivation in new warmer areas; better pest surveillance; greater insurance coverage; improved information systems on climate changes and adaptation options.

Forestry: Strengthening decentralized forest governance institutions like the Van Panchayats, Mahila Mandal Dals and the Biodiversity Management Committees proposed under the Forest Rights Act; better measures to contain forest fires; increased forest cover and livelihoods options including agro-forestry and biodiversity conservation.

Animal Husbandry: Animal husbandry has been a traditional coping strategy to deal with the vagaries of weather. The opportunities include improved disease surveillance, animal health and breeds; resilient technologies and institutions for better livelihood opportunities, for example, fodder development and dairy production, backyard poultry and women's SHGs.

Disaster Mitigation: Research and documentation of local climate change impacts; preparation of disaster management plans at all levels; monitoring of hazardous impacts; relocation of threatened communities and critical infrastructure; establishment of local quick response teams; retrofitting of lifeline infrastructure; promotion of multi-purpose insurance schemes.

IV.5 Conclusions

Uttarakhand needs to implement the indigenous development vision emphasized by the local people during the statehood agitation. The first priority must be to expand forest cover in a manner that enables livelihoods to grow. Local communities must be the custodians and managers of their environmental resources. Community based institutions like the Van Panchayats and Mahila Mangal Dals can expand

and manage village forests. Rights granted under the Forest Rights Act must be granted on a priority basis.

Ensuring remunerative livelihoods for mountain dwellers should be the second priority of economic development in Uttarakhand. Integrated farming systems along with irrigation, credit, new knowledge inputs and appropriate village institutions are needed to make farming remunerative again.

Rural development programs like Integrated Watershed Management Program (IWMP), MGNREGS and others can be used to enhance the productivities of common pool resources. Similarly programs of the Agriculture Department like RKVY, ATMA and NFSM can help farmers to adopt new practices and enhance farm yields.

Marginal land holders or landless persons have to be re-skilled for off-farm income generation activities. Capable VOs can be engaged to pilot innovative livelihoods development programs with a focus on value chain additions.

Post-disaster relief, reconstruction and rehabilitation measures are expensive. Hence Uttarakhand state must adopt a proactive prevention, mitigation and preparedness-driven approach for conserving developmental gains and to minimize loss of life, livelihood and property in disasters. Safety and sustainability have to be built into all infrastructure development projects.

The draft SAPCC proposes to build adaptive resilience and support mitigation measures. It offers many developmental opportunities, particularly in agriculture, forestry, animal husbandry and disaster mitigation.

Sustainable development is like nourishing food. It has to be cooked slowly and chewed slowly to extract maximum nourishment from it. However, in this age speed is advertised as desirable. Nature has enough resilience to recover from the damage that modern development processes inflict on it. Such recovery processes, however, require time. Eco-sensitive development may mean a slower monetary growth rate but it is more sustainable and equitable.

CHAPTER V: RECOMMENDATIONS

Recommendations are outlined in this chapter in the context of Uttarakhand's developmental concerns that have been highlighted in the previous chapters.

V.1 Afforestation for Ecological Sustainability

Uttarakhand must now adopt the vision of green development that fuelled the demand for a separate mountain state. The first priority of green development should be for improving forest cover in a manner that enables livelihoods to grow.

New legislation has been adopted to give villagers ownership of their local forests or Gram Vans. The Uttarakhand government also needs to take a pro-active approach to the implementation of the Forest Rights Act, 2005, inasmuch as the broader sense of the term forest dwellers is concerned. Priority must be given to communities that live inside notified forest areas.

Van Panchayats have to be made independent of the Forest Department. This requires at least rolling back the Van Panchayat rules introduced after statehood. The FD should adopt a facilitative role like the Agriculture Department and help communities to conserve their Gram Van and Panchayat forests. CAMPA funds should be channeled to the Van Panchayats so that they can expand forest cover.

Resources like fuel wood and fodder that are required for the daily sustenance of rural families should be accessed from nearby Gram Vans that are managed by Mahila Mandal Dals. It will significantly reduce women's drudgery. Green India Mission funds can be channeled to the MMDs for developing their Gram Vans.

Himalayan states deserve adequate payment for providing ecological services to the rest of India. The quantum to be provided by the Fourteenth Finance Commission must be significantly increased. Governments, legislators and people of the Himalayan states have to collectively lobby at the Centre for this change. These payments must directly benefit the people who forego the use of their forests and other environmental resources.

V.2 Equitable Livelihoods Development

Ensuring remunerative ecological livelihoods for mountain dwellers must be the second priority of

economic development in Uttarakhand. Mountain agriculture has to be revived in a sustainable manner. It requires integrating high value crop cultivation, basic agro-processing at the farm level, dairying, horticulture and floriculture with adequate market linkages. VO's can provide value chains development support to community based organizations. The Agro Vision Uttaranchal 2020 plan needs to be reviewed, modified and implemented.

Funds and activities under schemes like RKVY, ATMA and NFSM need to focus more on promoting integrated farming systems development to yield significant results. Effective use of funds under these schemes requires involving VO's with proven track records in the field.

Flagship rural development schemes like MGNREGA, NRLM and IWMP can be used to enhance the productivities of common pool resources and also help ensure food and livelihoods security for the rural people.

VO's should establish demonstration centres in Uttarakhand for new livelihoods development approaches and build training programs around them. Marginal land holders or landless can be re-skilled in off-farm income generation activities.

Community-based tourism needs to be promoted in a big way so that the visitors can be dispersed all over the state and the revenues directly benefit the local communities.

Special efforts must be made to ensure that development benefits reach members of small communities in Uttarakhand like the Buksa, Tharu and Van Raji tribals. The basic human rights and living conditions of migrant laborers from other states and Nepal also require special attention.

Women must be recognized as co-owners of family lands.

V.3 Sustainable and Safer Infrastructure Development

Safety and sustainability have to be built into hydropower development, tourism and related activities like roads and building construction. A Planning Commission Task Force has recommended that, "The balance between natural resource exploitation and conservation should tilt in favor of the latter" (Planning Commission & GBPIHD 2010).

Sustainable hydropower: Safe and sustainable hydropower production in Uttarakhand requires a new approach from planning to approvals, construction and regulation. The major issues that require reconsideration include:

- HEPs in Uttarakhand must be sanctioned only to experienced developers.
- The fragile and pristine area north of the MCT needs to be made an eco-sensitive zone. Almost this entire region lies in seismic zone V which has the highest earthquake risk. Several existing and proposed projects in this region lie downstream of glacial streams. They face the risk of destruction by glacial lake outbursts or the catastrophic failure of temporary dams in the event of heavy floods. Rivers stretches in this eco-sensitive zone will retain their natural wilderness.
- It will necessitate a reassessment of the hydropower potential of Uttarakhand. A time-bound decommissioning plan must be evolved for all HEPs already existing in this region. In the intervening period safe and sustainable alternate energy sources must be developed.
- A publicly accepted hydropower policy which takes into account demand management and greater reliance on alternative sources of energy has to be evolved. It must accord priority to community-owned micro and mini hydro projects to enhance local benefits.
- Planning should shift from maximum power production to sustainable or optimum power production. The lateral and longitudinal integrity of rivers must be maintained so that aquatic biota on the beds, banks and flood plains of the rivers are sustained. This will require the release of adequate environmental flows downstreams of all HEPs. All existing projects must begin to release eflows within a specified period, say one to two years. Monitoring of discharges downstream of HEPs must be done by an independent agency in which at least 50 per cent members are from local communities.
- Prior approval for a project should be obtained from the affected Gram Sabhas. Communities should be compensated for the loss of CPRs in addition to compensation for private lands. Resettlement and rehabilitation plans must be approved by Gram Sabhas prior to

construction related activities. Resettlement must be completed before commissioning of the projects. Where multiple projects are developed on a single river, basin level impact assessments and management plans must be approved in advance before any construction is started.

- Sanctions and approvals of projects must be done in a transparent manner. An independent state commission should evaluate dams' proposals and monitor construction activities. At least half the members of the monitoring committees must be from affected communities. The approvals must ensure use of good practices and safe technologies.
- The EIA process needs to be strengthened so that hydropower sustainability, environmental conservation and public acceptance can be achieved. EIAs must be mandatory for all HEPs with installed capacities greater than 1 MW. Project developers should pay a fee to the Ministry of Environment and Forest which in turn gets the EIAs done by independent, experienced, multidisciplinary institutions and organizations. Involving the potentially affected communities in the assessment process and making public hearings mandatory and honest can enhance public acceptance.
- Compensatory afforestation using CAMPA funds must be done locally through Gram Panchayats or Van Panchayats.
- Use of explosives in the fragile Himalayan terrain for constructing tunnels of HEPs and other infrastructure works should be banned.
- The state must develop a strategy for energy conservation.

Safer Tourism: Uttarakhand needs to be prepared to effectively manage any disaster emergency at Haridwar and other important locations where large numbers congregate regularly in the name of tourism.

Tourists must be dispersed throughout the state and across the year by promoting more tourism choices and locations.

Green Roads: GBPIHED has proposed guidelines for building safer, green roads in the Himalayan region (GBPIHED, undated). They need to be followed rigorously.

There is a need to develop safe, multiple alternate routes, preferably trekking paths, to the major shrines for safe and quick evacuation in the event of a disaster. Ropeways are useful alternatives to roads where the slopes are steep and distances are relatively short.

Safer Habitations: Riverside construction may only be permitted at safe distances from the rivers on solid rock. The Uttarakhand High Court order banning construction within 200 m of all rivers in Uttarakhand needs to be enforced.

The state government must take swift action to demolish structures built in dry stream beds and punish the erring officials.

The Uttarakhand government must effectively promote low cost earthquake safe building construction in the rural areas. Experienced VOs should be enlisted to raise the awareness of villagers about earthquake safe construction features and to train masons to build earthquake safe houses.

V.4 Disaster Preparedness

The state of Uttarakhand must review existing studies and reports by official and non-government authorities related to disaster preparedness. Thereafter it should formulate and implement disaster preparedness strategies at the village panchayat, district and state levels.

Technology-based approaches like early warning systems, use of Doppler radars, seismographs' networks, etc. have to be supplemented by community-based disaster preparedness (CBDP). The State Disaster Management Authority should involve VOs in CBDP activities on a programmatic basis.

Major infrastructure development projects in the Inner Himalaya region must be prohibited. Other development activities must be regulated. Green development activities must be actively promoted in this region and elsewhere.

V.5 Good Governance Imperative

The national disaster management policy is now based on a proactive prevention, mitigation and preparedness-driven approach. Uttarakhand

must be in a constant state of preparedness. Good governance is a pre-requisite for it.

Uttarakhand needs to implement the provisions of the National Disaster Management Act in letter and spirit. It must begin by making all the structural components of the state disaster management apparatus functional.

The state has to prepare a strategic State Disaster Management Plan as required by the Act of 2005. A bottom-up approach starting with Gram Panchayat plans should be adopted. All the plans must be translated into Hindi and put in the public domain.

The implementation of the disaster management plans must be monitored to achieve the desired outcomes.

Uttarakhand needs a rivers management division within the department of environment for collecting and sharing time-series flow data and their analysis. The Watershed Management Directorate and the Uttarakhand Space Applications Centre can provide technical support to it. The division can also develop community-based flood warning systems and help establish protected river zones.

Rural communities must become owners of local natural resources. They can then be made effective partners in fighting forest fires.

Uttarakhand must promote earthquake-safe housing construction. All Indira Awas Yojana (IAY) houses for the rural poor should be mandatorily built in an earthquake-safe manner.

The state must make VOs an integral part of its disaster management structure. It should identify experienced, dedicated and competent VOs and make them active partners in implementing disaster management plans and disaster response.

V.6 Advocacy

Civil society must advocate lessons learnt from the 2013 Uttarakhand tragedy. To effectively advocate a people-centric mountain development agenda, the people of the Himalayan states have to come together on a common platform. VOs must help facilitate this unity.

Some of the important advocacy issues are outlined below.

1. Uttarakhand and other Himalayan states should follow a new model of green development that is ecologically sustainable and socially just. Research should be initiated to determine the scope of economic growth based on such an approach.
2. Such a development model will have to restore the ownership and control of natural resources to the local communities.
3. The region around the Main Central Thrust and above it, in the Inner Himalaya, should be declared as an eco-sensitive area.
4. The Chief Ministers of several Himalayan states have recognized the need for the Government of India to adequately pay all the Himalayan states of India for the ecological services they provide to the nation (www.tribuneindia.com). All the mountain states

need to act together on this demand. Such payments must go directly to the communities that actually forego their resources rather than government departments.

5. VOs must be recognized as active partners in disaster management by the state. Specific tasks must be assigned to them on a continuing basis.

V.7 Conclusions

India's Himalayan states are disaster prone. They must heed the lessons emerging from the 2013 Uttarakhand tragedy especially in the context of the repeated indications of climate change. Ecologically sustainable development is the basic prerequisite for disaster mitigation. Equitable development will reduce the vulnerable populations. Governments must realize that they alone cannot take adequate measures. Communities and civil society organizations must be active partners.

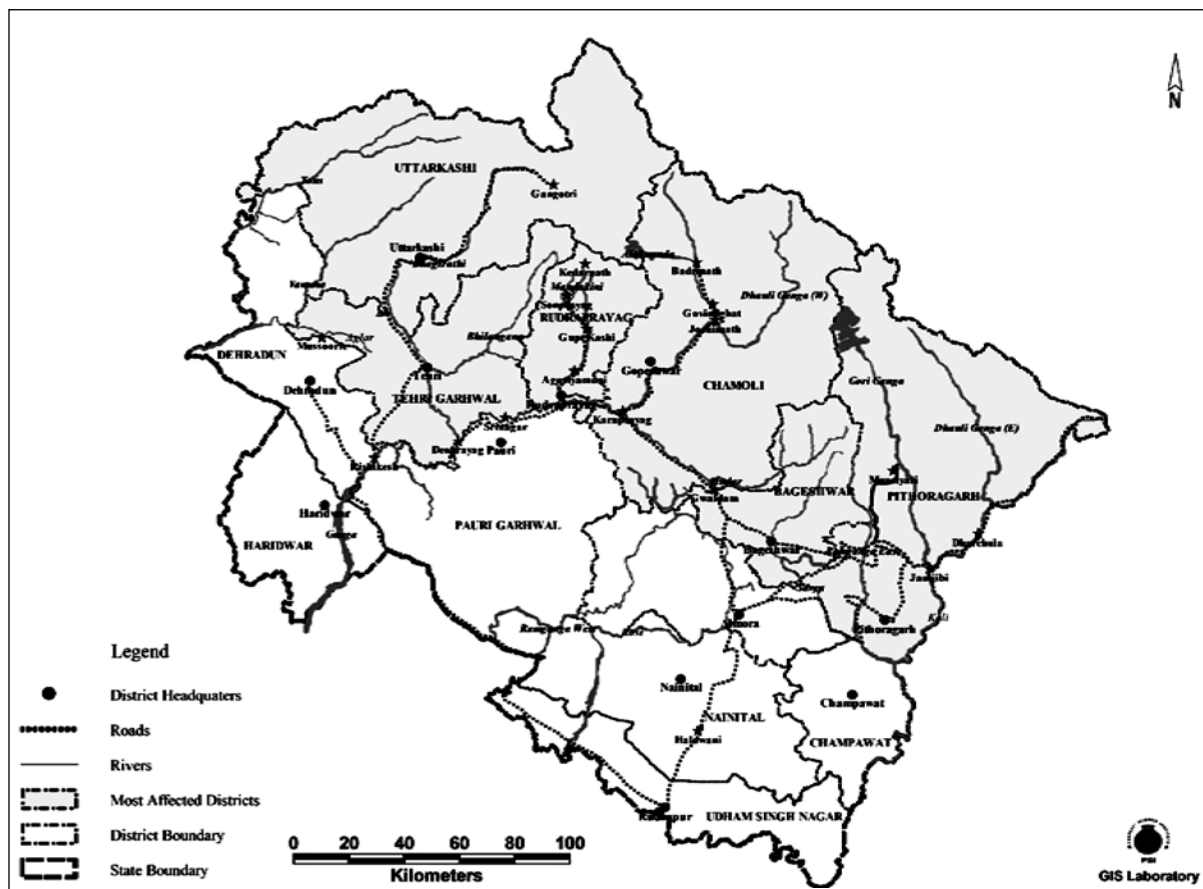


TABLE: STATE PROFILES

	Ar. P	Naga	Mani	Mizo	Trip	Megh	Assam	Sikkim	Ukd	H.P.	J & K	Remarks
Population (2011) in million	1.38	1.98	2.7	1.09	3.67	2.96	31.17	0.61	10.12	6.86	12.55	
Geographical Area km ²	83743	16579	22327	21081	10486	22429	78438	7096	53483	55673	222236	
Density per sq. km. (2011)	17	119	122	52	350	132	397	86	189	123	124	
% Rural Population (2011)	77.5	71	70	48.5	74	80	86	75	69.5	90	73	
Gender Ratio (2011) F/1000 M	920	931	987	975	961	986	954	889	963	974	883	
Gender Ratio at Birth (2011) F/1000 M	972	943	936	970	957	970	962	957	890	909	862	
IMR (2011) per 1000 live births	32	21	11	34	29	52	55	26	36	38	41	(Source: http://indiabudget.nic.in/)
Literacy Rate (2011) %	66.95	80.11	79.85	91.58	87.75	75.48	73.18	82.2	79.63	83.78	68.74	
FY' 12 GSDP (At 2004-05 Prices) (Rs. cr)	5691	8591	7184	4557	14203	10736	74215	3642	51107	39066	38739	(Source: http://mospi.nic.in/Mospi_New/upload/State_wise_SDP_2004-05_14mar12.pdf)
Per capita GSDP (Rs.)	41239	43388	26607	41807	38700	36270	23810	59705	50501	56948	30868	
Per capita GSDP (at current prices) 2012	NA	NA	29684	NA	38493	48383	30413	81159	68292	58493	33056	(source: http://www.nird.org.in/Rural%20Development%20Statistics%202011-12/data/section-2.pdf)
Recorded forest area (% of geog. area)	61.55	55.62	78.01	79.30	60.02	42.34	34.21	82.31	64.79	66.52	9.10	
% Forest Cover	80.5	80.33	76.54	90.68	76.04	77.02	35.28	47.34	45.8	26.37	10.14	(Source: http://pib.nic.in/newsite/erelease.aspx?relid=95717)
Net Sown Area (as % of geog. area)	213	362	348	130	256	284	2811	77	723	539	732	(Source: http://eands.dacnet.nic.in/LUS_1999_2004.htm)
Net Irrigation Potential (2010-11) (as % of net sown area)	26.3	22.9	21.0	9.2	23.4	22.2	5.8	18.2	46.5	20.0	43.9	(Source: http://eands.dacnet.nic.in/LUS-2010-11/S5.pdf)
Uncultivable Area (as % of geog. area)	5408	1208	1777	1912	792	1894	4961	610	4906	3951	2948	(Source: http://eands.dacnet.nic.in/LUS_1999_2004.htm)
Pasture and other grazing lands (as % of geog. area)	18	NA	1	5	2	NA	160	NA	199	1503	119	(Source: http://eands.dacnet.nic.in/LUS-2010-11/S1.pdf)
Total Workers	587657	974122	1159053	486705	1469521	1185619	11969690	308138	3872275	3559422	4322713	

Ar.P= Arunachal Pradesh, Naga= Nagaland, Mani= Manipur, Mizo= Mizoram, Trip= Tripura, Megh= Meghalaya, Ukd= Uttarakhand, H.P. = Himachal Pradesh, J&K= Jammu and Kashmir NA= Not available

END NOTES

- 1 The powers granted to the Van Panchayats under the 1931 Rules were modified and curtailed by the Panchayat Forest Rules of 1976, the Village Forest Joint Management Rules 1997 and the Uttarakhand Panchayati Forest Rules 2001.
- 2 Mining and real estate values are notoriously under-reported. The construction growth figure also appears to be low.
- 3 This includes main and marginal cultivators and agricultural laborers.
- 4 Based on a presentation made by the Uttarakhand Chief Minister to the Planning Commission to finalize the State Annual Plan for 2011–12, accessed at <http://planningcommission.nic.in/plans/stateplan/present/Uttarakhand.pdf>
- 5 Extreme rain is defined as more than 250 mm rain in 24 hours. Very heavy rain is about 120 to 250 mm in 24 hours. Heavy rain means 70 to 120 mm in 24 hours. A cloudburst refers to more than 100 mm rain in one hour.
- 6 Interview with the author.
- 7 *Ibid.*
- 8 Interview with the author.
- 9 Many persons who survived the initial deluge at Kedarnath and Rambara later succumbed to the cold weather when rescue was delayed.
- 10 Interview with the author.
- 11 These are crops that grow in special and limited locations due to their agro-ecological suitability. They include medicinal and aromatic plants, spices like ginger or large cardamom, fruits like apples, apricots or berries and grains like minor millets or amaranth. Because of their limited availability they generally command higher prices. Given the relatively limited production and higher value being increasingly commanded by organically cultivated crops they may also be categorized as niche crops.
- 12 This may raise project costs, but the current procedure of a cost plus assured reasonable return in setting tariffs protects the developers.
- 13 Developers hire EIA consultants not with the aim of minimizing damage to the environment and the dependent communities but simply to fulfill a mandatory requirement for project clearance. Instead, developers should pay a fee to the Ministry of Environment & Forests, which in turn gets the EIAs done by independent, experienced, multidisciplinary institutions and organizations of known integrity.

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