Report of the Task Force

To look into problems of hill states and hill areas and to suggest ways to ensure that these states and areas do not suffer in any way because of their peculiarities

Chairperson: G.B. Mukherji

Planning Commission
Government of India

G.B. Pant Institute of Himalayan Environment & Development
(An Autonomous Institute of the Ministry of Environment and Forests, Govt. of India)

Dribling hill paddy in South Mizoram

High quality, off season pea farming in Spithi Himalaya

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The IHR States must embark on a development path that does not disturb the primary colours of this picture: white, blue, green and brown representing the precious natural resources of the IHR, namely the snow and water, forest, and land.

सत्यमेव जयते

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&

Planning Departments of Govt. of Himachal Pradesh, Meghalaya, and Nagaland

It is a matter of great pride & happiness that G.B. Pant Institute of Himalayan Environment and Development, Kosi-Katarmal, Almora was entrusted with the task of compilation of the report of the Task Force on "*To look into problems of hill states and hill areas and to suggest ways to ensure that these states and areas do not suffer in any way because of their peculiarities*". I would like to thank my colleagues in the Headquarters and regional Units for providing valuable help in the collection & analysis of data. In particular, I wish to place on record appreciation for the untiring support provided to me by Dr. Subrat Sharma, as well as by Dr. D.K. Agrawal (during the initial months) without which it would not have been possible for me to complete this assignment. I also extend grateful thanks to all Task Force members and to the Chairperson, Shri G.B. Mukherje, for their valuable guidance, support and constructive critique at various stages during the compilation of this report. I am also thankful for the whole hearted support received form Shri L.P. Sonkar and Dr. Indu Patnaik of the Planning Commission. Help received from Dr. Rajeev Semwal and Ms. Kajal Joshi is also acknowledged.

L.M.S. Palni
Director
G.B. Pant Institute of Himalayan Environment and Development

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Contents

List of Figures

List of Tables

List of Boxes

From the Desk of the Task Force Chairperson

It has been a great honour and privilege to chair this Task Force on Hill Area Development, in the context of the Indian Himalayan Region; not only because the assignment came on the direction of the Hon'ble Prime Minister of India, but because we all are aware that this is a very important issue that is craving for attention; and tomorrow may be too late.

We, the Task Force members are convinced that proper planning on the Indian Himalayan Region (IHR) can be attempted only if we insulate ourselves from thinking from the view point of the plain areas. This is not to say that we should not be aware of the importance and the influence that the IHR has on the rest of the country; but, it is a recommendation of this Task Force that the needs of the rest of the country should not overshadow or unduly influence our views on the needs and vulnerabilities of the IHR.

I am very pleased that the esteemed Members of this Task Force, who in their own right and individual capacity are very well aware of the potential and the problems of the IHR, participated whole heartedly in offering practical suggestions. Yet, they have restricted their interventions only to the broad concepts leaving the details to be worked out by the state governments themselves, according to their own genius.

This Task Force, the Members felt, should not touch upon all the development and welfare issues that many earlier committees have tended to dwell upon at length. Instead, it was agreed from the very beginning that the recommendations of the Task Force would be effective only if it highlighted the major directions, leaving the rest to be followed up by those who have been tasked with that responsibility.

The Task Force is also seized of the fact that activities in the neighbouring countries can profoundly affect the ecology and economy of the Himalayan States. An example is the proposal to construct the Zhangmu dam on the Yarlung Tsangpo (as the river Brahmaputra is known in Tibet) by China. This action is likely to adversely impact the flow of water downstream in India including the planned hydro-electric and irrigation projects. Construction activities may also affect glaciers which help to maintain the flow of water not only in the rivers but also in underground aquifers. These external influences, however, are not being discussed except for suggesting continuous and pre-emptive collaborative effort, both in terms of research and dialogue with countries with which we share our borders.

I must express my sincere gratitude and thanks to the Director and associated scientists of the G.B. Pant Institute of Himalayan Environment and Development, Almora, for taking the ideas expressed in the Task Force meetings and packaging them with the result of studies taken up by various organisations that have worked in the Himalayan Region. The Chapters on Climate Change, and Governance were penned by me and I am happy that the Members of the Task Force are in agreement with my views. Their suggestions have, of course, been incorporated therein.

I also thank the Planning Commission for understanding why the Chairman, being a serving Secretary to the Government of India, has not found it possible to meet more frequently with the Task Force members, so as to finalise the report earlier.

Shri LP Sonkar, Senior Adviser and Dr. Indu Patnaik, Deputy Adviser, have been with us all through, quietly offering incisive thoughts and looking after the secretarial requirement. I thank them and their colleagues.

The Members of the Task Force would be more than happy if, at least the major recommendations find place in the planning and implementation agenda of all the Indian Himalayan States. A IHR initiative to bring about programme convergence may be the most relevant to begin with.

(G.B. Mukherji)
Secretary to Government of India
Ministry of Tribal Affairs

DISTILLED WISDOM

Opinions have been expressed that the pace of development of the Indian Himalayan Region (IHR) has been slow when compared to rest of the country. At the same time, its fragile nature and difficulty of taking up conventional development initiatives has not been appreciated. The Hon'ble Prime Minister of India, therefore, expressed[1] the need for a fresh analysis of the problems of the hill states and hill areas of the country in a manner that suggests that these areas do not suffer in any way on account of their peculiarities. To take note on this, a Task Force[2] was constituted by the Planning Commission of India in April, 2008. The composition of the initial Task Force and the subsequent modifications are at Annexure I.

The Task Force, at its first meeting on 19th May, 2008 agreed on a clear understanding that the scope of work should encompass only the states falling within the Indian Himalayan Region (comprising Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Manipur, Meghalaya, Tripura, Nagaland, and Mizoram, and the hilly areas of Assam and West Bengal). In the next meeting it resolved to recommend only such policies and programmes that help strike a balance between the four key natural treasures of the IHR viz., the snow, water, forests, and soil, with the developmental aspirations of its people. The Task Force members had no hesitation in stating that in case of a conflict between the two, the natural treasures should get primacy. Indeed, it is felt that snow, ice, water, and soil should be declared as the blessing of the mighty Himalayan ranges to our country and beyond. The acceptance of this wisdom resulted in a "Vision" for the IHR.

VISION

In order to suggest a new plan for the IHR, based on the lessons learned thus far, one needs to first visualize a picture of the IHR; a picture that is not only acceptable to those who live in the region, but also to those who live beyond its physical boundaries. The picture, if painted powerfully, will provide the impetus for strict control of behaviour and action that are often tempted to accord primacy to resource exploitation, growth and markets over conservation, protection and eco-friendly living. It is not an idealistic approach but a practical one. To put it bluntly, we cannot afford to burn a Kangra painting or a Ladakhi Tangka to provide immediate warmth. The primary stakeholders living in the IHR must believe in this picture in order to effectively counter the demands of those who live outside. Likewise, the "outsiders", becoming aware of the contents of the picture, and appreciating its influence on the rest of the country, must be prepared and willing to compensate the IHR for the self restrictions that it will be imposing.

Therefore, the IHR States must be persuaded to emphasize on a development path that does not disturb the primary colours of this picture: white, blue, green and brown representing the precious natural resources of the IHR, namely the snow and water, forest, and land.

Our Vision of the IHR accords maximum primacy to Blue: representing river valleys, watersheds and water bodies providing myriad sources for this life supportive elixir to multiple users, both in the Himalayan as well as the downstream regions of the country. Moisture provides support to soil, for crops to grow. Water makes forests dense and productive. So, in recognition of the ever increasing importance that water plays and will continue to play for the very survival of life, including in the IHR, and especially in the context of the anticipated adverse effects of global warming, no activity that threatens to bring a change in the natural water regimes of the IHR should be allowed. Period forests

1 Concluding remarks during the 54th meeting of National Development Council. 19 December, 2007.

2 No.M-13055/1/Task Force/2008-MLP Planning commission (MLP Division), Dated April 2, 2008.

that presently occupy 65.5% of the IHR, and are the main contributor to the colour Green, trap water and let it seep gradually into the ground and into streams. Blue and Green are linked; erase one, and the other automatically gets erased. Hence, forests in the IHR should not be allowed to decline but should actually be facilitated to increase to 70% by supporting their conservation and expansion with fiscal incentives to the local inhabitants, and by encouraging traditionally protective religio-socio-cultural norms and behaviour. For every item of use that crosses the limits of sustainability, alternatives must be provided; and disincentives for crossing must be made painful.

Various shades of the Brown, representing land and soil complement the green of the forests. Stringent zoning regulations, land use plans and control mechanisms must be in place so as to quickly and effectively stop all mountain unfriendly activities, especially by those individuals and institutions whose primary stakes are not in the region. Land in the IHR is too precious to be available to speculators.

White, dominated by snow, ice and glaciers represents the crowning colour of the IHR. White, in the context of the Himalayan region, is the key contributor to the sustenance of all other natural resources, especially water, making them potentially richer. Unfortunately, white is reportedly diminishing gradually in the wake of climate change, thereby posing one of the most serious ecological challenges for the country. Not much can be done to squarely address this concern except indirectly, by increasing the extent of the blue and the green, and by regulating activities that encroach upon snow and ice bound areas.

Finally, in addition to the above, mountains of the IHR are also for the people who are born in these areas and continue to remain the primary stakeholders. So, providing knowledge, training and skills to these primary stakeholders and creating enabling policy environment and infrastructure for controlled harnessing of the above mentioned natural resources is imperative. In the process it is expected to generate pockets of additional colours that would represent agro-horticulture crops, animal husbandry, strengthened social infrastructure (health, education, and housing) and a reliable network of roads, railways and air connectivity.

The IHR should be looked as being more than a tourist destination; it can be developed as one of the major production centres for niche crops and human capital of the country. Our vision does not, however, allow these additional pockets of colours and infrastructure development to adversely affect the key resources of the IHR that we are calling Blue, Green, Brown and White.

Arguments have been presented recommending reshaping of policies to bring in the "mountain perspective" for the IHR, in the national planning. Emphasis has also been laid on developing norms for good governance and for harnessing social capital at the grassroots.

To hasten development processes in the IHR, the other important recommendations of the report cover:

Resource and environmental issues:

- In order that conservation of key natural resources and eco-sensitivity is not neglected, development planning must be based on Zones. Activity or non activity zones must first be identified and taken into account for appropriate interventions;
- Zones of snow, alpine, sub-alpine areas and sacred landscapes need to be protected at any cost, for maintaining the flow of vital ecosystem services and for respecting and preserving religio-cultural values;
- All natural water zones (glaciers, rivers, lakes, and springs) must be strictly protected. Activities in any of the zones that, in any way, adversely impact on water resources should be nipped in the bud;
- Forest zone should be conserved and augmented for environmental services and biodiversity value. This zone should also be available for

sustainable bio- and non-timber forest produce (NTFP) prospecting, and for eco-tourism;

- Zone of fertile river valleys at lower altitudes should be utilized for agricultural production but conversion of agricultural land to other uses in such zones should not be allowed. Likewise sub-zones for terraced agriculture should be earmarked for unique crops, organic agriculture, horticulture, agro-forestry, and better managed shifting cultivation ($Jhum$);
- River zones for decentralized electricity production should be earmarked to meet the household and small industrial power requirements;
- Zone of urban spaces: no construction should be allowed in areas having slope above 30°, in areas that fall in hazardous zones, and areas falling on spring, aquifer lines and first order streams. Efficient sewage & municipal waste management systems should be mandatory in such places;
- Zone of industries should only be in non-fragile areas and include only those activities favourable to mountainous conditions, such as processing non-toxic, preferably locally available raw materials, and investment that generate local employment;
- In order to safeguard the Himalayan water regime, instead of project wise environmental impact assessments, Strategic Environmental Assessment (SEA) should be mandatory, concurrently developing the required human resource for carrying out SEAs;
- Mountain sensitive land use policy should be developed and laws should be made stringent to help minimize erosion and silt flow, facilitate functional land consolidation, and regulate mining irrespective of size to reduce environmental degradation;
- The solution to many connectivity related problems of the IHR seems to lie in finding and supporting road making technologies that are sensitive to, and also in conformity to the characteristics of mountain ecology and geology. Ridge alignment rather than along river valleys, efficient side drains, bio proofing of slopes below and above roads (tea bushes, bamboos and the like that bind the soil through intricate latticework of roots as well as a thick canopy that arrests raindrops from directly hitting the soil), location specific designs, and loops (networks interlinked in the region itself) are obvious choices that must be preferred;
- Planning for eco-friendly disposal of municipal solid waste must be the first charge of every IHR state. IHR towns cannot make garbage dumps of river basins and hill slopes. Awareness raising of this need and skill development programmes are required at every level for the key stakeholders for this;
- IHR States and local government must empower themselves to draw up eco-sensitive habitat plans, especially for disaster prone areas, fix zones for various activities, building codes, ownership codes, and strictly enforce implementation; and
- Since a demand for changing over from firewood to LPG is emerging, the Task Force recommends, all the IHR states, should capitalize on it. Increasing the availability of cylinders, especially the conveniently transportable or head loadable sizes, options for localized piped gas connections; and making LPG use mandatory for all hotels and eateries, whatever the size are corollary recommendations.

Human capital and skill development issues:

- If restrictions on the free use of natural resources are to be worked upon, alternate strategies for livelihood generation, beyond agriculture, horticulture and animal husbandry must be designed. In concrete terms, this would translate into large, focused investments in education and skill development. The human capital of the IHR must be enabled to tap technology to increase the output of traditional production, provide specialized services and even high scientific research into bio sciences, energy, materials and information technology;
- In whatever manner development and welfare is viewed, the need for measures that directly address the indicators of development and welfare is evident. While it is up to the

respective States to design these interventions and ensure effective implementation, the Task Force is of the opinion that mountain specific skill development with education will enable the people themselves to avail the services on offer, either within the region or beyond;

- Design specific courses on mountain ecology, sensitizing key decision makers and stakeholders and institutionalize this in administrative academies, universities, and skill training institutions in the IHR. Establishing a mechanism to collate and analyze the institutional resource already available in the IHR, coordinate their output and if necessary, set up new ones that meet the objectives of skill development is a related requirement;
- Skills for niche tourism is a mountain friendly option but only if it is regulated, is eco-sensitive, not energy or waste intensive, and is accompanied with local, community participation. IHR tourism must be an area of special focus but built on the foundation of local skill development and environmental "benign-ness";
- For the overall improvement of the IHR, the physical health and human capital of its inhabitants should be focused for quick improvement. This can be done, in the first instance, by delivering both preventive and curative services, found on a supportive, efficient and extensive infrastructure. Appropriate policy support is needed for attracting and producing quality teachers, amongst the locals, particularly for the remote areas. Introduction of mountain relevant syllabi, including vocational education, is another essential. Recruitment rules that favour area-wise, if not position-wise appointments are expected to negate pressures of moving to cities leaving vacancies in vulnerable areas. Full advantage of distant learning institutions (e.g., IGNOU), including those in the private sector (e.g., SMU, NIIT), must be taken. Policy support for this would imply satellite connectivity; and
- Upgradation of an existing institute or the establishment of a new institute for Natural Resource Analysis and Advisory Centre (NRAAC) is also recommended.

Fiscal issues:

- Reward as well as compensation mechanisms should be put in place at the national level for acknowledging and maintaining the flow of life supporting ecosystem services from the IHR to the rest of the country. For the maintenance of forests, incremental green bonus should be provided based on proportion of the area of IHR under forest while paying attention to the fact that there are vast tracts of lands in high altitudes where forests cannot grow;
- Set up a non-lapsable, IHR Gap Fund from sources to be identified by the IHR States with the Planning Commission, for compensating IHR states for sacrificing conventional development in favour of ecologically sustainable and water conserving initiatives;
- IHR development norms must be formulated on IHR relevant parameters rather than conventional, plain area parameters;
- Introduce a different price policy for organic/ niche products of the mountains so as to promote energy efficient and environmental friendly practices, support local economy, and conserve the IHR gene pool to respond to unforeseen challenges. Develop a policy framework to guide creation of Himalayan Brand (e.g., eco-mark, energy star label) for eco-friendly mountain products; and
- For seeking credit, banking norms should consider social capital as a surrogate to land ownership in states/areas where land tenure system restricts personal ownership of rights, and documented land records are not available.

Developmental issues:

- Develop reliable and efficient road, rail and air connectivity networks in the IHR. IHR roads must, even at the cost of redundancy, especially along sensitive and strategic areas, have parallel alternatives. Two loop railway lines – one for the Western Himalayan region and the other for North-Eastern region should be designed.

Major roads must link up with these two railway loops. There should be at least one small air-strip in every state; roads and railways should link up with that air-strip. Extensive network of ropeways and hanging bridges should be the backbone of surface connectivity in the high Himalayan region;

- Radio transmission and satellite based links should be strengthened for electronic communication at village level. This may enable electronic trading, bio-prospecting and software development for the rest of the country and the world;
- Decentralized small scale power generation and distribution are considered to be mountain friendly and need to be promoted. Medium and major projects can be planned only in areas considered to be ecologically stable and where river basin environmental impact assessments, as opposed to project-wise appraisals have been undertaken; and the resultant findings support such projects. Solar and wind energy must be considered as the first alternative to fuelwood and economic incentives have to find prominent place in IHR energy planning in order to help people switch over from fuel-wood to alternatives;
- Climate Change is a cross cutting issue and challenges transcend sectors. Strategies to minimize the anticipated adverse impacts must be designed right away, in association with the Central Government;
- Upgrading the standards of administration in the IHR is a task that the Task Force recommends, has to be specifically addressed by all the IHR States, preferably with the help of professionals and academic bodies; and
- A Convergence Mission to look into issues of delivery in the IHR is considered to be essential. Whether this should be in the form of a Himalayan Sustainable Development Forum, as was recommended by the Declaration following the Himalayan Chief Ministers' Conclave convened on October 30, 2009 in Shimla, or in any other form is a decision best left to the IHR States.

The super distilled recommendations of the Task Force are

- IHR States should invest in agro-horticulture-forestry skill and technology development.
- Output per ha will increase, productivity per person, in terms of service capability will increase.
- However, producers and skilled persons need access to markets for selling surplus as well as opportunities to offer their skills. Therefore, States should invest in connectivity, marketing arrangements including IT enabled service infrastructure.
- Wealth generated should be attracted for ploughing back on land as well as on education/ training. So, IHR States should encourage special investment opportunities with high rate of return.
- Resultant skill/ educational institutes will be enabled to improve production technology as well as human capital.

CHAPTER 1

INTRODUCTION

1.1. PREAMBLE:

Environmental conservation and sustainable development are conventionally stated to be the two sides of the same coin, but in mountainous regions, *it is the cone not coin, with natural resource as the base*. This statement is most appropriate in situations that abound in the mountains across the globe. 'Mountains are an important source of water, energy and biological diversity. Furthermore, they are a source of such key resources as minerals, forest and agricultural products and of recreation. As a major ecosystem representing the complex and interrelated ecology of our planet, mountain environments are essential to the survival of the global ecosystem' (Agenda 21[3]). Mountains are essential for snow to fall, ice to form and rivers to flow. All the major rivers in the world have their headwaters in mountains, and hence these are aptly called the Water Towers[4] (or the Third Pole) on the earth.

A strong consensus was evolved during the worldwide deliberations in the International Year of the Mountains (2002) and the International Year of Freshwaters (2003) to work towards sustainable development of the mountain regions that directly impact the lives of more than half of the world's population. However, the mountain ecosystems are rapidly changing owing to numerous biophysical and socio-economic factors and as a result the mountains, throughout the world, are experiencing environmental degradation.

Mountains are known for their specificities viz., inaccessibility, fragility, marginality, diversity (heterogeneity), niche (natural suitability) and adaptability[5]. Therefore, in the concluding remarks during the 54th meeting of National Development Council (19th December, 2007), the Hon'ble Prime Minister of India expressed the need for a fresh analysis of the problems of the hill states and hill areas of the country in a manner that suggests ways and means so that these areas do not suffer in any way on account of their above mentioned, largely geographical, peculiarities.

The recognition that the hill states and hill areas of the country have not been able to join in the race of socio-economic development of the country[6] even after more than 60 years of independence, strongly implies that the situation and underlying causes need to be analyzed afresh and suggest critical corrective measures. The primary question before the Task Force [2] is, "what type of development?" It is in the aforesaid back drop that a Task Force[2] was constituted by the Planning Commission of India in April, 2008 under the Chairmanship of Shri G.B. Mukherji.

1.1.1. The Himalaya: Region & the People

The name Himalaya has been derived from two Sanskrit words *Hima* (snow) and *Alaya* (abode), i.e., the abode of snow. The massive Himalayan arc extends over 2,500 kilometers between Nanga Parbat (8,126 m) in the west and Namcha Barwa (7,755 m) in the east[7] . The extreme variation in elevation and rugged relief are the result of orogenic forces with vigorous erosion processes. India-

3 Agenda 21, Section-II, Chapter 13th Managing Fragile Ecosystems: Sustainable Mountain Development. http://www.un.org/esa/dsd/agenda21/res_agenda21_13.shtml visited on 17.9. 2009.

4 Liniger, H., Weingartner R., and Grosejean, M. 1998. Mountains of the world: Water towers for the 21st century. United Nations Commission on Sustainable Development.

5 Jodha, N. S. 2005. Himalayan Journal of Sciences, 3(5):33-43

6 Infrastructure Index by UNDP for Twelfth Finance Commission (2005-10) Govt. of India. Lower Middle Category – Himachal Pradesh, Uttarakhand, Low Category – Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim, Tripura, and J&K.

7 Kenneth Mason. Abode of Snow: A History of Himalaya Exploration and Mountaineering. London: Rupert Hart-Davis, 1955. p.6

Asia convergence (20 mm/year) is absorbed by a thrusting along the southern front of the Himalaya leading to the continuous rising of the Himalaya by about 5 mm/year and, therefore, making it geologically unstable and prone to earthquakes [8,9,10]. Being the youngest and loftiest mountain chain (more than 30 peaks exceeding 7,600 m in elevation[11]) of the world which is still rising, the Himalayan region is naturally unstable and fragile.

Box 1 - Origin of the Himalaya and ongoing processes

The Himalaya came into existence as a result of a collision along the convergent boundary between the Indian Plate and the Eurasian Plate. The collision began in the Upper Cretaceous period (about 70 million years ago) when the Indian Plate, moving north at about 15 cm/year, collided with the Eurasian Plate. By about 50 million years ago this movement completely closed the Tethys Sea thrusting the sediments up and forming the youngest and loftiest mountain ranges on the face of the earth known as the Himalaya. The Indian plate is still moving at 67 mm/year, and over the next 10 million years is likely to travel about 1,500 km into Asia.

Physiographically, starting from the Siwalik hills in the south, the Himalayan mountain range extends to the Tibetan plateau in the north. The broad divisions are the Siwaliks, the lesser Himalaya, the greater Himalaya and the trans-Himalaya; extending almost uninterrupted throughout its length, separated by major geological fault lines.

The climate ranges from tropical at the base of the mountains to permanent ice and snow at the highest elevations. The amount of yearly rainfall increases from west to east along the base of the range. The Indian Himalayan region (IHR) contains some of the wettest spots on the face of the earth in the eastern side, and vast expanses of cold desert in the north-west. The eastern Himalayan region, which is at a relatively lower latitude than the western region, is also comparatively warmer. Local relief and location determine such climatic variation not only in different parts of the Himalaya but even on different slopes of the same range. The diversity in climate, altitude, rainfall and soil types along the altitudes and longitudes manifests itself in the presence of a variety of agro-climatic zones, each harbouring distinct and sometimes overlapping plant and animal communities.

The higher regions of the Himalaya are snowbound throughout the year and in spite of their proximity to the tropics, the perpetual snow level seldom falls below 5,500 meters. The Himalayan ranges encompass numerous glaciers (9,575[12]); notable among them is the Siachen which is the largest glacier in the world outside the polar region (Table 1.1). The Himalayan glaciers are the source for several large perennial rivers which in turn further define and shape the mountain configuration, and drain into major river systems of the continent (Table 1.1).

The Himalayan region is dotted with hundreds of small and big, crystal clear lakes, many of which are considered sacred by the followers of various religions. Most of such lakes are found at altitudes less than 5,000 m above mean sea level (amsl). The Pangong Tso which is spread across the border between India and Tibet (China) at an altitude of 4,600 m amsl is the largest (as wide as 8 km at places and nearly 134 km long) lake in the region. The other notable high altitude lakes are Gurudogmar (5,148 m) and Tsongmo in Sikkim, and Tilicho in Nepal.

The Himalayan ranges have a profound affect on the climate of the Indian subcontinent and the Tibetan plateau. They prevent frigid and dry arctic winds from blowing south into the subcontinent keeping South Asia much warmer when compared to the regions located between corresponding latitudes throughout the globe. They are a barrier for the moisture laden monsoon winds, preventing them from traveling further northwards and thus facilitating timely and heavy precipitation in the entire Northern India.

8 Valdiya, K. S. 2001, Current Science, 81(11):1418-1431.

9 Valdiya, K. S. 2002, Physical Geography, 26(3):360-399.

10 Valdiya, K. S.1993, Current Science, 64(11-12):835-885.

11 Gurung, H. 2005. Atlas of the Himalaya. ICIMOD, Kathmandu, Nepal.

12 Raina, V.K. & Srivastava, D.K. 2008. Glacier Atlas of India. Geological Society of India, Bangalore.

During winter, the Himalayan ranges pose a barrier to storms coming from the west, and as a consequence receive precipitation in the form of snow at higher ranges, and rainfall in lower elevations and the adjacent plains of northern India. Thus, there are two distinct periods of precipitation in the IHR: (i) the moderate amounts brought by western disturbances during winter, and (ii) the heavier precipitation during summer due to southwesterly monsoon winds. The winter precipitation is more pronounced in the western Himalaya in comparison to the eastern Himalayan region, while the reverse is true for the summer monsoon. Despite being a general barrier to the cold northerly winter winds, the Brahmaputra valley receives part of the frigid winds causing substantial lowering of the temperature in the North-East India helping North- East monsoon to occur during this season.

Table 1.1. Important Glaciers in the IHR and River Systems

Location	Glacier	Length (km)
Karakoram Range	Siachin	72
	Hispar	62
	Baifo	69
	Batura	59
Kashmir	Kolahai	6
	Machai	8
	Shishram	6
	Liddar	5
Himachal Pradesh	Bara Shigri	30
	Chhota Shigri	9
	Sara Umga	17
	Parvati	8
	Samudra Tapu	9
Uttarakhand	North Nanda Devi	19
	South Nanda Devi	19
	Trishul	15
	Gangotri	30
	Dokriani	5
	Chorabari	7
	Gantotri	19
	Chowkhamba	12
	Satopanth	13
	Pindari	8
	Milam	19
Sikkim	Zemu	26
	Kchangchendzonga	16

Source : Report of the Task Force on Mountain Ecosystems Environment and Forest Sector for Eleventh Five year Plan. Planning Commission, Govt. of India, 2006

River Systems

The western rivers combine and drain into the Indus Basin, of which the Indus River is the largest. The Indus begins in Tibet at the confluence of Sengge and Gar rivers and flows southwest through Pakistan to the Arabian Sea. It is fed by the Jhelum, the Chenab, the Ravi, the Beas, and the Sutlej rivers, among others.

The other Himalayan Rivers drain into the Ganga-Brahmaputra Basin. The Ganga originates as Bhagirathi from Gangotri glacier and flows southeast through the plains of northern India, fed by the Alaknanda and the Yamuna among other tributaries. The Brahmaputra originates as the Yarlung Tsangpo River in western Tibet, and flows east through Tibet and west through the plains of Assam. The Ganga and the Brahmaputra meet in Bangladesh, and drain into the Bay of Bengal forming one of the largest river deltas in the world.

As the only exception, the eastern-most glacial Rivers feed the Irrawady River basin, which originates in eastern Tibet and flows south through Myanmar and finally drains into the Andaman Sea. The Salween, the Mekong, the Yangtze and the Hwang Ho, all originate from parts of the Tibetan plateau which is geologically distinct from the Himalaya and are, therefore, not considered as the true Himalayan Rivers. Some geologists refer to all these rivers collectively as the circum-Himalayan Rivers.

With such a profound influence on the regional climate and due to great variations in altitude and latitude, the Himalayan region nurtures a staggering diversity of flora and fauna. The vegetation assemblages of the Himalayan region range from tropical savanna type to alpine meadows. Taking note of this, the entire landscape has been designated as one of the global hotspots of biodiversity. IHR accounts for around 70% of the Himalayan biodiversity hotspot; Recognition of the Himalaya as one of the 34 global biodiversity hotspots aptly reflects it's wide ranging ecological significance[13]. Diverse natural resources support socio-cultural diversity in these mountains.

The initial human settlement of the Himalayan region was the result of waves of Caucasoid migration from the west and Mongoloids from the east. Thus, due to their individual migration routes, the former are spread across the Western Himalaya while the latter settled in the eastern Himalaya. Migrants settled with time and brought their religions such as Hinduism from the southern plains, Buddhism from the northern high plateau and Islam from the west. While their cultural identity remains preserved in a large number of distinct languages of Tibeto-Burman and Indo-Aryan language families, which they speak across the region, the spiritual faith of many Himalayan people is still ingrained in their Shamanistic belief[11].

1.1.2. The Indian Himalayan Region (IHR)

The IHR, including the Himalaya proper and the north-eastern hill states, lies between 21°57' and 37°5' N latitudes and 72°40' and 97°25' E longitudes covering an area of 5,33,000 km^2 (16.2% of the total geographical area of the country). It stretches over 2,500 km from Jammu & Kashmir in the west to Arunachal Pradesh in the east, covering partially/ fully twelve states of India (Fig. 1.1), but its width varies from 150 km to 600 km at different places.

The IHR is the home to four crore (40 million) people[14] (3.8% of the total population of the country). Historically the region had been controlled by different principalities/tribal coalitions/ monastic orders, and then came the colonial regime that lasted till the independence of the country. Since independence, the system of democratic governance ushered in new institutional arrangements with some specific arrangements[15] to protect and maintain socio-cultural identities of the mountain societies in the IHR.

In the religious traditions of India, the Himalaya as an entity has been personified as God Himvat (in Hinduism), the father of lord Shiva's consort, Parvati. However, religious significance of the Himalaya extends to other religions as well. Some scholars opine that the IHR has become the symbol of religious harmony of the highest order in the country[16,17]. Multiple ethnic compositions are a striking feature of the region. More than 170 of the total 701 scheduled tribes of India inhabit the IHR.

Broadly divided into the eastern Himalaya and the western Himalaya, each region has its unique culture and cultural diversity. Ethnic mosaic of western Himalaya differs conspicuously from that of the east. A wide spectrum of biophysical gradients when superimposed with socio-cultural diversity make the IHR all the more heterogeneous, necessitating formulation of location specific developmental plans as well as finding solutions to the local problems. There is a distinct social awareness on conservation and natural resource management as reflected by the origin of world famous environmental movement Chipko and the existence of a number of traditional institutions like Dzumsa, Mangma, and Dwichi in the IHR.

The region is vast, rugged and varied. The higher ranges remaining perpetually snow bound

13 Conservation International. 2007. http://www.biodiversityhotspots.org

14 Census of India, 2001.

15 Indian Constitution – Part XXI: Article 370; 371A, B, C, F, G, & H. Foreigners (Protected Areas) Order 1958- Protected Area Permit.

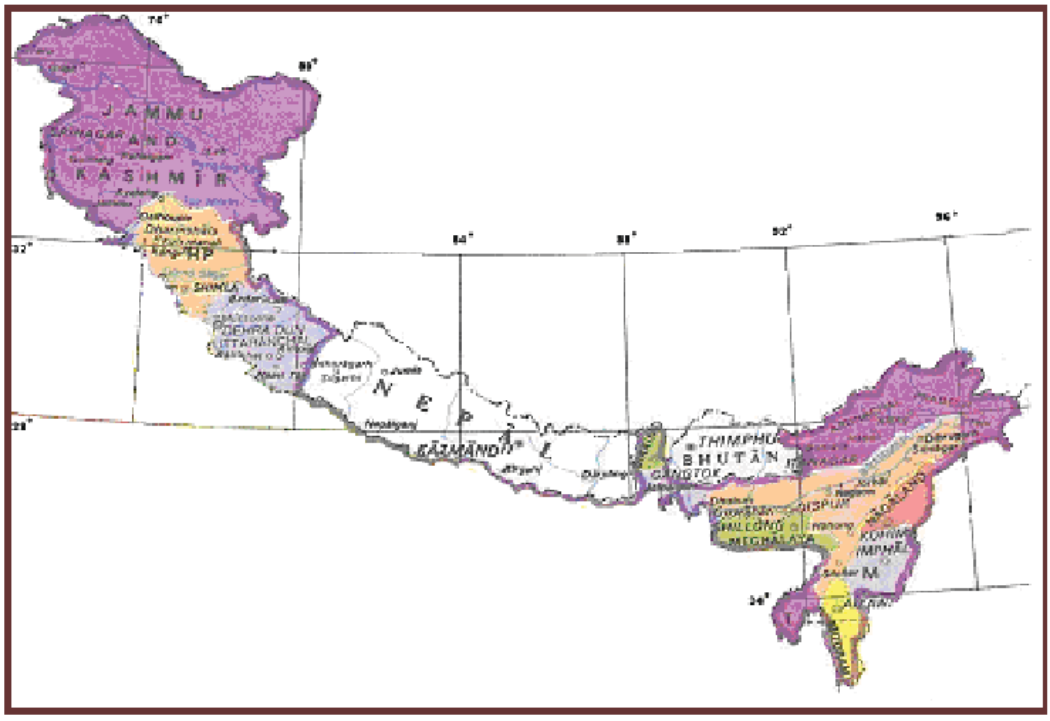
16 Gurudwara Pather Sahib's was built by Lamas of Leh in 1517 AD, and run by them for over four centuries.

17 Religious harmony between Hindu pilgrims and local Muslims during Amarnath yatra.

overlooked by more than 13 peaks surpassing 7000 m in elevation (Table 1.2). It plays a vital strategic role in safeguarding the entire northern boundary of the nation. Apart from national security standpoint, the Himalayan region is also important for its high forest cover. More than 65% of its geographical area is under forests representing one-third of the total forest cover and nearly half (46%) of the very good forest cover of the country. The forests of the region provide life supporting, provisioning, regulating, and cultural "ecosystem" services to millions of local as well as downstream people. Over 9,000 Himalayan glaciers and high altitude lakes form a unique reservoir storing about 12000 km^3 of fresh water[18] (Table 1.3). This reservoir benignly releases its wealth to the rest of the country, mostly in a manner that sustains life to millions, deep into the plains.

Box 2 - Diversity of major religious Sanctum Sanctorum in the IHR	
Religion	Important Places
Buddhism	Tawang & Rumtek Monasteries, Dharmshala, Buddha temple at Manu Bakul
Hinduism	Kamakhya, Badrinath, Kedarnath, Gangotri, Yamunotri, Vaishnov Devi, Shri Amarnath
Sikkhism	Nisahn Shaib, Nanak Sahib, Hemkund Sahib, Ponta Sahib, Manikaran Sahib, Pather Sahib
Islam	Hazratbal Shrine, Charare-e-Sharif, Peran-e-Kaliyar,
Christianity	The Catholic Cathedral (Kohima), Baptist Church Of Mizoram

Fig.1.1. Indian Himalayan Region (IHR)



Source: Survey of India[19]

18 Valdiya K.S. 1998. Dynamic Himalaya, Universities Press, Hyderabad, p.178.

19 http://www.surveyofindia.gov.in/ soi_maps/atlas/p_21_200.pdf

Table 1.2. Major peaks and lakes in the Indian Himalayan Region (IHR)

Mountain peaks	Location	Height (m) amsl		High Altitude Lakes	Altitude (m amsl)
Kanchenjunga	Sikkim	8,586		Suraj tal	4950
Nanda Devi	Uttarakhand	7,824		Tso Moriri	4524
Masherbrum	Kashmir	7,821		Pangong Tso	4350
Kamet	Uttarakhand	7,756		Hemkund Sahib	4329
Saser Kangri	J&K	7,672		Vasukital	4300
Baltoro Kangri	Kashmir	7,312		Chandra tal	4300
Mana	Uttarakhand	7,273		Daityatal	4275
Badrinath	Uttarakhand	7,138		Dasir lake	4270
Nun Kun	J&K	7,135		Manimahesh	4080
Pauhunri	Sikkim	7,128		Gandhi Sarovar	3970
Trisul	Uttarakhand	7,120		Nako lake	3662
Trisuli	Uttarakhand	7,074		TsoMgo (Changu)	3658
Dunagiri	Uttarakhand	7,066		Tulian lake	3353
				Deoria tal	3255

Source: Government of Himachal Pradesh (www.himachaltourism.nic.in)

Table 1.3. State wise- Water Resources in the IHR

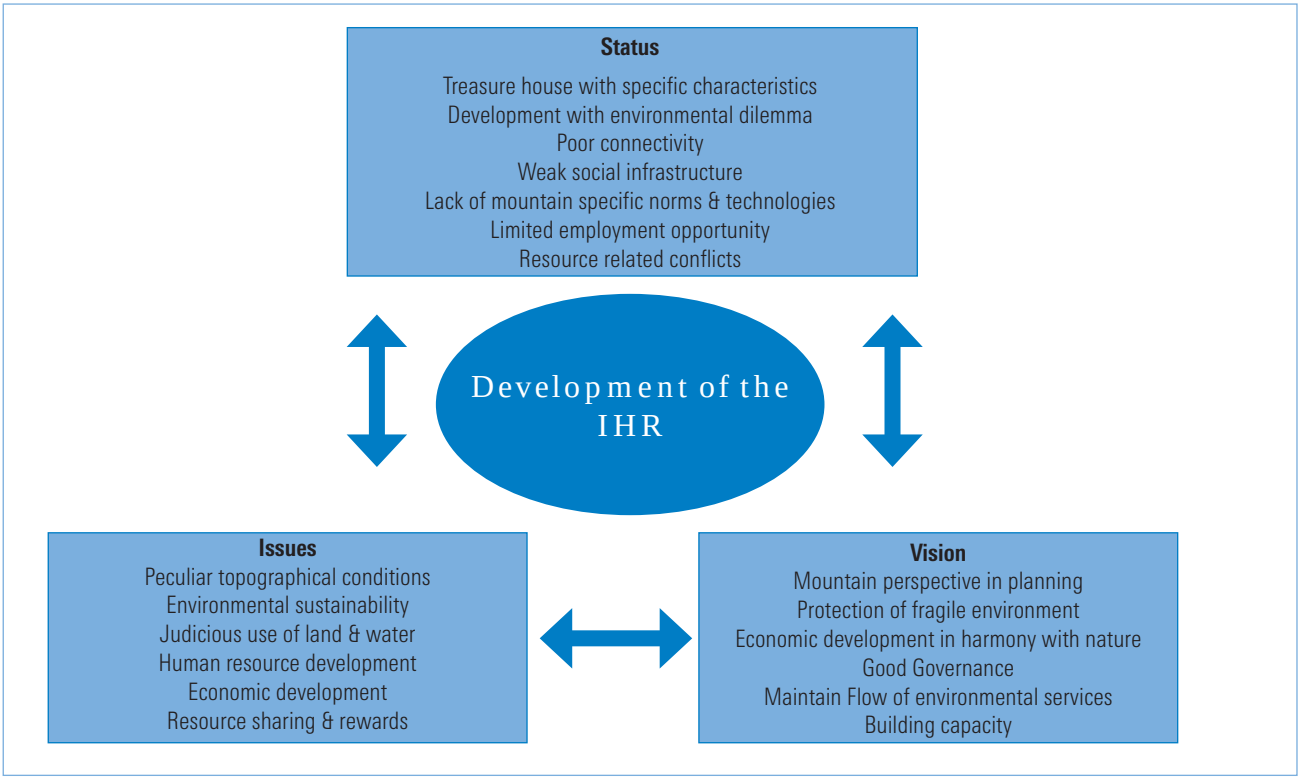
State	Water bodies (lakh hectare)	Total Replenishable ground water (Mcm/yr)
Jammu & Kashmir	0.30	4425.84
Himachal Pradesh	0.43	365.81
Uttarakhand	0.20	-
Sikkim	0.03	-
Meghalaya	0.10	539.66
Tripura	0.17	663.41
Mizoram	0.02	-
Manipur	0.46	3154.00
Nagaland	0.67	724.00
Arunachal Pradesh	0.04	1438.50

Mcm = Million Cubic Meters. 1million is 10 lakhs

Source: Ground Water Statistics 1996, Central Ground Water Board

1.1.3. Developmental Approaches for the IHR

Fig.1.2. Developmental Perspective for the Indian Himalayan Region



Over the years, policies for the development of the IHR as a part of the national policy have been evolving. In the initial years after independence, especially up to the Fifth Five Year Plan (1974-79), the approach to development of the Himalayan region was no different from that of the rest of the country as there was little appreciation of the unique problems and developmental needs of the IHR. However, the Fifth Five Year Plan, for the first time, recognized that the development issues, needs and problems of the hill areas of the country, were markedly different from that of the vast lowland areas of the country requiring a different set of policies and programmes. It was in consideration of this need that a special Hill Areas Development Programme (HADP) was initiated during the Fifth Five Year Plan. Since then, this differential understanding has been interceding national and state level policy perspectives as well as any debate on the development of IHR.

Development programmes, based on sectoral approaches, implemented during 1970s made limited impact in the hill areas of the country. Therefore, in recent years, the need to integrate development with environmental concerns has become centre stage, accepted and articulated in policy documents with greater regularity. The development approach for the Himalayan region and other hill areas of the country has been summarized by the working group constituted during the Eighth Five Year Plan (1992-97): "The hill areas of the country are faced with certain peculiar problems inhibiting the process of development. On account of the difficult terrain, variable agro-climatic conditions, distinct socio-cultural features, the hill areas have remained backward".

The emphasis on a specific hill area development approach emerged from the ever growing inter-regional disparities and the isolated condition of the hill people. Initially, the interventions consisted only of special financial allocations made for the development of the region. The quantum of allocation was governed by the need of two broad

sectors viz., agriculture and road connectivity. Over a period of time, it was realized that while the development of the hill areas cannot be planned without reference to the needs and resources of the adjoining plains, with which its health is closely linked, its own needs and specificities being vastly different, planning for the IHR must stand on a separate footing. Indeed, while the influence of the IHR on the welfare of the plains was obliquely appreciated, the need for harnessing its major rivers that flow to the plains became an immediate issue in national level planning. Subsequently, it was felt in many quarters that if the "thinking for the plains" continues to dictate the resource use of the IHR, the fragile nature of the IHR and the vulnerabilities of its people would not be protected.

Various commissions and working groups constituted by the Government of India and the Planning Commission, from time to time, recommended policy measures and programmes for the development of IHR. They generally concur with the view that the entire region does not constitute a homogenous entity and variations on the basis of terrain, climate, altitude, rainfall, topography, soil, proximity to plains and various socio-economic and cultural factors call for varying strategies to be developed. For instance, the Planning Commission of India has identified the following constraints that affect agricultural productivity in the IHR (Table 1.4).

A review of the policy formulation at the national level related to development of the Himalayan region and hill areas, shows that while a consensus seemed to be building up regarding the need for integrating the environmental concerns of the IHR with the development issues, this focus tends to get lost in the context of the wide ranging recommendations made for all sectors in the IHR. Interestingly, the feedback from those Task Force members who are deeply rooted in the IHR is that most of these recommendations have remained unimplemented. Some of the important Commissions and working groups and their key recommendations are placed in Annexure II. Keeping the past outcome in mind, this Task Force has restricted itself to a few critical concepts and interventions; assured that if these are addressed, the rest of the valuable recommendations of the earlier committees will naturally follow.

Table 1.4. Region-specific Factors Responsible for Low Productivity of Agriculture in the IHR (11th Five Year Plan 2007-12)

Agro-climatic Region	State/Parts of State	Region-specific Constraints
Western Himalayan Region-I	J&K, HP, Uttarakhand	Severe soil erosion, degradation due to heavy rainfall/ floods and deforestation, poor road, poor input delivery, inadequate communication infrastructure and marketing
Eastern Himalayan Region-II	NE States, Sikkim, Assam	Aluminium toxicity and soil acidity, soil erosion and floods, shifting cultivation, non-availability of electricity, poor road, poor input delivery system and communication infrastructure

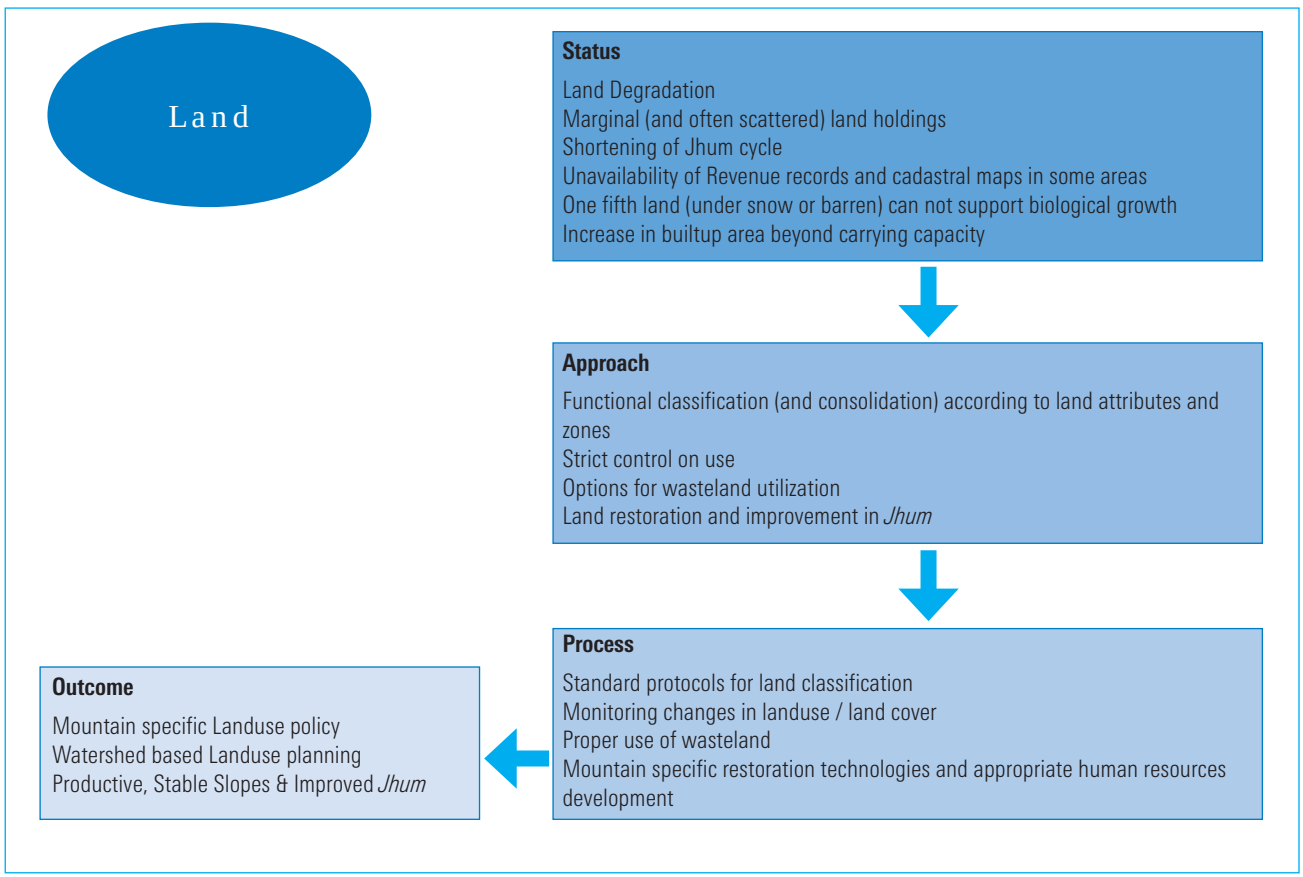
Source: Working Group on Agro-Climatic Zonal Planning. Planning Commission of India

CHAPTER 2

GEORESOURCES

2.1. LAND:

Fig.2.0. Schematic Plan for the Development of Land Resources in the IHR



At the outset, it needs to be noted that two different sets of land statistics are available for the IHR. The first one provides information in terms of "Reporting Area", whereas in the other set, the information is presented on the basis of total "Mapped Area". These two different types of land use statistics at times present confusing figures. Table 2.1 depicts the summarized land use statistics for the country and the IHR. It can be seen therein that in case of Reporting Area based statistics, most parts of the country (92.8% of the total geographical area) have been represented. However, the un-reported area (~7%) represents parts of the IHR only. When one looks closely, it is observed that this land use statistics reflect less than half (48%) of the total geographical area of the IHR only (Table 2.1).

Incompatibility of different land use classifications poses problems in data matching. For example, culturable waste (not available for cultivation), permanent pastures and other grazing lands in the Reporting Area based classification (which describes current use status) are not represented in the map based classification.

It is apparent from Reporting Area based land use classification that contrary to the general scenario in the country, where agriculture is a major land use (50.9% of the total area of the country), forests (recorded area in forest records) is the major land area in the IHR (65.4% of the total reporting area of IHR; Fig. 2.1) followed by wastelands (15.7% of the area not available for cultivation and culturable wasteland), and agriculture (13.6% comprised of net area sown and current fallow).

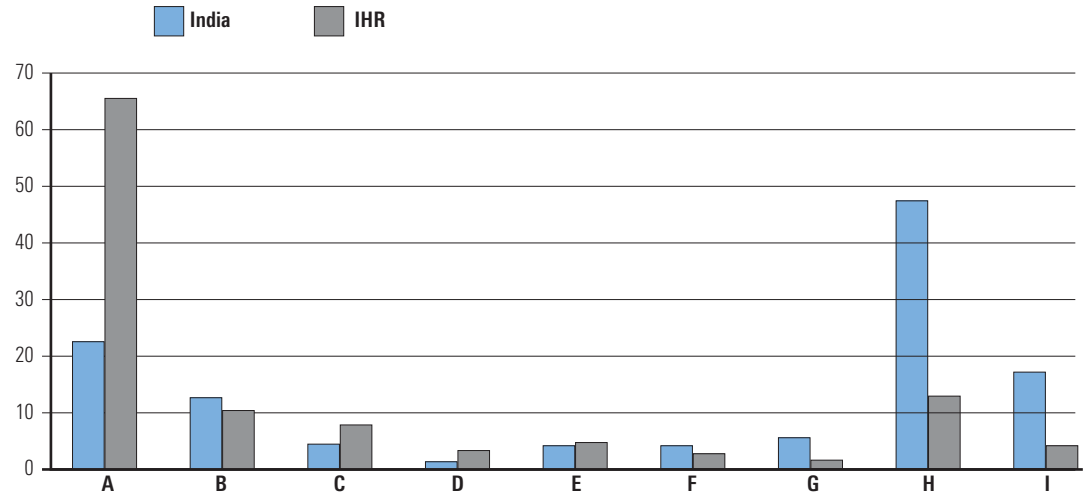
Table 2.1. Area Covered in Landuse Classification

No.	Reporting Year	Area (thousand ha)	
		India	IHR
A.	Total Geographical Area	328726	53743
B.	Reporting Area (Year)		
1	2006-07*	305507	
2	2005-06*	305269	
3	2004-05*	305313	
4	2003-04*	305399	
5	2002-03*	305399	
6	2001-02*	305112	
7	2000-01	305174	
8	1999-00	304946	

* Provisional Estimates

Source: (Ministry of Agriculture, Govt. of India) 2006-07

Fig.2.1. Landuse Classification based on the Reporting Area (Provisional 2005-2006)



A- Forests, B- Not Available for Cultivation, C- Permanent Pastures & Other Grazing lands, D- Land under miscellaneous tree crops & groves, E- Culturable Waste Land, F- Fallow land other than current fallows, G- Current Fallows, H- Net Area Sown I- Area sown more than twice

Source: Provisional Estimates (Ministry of Agriculture, Govt. of India)

Area not available for cultivation is almost similar, in terms of proportion, in both the cases (IHR: 11.1%, and India: 13.9%) while the proportion of area under permanent pastures and grazing lands is higher (7.1%) in the mountains as compared to the national figure (3.4%). This is also true for land under tree crops and groves which are outside the forest area (IHR: 2.8%, and India: 1.1%). Thus, only limited land resource is available (outside the forest area) to be used for agricultural or allied production. It must be noted that about 12% of the land area in the IHR is either barren or fallow due to various, mostly location related reasons. These lands are prone to further degradation and soil erosion in the inherently fragile Himalayan landscape. This is reflected by the fact that some of the rivers in the IHR carry very high sediment causing problems downstream. Marginal land holdings in the western Himalayan region and shortening of Jhum cycle in the eastern Himalayan region are some of the major land based production related concerns in the IHR.

2.1.1. Wasteland Estimation:

Wastelands per se are not included in the point classification of the Central Ministry of Agriculture (Fig. 2.2). National Remote Sensing Agency (NRSA) of the Department of Space, has developed an atlas (Wasteland Atlas of India) on the wastelands of the country under the aegis of the Department of Land Resources, Ministry of Rural Development. According to this, there are 13 categories of wastelands covering 19.4% of the country's geographical area; while in the IHR, wastelands cover significantly higher (about one-third) proportion of the total area of the region (Table 2.2). More than one fifth (22.4%) land in the IHR is either under snow or barren and does not support any biological growth (Fig. 2.2).

In the western states of the IHR, cadastral maps of villages and towns give a real estimate of land under various uses. However, for most of the states

Table 2.2. Wastelands and Non-usable lands in the IHR (km^2)

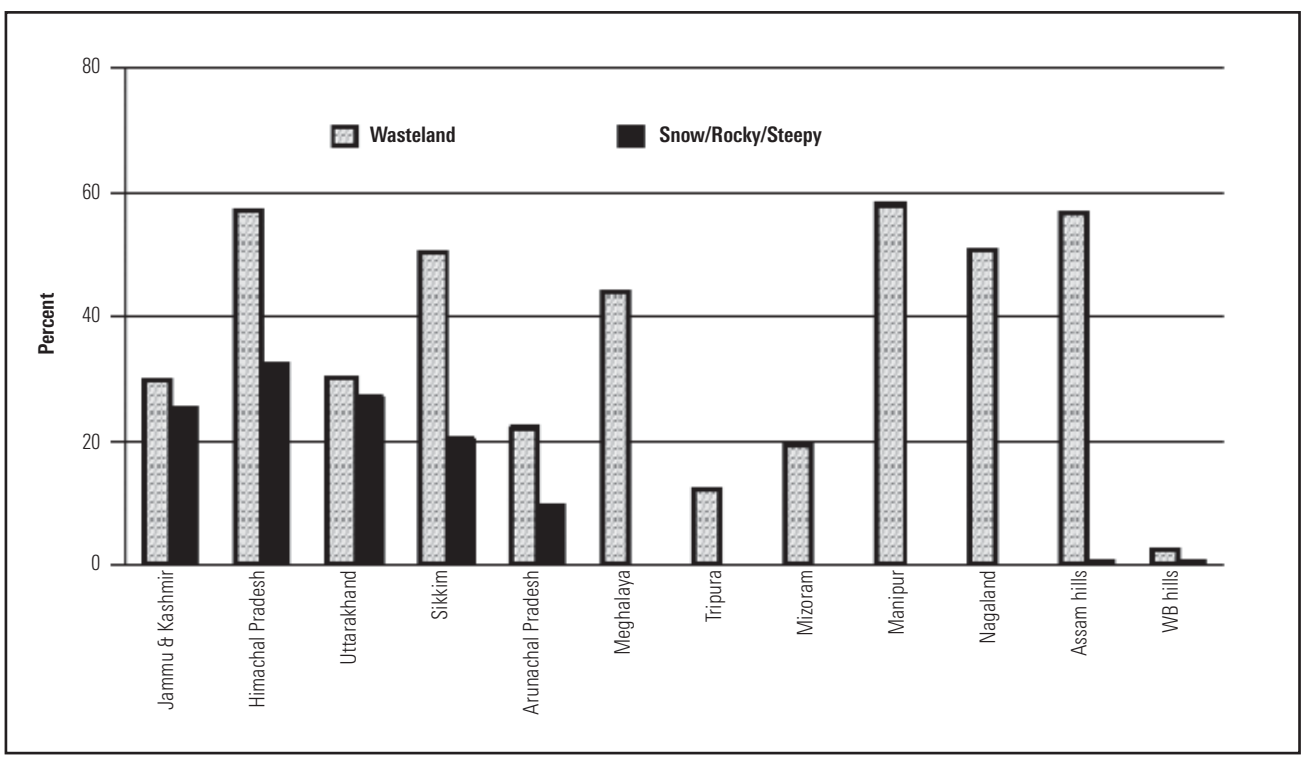
Region	Wastelands		Non-usable Area		
	Total Area	% to Total Area	Snow/Glacier	Barren/Rock	Steep Slopes
Indian Himalayan Region	180432.91	33.5	55788.49	38415.07	4198.37
India	638518.31	19.4	55788.49	64584.77	7656.29

Source: Based on Wastelands Atlas of India 2000, Department of LandResources, Ministry of Rural Development Government of India

in the north-eastern Himalaya, reliable revenue records are yet to be prepared or updated. Land ownership and obtaining right-of-way are major issues for executing developmental projects in areas where government does not own any land[20] (e.g., Nagaland). This has implications on the time taken for project execution and cost of the project.

The Wasteland Atlas has categorized *Jhum*[21] (area under shifting cultivation) as wasteland, although it is a prominent traditional agricultural land use associated with the social framework of a large number of tribal communities of the north-eastern states. Local terrain in the region coupled with dynamic practices (both in time and space) of shifting cultivation, and lack of cadastral maps make it difficult to provide accurate estimates of areas under such usage. This can, however, be measured using space borne technology, albeit at higher resolution; and will require frequent updating.

Fig.2.2. Total Wastelands (% of total geographical area), and Area under Snow, Rocks, and Steep Slopes (% of total wastelands) in Different States of the IHR



Source: Based on Wastelands Atlas of India 2000, Department of Land Resources, Ministry of Rural Development, Government of India

20 Planning & Coordination Department, Government of Nagaland.

21 Also described as shifting cultivation in documents. In literature it is also known as Swidden, Podu, Slash & Burn agriculture, etc.

The land resources of the Himalayan region are steadily degrading due to a number of natural and man-made factors. The continuing uplift of the Himalaya has also contributed to a modification in the land forms, leading to slope instability especially during heavy rains.

The soil erosion rate in northwest Kashmir is of the order of 2 to 12 mm/year, and in Kumaun region of Uttarakhand it is 1.73 mm per year. The IHR rivers transfer the eroded material to the plains and as stated earlier, the sediment load in the Himalayan rivers is amongst the highest in the world. River Brahmputra carries more that 650 million tons of sediment per year; the Ganga more than 417 million tons per year.

Soil erosion and landslides that occur in the IHR on account of very swift surface run-off from degraded forests, low vegetal cover areas, construction activities (buildings and roads), improper cultivation practices (faulty terraces and shortened *Jhum* cycles) are of major concern (Table 2.3).

Box 3 – Protection of Hill land and Ecological Sites in the Assam[22]

The State of Assam has passed a bill – The Assam Hill land and Ecological Sites (Protection and Management) Bill, 2006. This bill prevents indiscriminate cutting of hills and filling up of water bodies in urban areas, which has led to serious ecological problems. Under the bill, the state government can bring any hill under its purview for protection. The state government is also developing a new land use policy for traditional settler's rights in the hills affected by the bill.

The only way of tackling this is through a strictly observed, mountain specific land use policy and watershed based land use planning. There is need for uniformity in protocols for land use classification in the entire region. Interventions are also required to manage, improve and supplement *Jhum*.

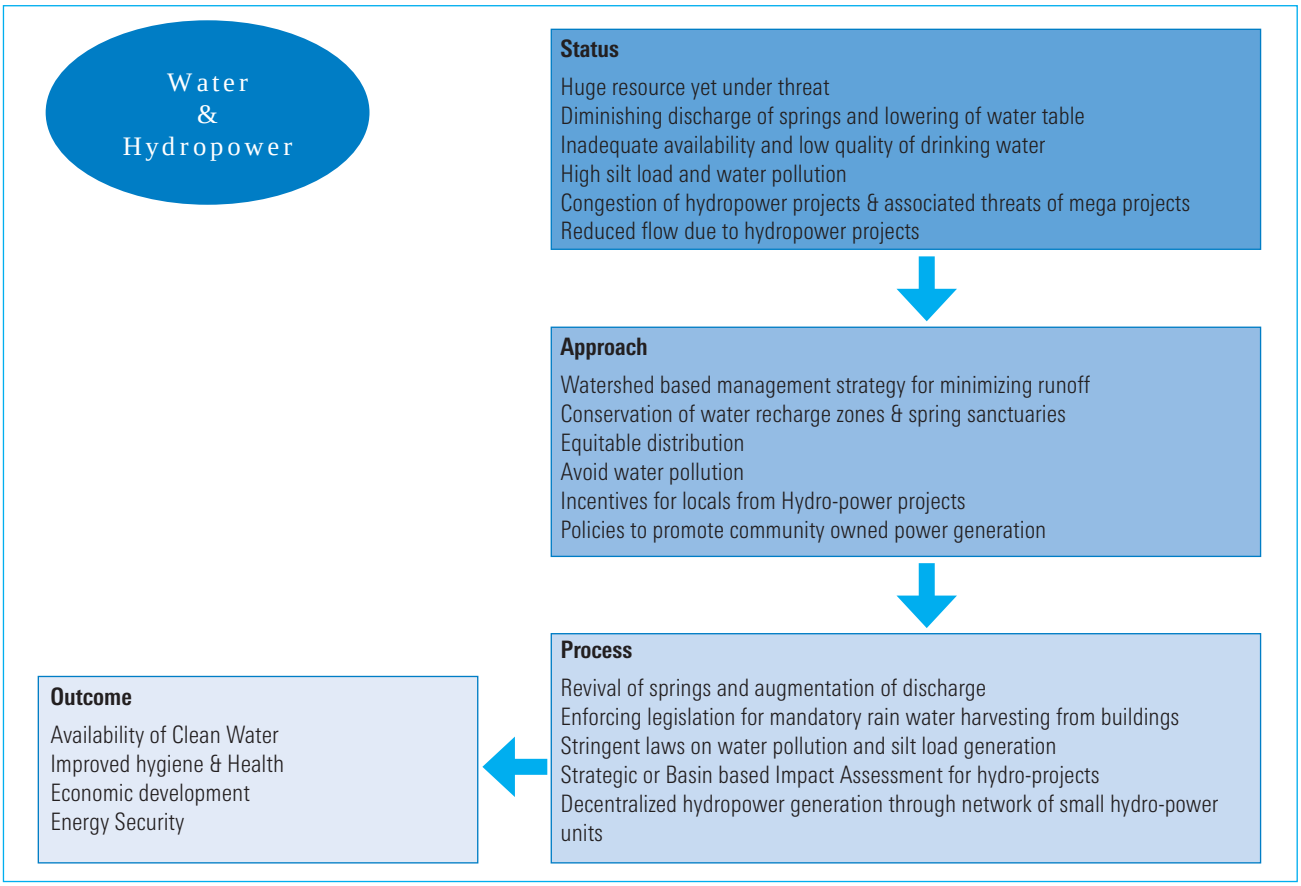
Table 2.3. Runoff and Soil Loss from Various Watersheds in the IHR[23]

Land use/watershed	Runoff (% of annual rainfall)	Soil loss (t/km^2 /yr)
Western Himalayan watersheds	23.2 – 65.0	362 – 3596
Central Himalayan watersheds	14.0 – 76.0	110 – 3703
Eastern Himalayan watersheds	1.12 – 4.6	67 – 616

22 The Assam Hill Land and Ecological Sites (Protection and Management) Act 2006 (2007).

23 Modified from Negi, G.C.S. 2002. Current Science, 83(8): 974-980.

Fig. 2.3. Schematic Plan for the Development of Water Resources in the IHR



The National Water Policy of 2002 defines water as "a prime natural resource, a basic human need and a precious national asset which needs to be governed through a national perspective". It outlines the importance of planning for sustainability of all the nation's water resources.

Since the country has been experiencing an exponential growth in population, the per capita availability of water has been correspondingly decreasing. For example, it was 1953 m^3 in 1991, and is expected to fall to 1235 m^3 by 2050. The annual runoff in the major Himalayan rivers has been estimated roughly to be 1658 billion m^3[3,24] . In simple terms, disregarding the supply from other sources, the contribution from and the safeguarding of the water flow from the three major Himalayan river systems viz., the Indus, the Ganga, and the

Box 4– Snow Water harvesting in Cold deserts[25]

Among other environmental stresses, severe water shortage in remote cold deserts of the IHR makes these areas most difficult to live in. Snow melt water harvesting in this region has traditionally played a significant role in the sustenance of farming communities. Introduction of modern technologies in snow melt water harvesting have proved beneficial for this region. Initiatives of Chewang Norphel "glacier man' in Ladakh have enabled the villagers to get irrigation during sowing season (April-May) by forming low cost artificial glaciers during winters. This has improved crop growth and added advantage is that the areas under artificial glaciers turn into green pastures during summers.

24 Bandyopadhyay, J. and Gyawali, D. 1994. Mountain Research & Development, 14 (1): 1-24.
25 G-SHE. 2009. Governance for Sustaining Himalayan Ecosystem: Guidelines & Best Practices. Ministry of Environment & Forests (GOI) & GBPIHED, Almora.

Brahmputra must continue to remain issue of utmost priority in all planning. Or else, supporting life and habitations further down and spread across the plains of India, Pakistan, and Bangladesh would become impossible. The regional politico stability implications of this cannot be overstated.

The catchments of the Indus river system in the western Himalaya are in parts of Jammu & Kashmir and Himachal Pradesh, while river Ganga, originating from the snout of Gaumukh glacier drains the river valleys of Himachal Pradesh and the entire Uttarakhand. In the eastern part, the Brahmaputra river system drains a considerable area of the Tibet and North Bengal, Sikkim, Bhutan and Arunachal Pradesh.

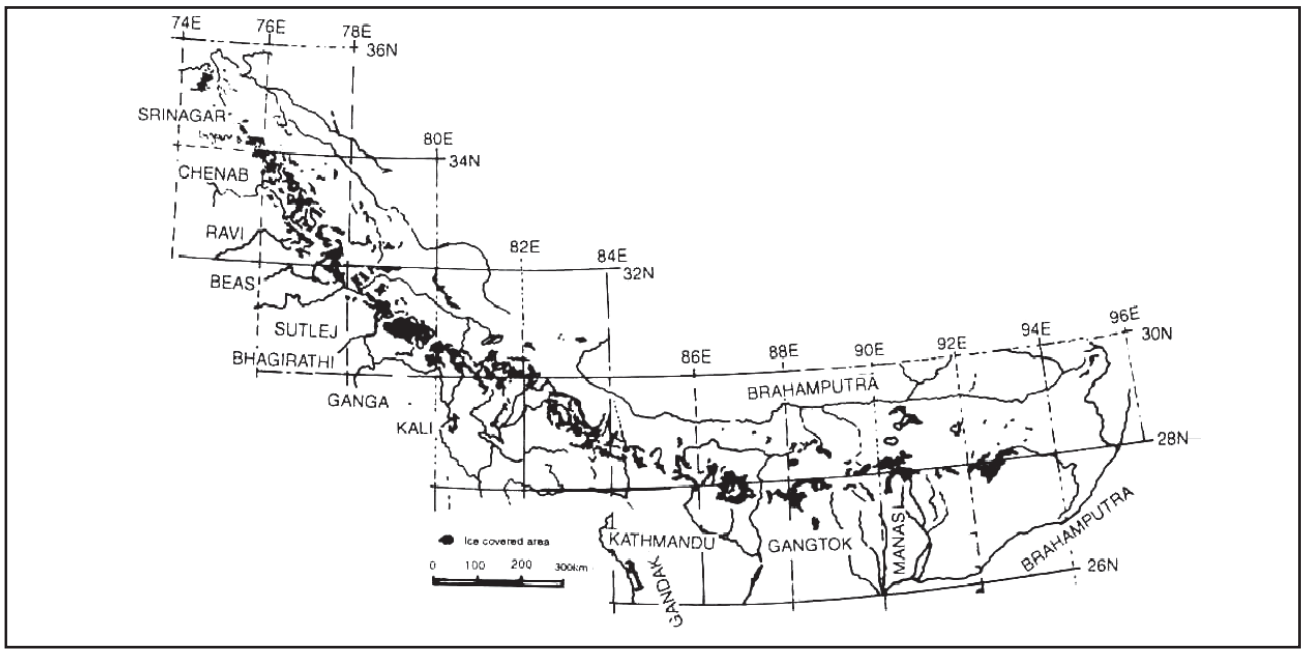
The IHR has other fresh water reserves in its lakes and glaciers, recharged by monsoon rains and winter precipitation. About 17% of the total area of the IHR is under permanent cover of ice and snow (~32 thousand km^2). Over 9,000 Himalayan glaciers form a unique reservoir storing about 12000 km^3 of fresh water[24]. Himalayan glaciers are important in maintaining ecosystem stability and as buffers regulating runoff water supply (Table 2.4, Fig 2.4). However, since continuous glacier recession is becoming a distinct possibility (Table 2.5) in the context of global warming, spatio-temporal monitoring of its mass and dynamics has become important. Likewise, relating the change to the likely effect on the IHR dwellers and their resource use is now a very real imperative. In a wider context, the possible impact on the operational efficiency of downstream hydropower and irrigation projects would have to be proactively assessed.

Table 2.4. Principal Glacier-fed River Systems of the Himalaya

River	Mountain Area (km^2)	Glacier Area (km^2)
Indus	268842	7890
Jhelum	33670	170
Chenab	27195	2944
Ravi	8092	206
Sutlej	47915	1295
Beas	12504	638
Jamuna	11655	125
Ganga	23051	2312
Kali	16317	997
Karnali	53354	1543
Gandak	37814	1845
Kosi	61901	1281
Tista	12432	495
Raikad	26418	195
Manas	31080	528
Subansiri	81130	725
Brahmaputra	256928	108
Dibang	12950	90
Lohit	20720	425

Source: Glacier Atlas of India, 2008

Fig. 2.4. Origin and Spread of Glacier- fed rivers along the Himalayan Arc



Source: Hasnain, SI. International Commission on Snow and Ice, UK, 1999

Table 2.5. Rate of Recession of Various Glaciers in the IHR[26]

Name of glacier	Period of Measurement	Period (in years)	Recession (in m)	Average rate (m/yr)
Milam glacier	1849-1957	108	1350	12.50
Pindari glacier	1845-1966	121	2840	23.40
Gangotri glacier	1962-1991	29	580	20.00
Tipra glacier	1960-1986	26	325	12.50
Dokriani glacier	1962-1991	29	480	16.5
Dokriani glacier	1991-2000	09	161.15	18.0
Chorabari	1962-2005	41	238	5.8
Shankulpa	1881-1957	76	518	6.8
Poting	1906-1957	51	262	5.13
Glacier no-3 Arwa	1932-1956	24	198	8.25
Bara Shigri	1956-1963	07	219	31.28
Chhota Shigri	1987-1989	03	54	18.5
Sonapani	1909-1961	52	899	17.2
Kolai	1912-1961	49	800	16.3
Zemu	1977-1984	07	193	27.5

Note: The Department of Science and Technology, GOI, under the Himalayan Glaciology Programme (HGP) has been carrying out a multidisciplinary study on the mass balance, recession, ice thickness, glacial discharge, sediment transfer, isotopic and chemical characteristic of snow, ice and melt water and geomorphology mapping under the leadership of Wadia Institute of Himalayan Geology since 1986. During the first phase information has been generated on Chhota Shigri glacier in Himachal Pradesh, Dokhriani in Bhagirathi Valley and Chorabari in the Alaknanda basin of Uttarakhand. These glaciers are being monitored regularly to detect changes.

26 Report of the Task Force on The Mountain Ecosystems [Environemnt and Forest Sector] for Eleventh Five Year Plan. 2006. Planning Commission, Government of India.

Because of reasons not all understood, but essentially because of an absence of primacy given to the conservation of the water resources of the IHR, many areas of the IHR are facing water and moisture scarcity. Rainfed re-charge in the springs is decreasing as evident by its drying up or decreased discharge observed in the springs of Uttarakhand[23],[27] (decrease was 25% to 75% during the preceding 5 to 50 years in different springs). Ground water potential of different states of the IHR (Table 2.6) should also be considered while planning for water security for the region.

Access to drinking water varies across the IHR. While Himachal Pradesh has been able to plan for and provide tap water to 83% of its rural households, accessibility is 66.5% in Sikkim and Arunachal Pradesh, and 60.5% in Uttarakhand. The north-eastern States have been able to provide access to tap water to less than one-fourth of their total rural population (Meghalaya 24.4%, Manipur 20.6%, Mizoram 19.3, and Tripura 18.1%) (Table 2.7). Majority of the rural households in Tripura are dependent on the wells (44.8%) while hand pumps (13.9%) and tube wells (13%) are the other prominent sources. Wells are also a prominent source of drinking water in rural Meghalaya (31.7%) and Nagaland (32.6%).

Table 2.6. Ground Water Potential in Different States of the IHR (BCM per year)

S. No.	State	Total Replenish-able Ground Water Resource	Provision For Domestic Industrial and other Uses	Available Ground Water Resources for Irrigation	Net Draft	Balance Ground Water Potential Available for Exploitation	Level of Ground Water Development (%)
1	Arunachal Pradesh	1.44	0.22	1.22	0	1.22	0
2	Himachal Pradesh	0.37	0.07	0.29	0.03	0.26	10.72
3	Jammu & Kashmir	4.43	0.66	3.76	0.03	3.73	0.81
4	Manipur	3.15	0.47	2.68	0	2.68	0
5	Meghalaya	0.54	0.08	0.46	0.02	0.44	3.97
6	Mizoram	1.4	0.21	1.19	0	1.19	0
7	Nagaland	0.72	0.11	0.62	0	0.62	0
8	Sikkim	0.07	0.01	0.06	0	0.06	0
9	Tripura	0.66	0.1	0.56	0.19	0.38	33.43
10	Uttarakhand	2.7	0.41	2.29	0.82	1.47	35.78
	IHR	15.48	2.34	13.13	1.09	12.05	7.04
	ALL INDIA	433.88	71.16	362.36	149.97	213.13	41.57

Source: Ground Water Statistics, 2003. Central Ground Water Board, Govt. of India. As on 31.03.2003.

27 Valdiya K.S. and Bartarya S.K. 1991. Mountain Research and Development, Vol 11(3):239-258.

Table 2.7. Sources of Drinking Water in the Rural areas in Various States of the IHR (per cent of total rural households)

State	Tap	Hand Pump	Tube well	Well	Tank, Pond, Lake	River, Canal	Spring	Other
Jammu & Kashmir	40.7	12.8	1.4	7.1	1.5	17.3	7.4	11.8
Himachal Pradesh	82.9	4.2	0.5	5.3	0.9	0.7	1.8	3.8
Uttarakhand	60.5	21.4	1.1	1.6	1.6	2.4	2.8	8.7
Sikkim	66.5	0.3	0.2	0.2	1.1	1.3	28.6	1.9
Tripura	18.1	13.9	13.0	44.8	1.8	3.6	3.1	1.8
Mizoram	19.3	1.5	3.0	1.8	4.6	18.1	47.4	4.3
Manipur	20.6	7.1	1.7	7.4	28.4	20.1	13.4	1.4
Meghalaya	24.4	2.2	2.8	31.7	6.5	5.2	25.1	2.1
Nagaland	44.3	1.6	1.7	32.6	10.6	2.4	5.6	1.4
Arunachal Pradesh	63.3	7.8	2.6	4.9	1.3	9.6	7.6	2.9

Source: Census of India, 2001

Water is the most precious product of the Himalayan ranges, and therefore, planning and investment priority must be accorded to the conservation, protection and maintaining the purity of this resource. A prerequisite for this is the formulation of an efficient and practical river valley and watershed management strategy within enforceable, water governance framework. There must be clear, locally acceptable distribution and consumption norms based on transparent inflow and consumption accounting. Conservation initiatives must be introduced for the revival of springs, lakes, aquifers, underground channels and natural storage on the concept of "Spring Sanctuaries". Likewise, the following should be made mandatory:

(i) Rain water harvesting for all government and government funded structures; incentives for establishing such structures in private premises as may be appropriate; and concurrent enforcement legislation.

(ii) Finding workable and community supported solutions to the discharge of polluted water from human habitations and agro-horticulture and industrial operations.

2.3. HYDROPOWER

The availability of large volumes of water, along great height differentials, offers tremendous potential for hydropower generation in the IHR. The IHR is estimated to have 79% of the total hydropower potential of the country. Since the demand for power in India has increased manifold, especially in the northern region of the country, tapping the hydropower potential of the Himalayan rivers has become a national planning priority. Looking to the rich water potential in the region against the constantly increasing energy demand of the country, it is but natural that the IHR water resource has become and will continue to be under great pressure for exploitation. As per an assessment made by the Central Electricity Authority (CEA), Government of India, against the hydropower potential of the

Box 5 - Carrying Capacity Assessment at the basin Level

At the instance of the Ministry of Environment and Forests (MoEF, GOI), a study of the carrying capacity of Teesta basin in Sikkim was conducted to suggest the optimum utilisation of hydropower potential with least environmental damage. The study helped in formulating guidelines for overall development of hydropower in Teesta basin over and above the usual, individual project to project based EIAs. The MoEF proposes to make this a standard practice for all river basins in the country especially in the IHR.

country (1,48,000 MW at 60% load factor), only 21.3% has been harnessed (16% developed and 7% under various stages of development) in the states of the IHR (Table 2.8).

Mega hydropower projects pose many all round challenges (very long gestation period makes it difficult to attain sustained focus and political priority besides this, higher risks, difficulties in financing, high investment imposed by transportation cost, non-availability of cheap labour[20] are some other challenges) in the course of their establishment. Changes in the natural riverine valleys crafted over centuries, displacement, associated changes in lifestyles, environment pollution during construction, resultant vulnerabilities to natural disasters are some of the primary adverse impacts of mega hydro electric projects (HEP). These negative aspects generally outweigh the marginal positive impacts (identified by the locals themselves), such as economic benefits and creation of employment opportunities; but in the national context of demand for power for development, the investments are taken to be justified.

At the same time, the cumulative impact of multiple hydropower projects along the same river basin and the threat of a cascading chain of catastrophes in case of structural failures or even from purely natural causes suggest the urgent need for a region or entire basin based Strategic Environmental Assessment (SEA) rather than individual project oriented environmental impact assessments (EIA) that neglect the summation effect. The Task Force supports the MoEF's decision on basin based assessments for projects.

There is every reason to suggest that the standard pattern for hydro power generation, distribution and consumption within the IHR should be decentralized and networked through small projects only. The task force strongly seconds the views of the state governments that for exporting power, mega projects rarely; and a few medium projects are the logical recommendations for the IHR. It also seems logical and essential to demarcate zones in the higher Himalayan region that are naturally unstable. In these areas, no hydropower projects should be allowed to be developed. Areas above 3500 m should be considered to be particularly vulnerable on account of their natural fragility. Best alternatives appear to be solar energy and strengthening of general pubic participation in decision making on such matters.

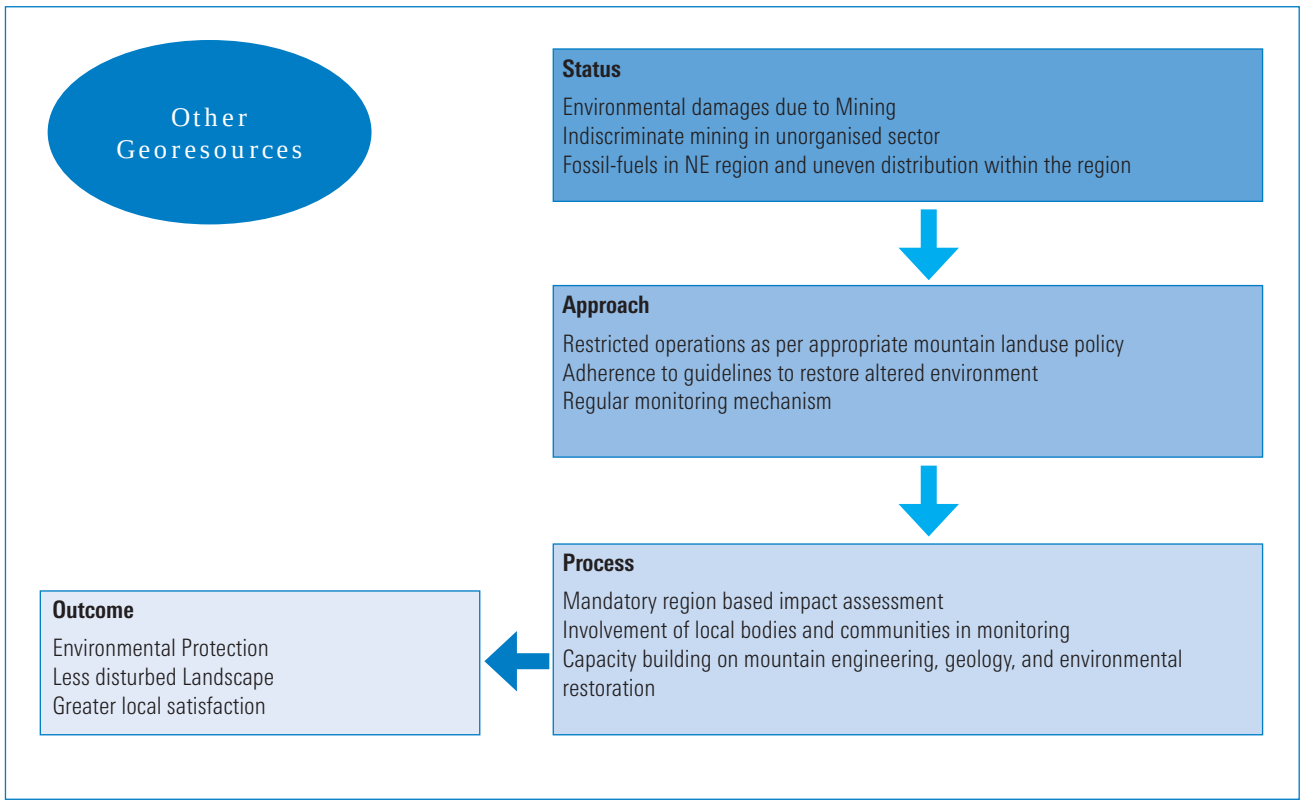
Table 2.8. Status of Hydropower Potential and Development in the IHR (installed capacity)

State	Identified Capacity	Capacity Developed		Capacity Under construction		Capacity Developed & Under Construction		Capacity yet to be developed	
	(MW)	(MW)	(%)	(MW)	(%)	(MW)	(%)	(MW)	(%)
Uttarakhand	18175	2980.1	16.40	1926.0	10.60	4906.1	26.99	13269.0	73.01
J&K	14146	1864.2	13.18	899.0	6.36	2763.2	19.53	11382.9	80.47
Himachal Pradesh	18820	6085.5	32.34	4435.0	23.57	10520.5	55.90	8299.6	44.10
Meghalaya	2394	185.2	7.74	84.0	3.51	269.2	11.24	2124.8	88.76
Sikkim	4286	254	1.96	2139.0	53.87	2393.0	55.83	893.0	44.17
Arunachal Pradesh	50328	423.5	0.84	2600.0	5.17	3023.5	6.01	47304.5	93.99
Nagaland	1574	99.0	6.29	0.0	0.00	99.0	6.29	1475.0	93.71
Assam	680	375.0	55.15	0.0	0.00	375.0	55.15	305.0	44.85
Manipur	1784	105.0	5.89	0.0	0.00	105.0	5.89	1679.0	94.11
West Bengal	2841	156.5	5.51	292.0	10.28	448.5	15.79	2392.5	84.21
Tripura	15	15.0	100.00	0.00	0.00	105.0	5.89	1679.0	94.11
Mizoram	2196	0.0	0.00	0.0	0.00	0.0	0.00	2196.0	100.00

Source: Central Electricity Authority, 2008

2.4. OTHER GEORESOUCES

Fig.2.5. Schematic Plan for the Development of other Geo-resources in the IHR



2.4.1. Coal, Petroleum and Minerals

The IHR is endowed with considerable amount of natural resources and geological wealth. It accounts for about 25% of hydrocarbon potential of the country. Large quantities of low ash coal resources, limestone, dolomite, base metals, clays, gemstones, chromites, iron ore and various other minor minerals occur in the IHR (Table 2.9).

Most of the natural gas and oil fields occurring in the IHR are confined to the north eastern region, *(Arunachal Pradesh - 2 Oil and Gas fields; Nagaland - 2 Oil fields; Tripura – 9 Gas fields; Upper Assam 43 Oil and Gas fields)*. The output of petroleum products in the region during 2006-07 has been crude oil (4.51 million tonnes) and natural gas (3081 million m^3). Petroleum retailers, SKO/LDO dealers, and LPG distribution in the Himalayan region account for just 4%, 5.1% and 7% of the country's distribution chain, respectively. The constraint is not only the topography of the region but also the counter pressure of demand from the rest of the country. The question that arises is why should the need of the IHR not be addressed first, especially when it is a producer?

Table 2.9. Occurrence of Various Minerals in the IHR	
State	**Minerals**
Arunachal Pradesh	Copper, Gold, Pyrite, Dolomite, Graphite, Flux Grade Limestone, Oil, Coal
Himachal Pradesh	Limestone, Q Limestone, Quartzite, Glass, Sand , Pyrite, Copper, Rock Salt, Natural Gas, Oil, Gypsum, Bayrite uartzite, Glass, Sand , Pyrite, Copper, Rock Salt, Natural Gas, Oil, Gypsum, Bayrite
Jammu & Kashmir	Coal, Lignite, Limestone, Gypsum, Bauxite, Graphite, Magnetite, Lead, Tin, Betonies, Slate, Kaolin, Oil & Natural Gas, Borax, Chromites, Precious Stone, Gold, Iron Ore, Barites, Soap Stone, Copper
Mizoram	Shell Limestone, Sand Stone / Siltstone, Clay Mineral, Coal and Oil & Natural Gas
Manipur	Chromites, Copper, Coal, Bog Iron, Lignite, Limestone, Nickel and Petroleum
Meghalaya	Coal, Limestone, Feldspar, Quartz, Glass Sand, Sillimanite, Clay, Kaolin
Nagaland	Coal, Limestone, Nickel, Ferrites, Chromites, Petroleum & Natural Gas
Sikkim	Dolomite, Coal, Quartzite, Graphite, Limestone, Talc, Building Stone, Lead
Tripura	Oil & Natural Gas, Fire Clay, Glass Sand, Clay, Lignite, Limestone
Uttarakhand	Limestone, Dolomite, Magnesite, Rock Phosphate, Gypsum, Soap Stone, Steatite

Large scale explorations have taken place in different IHR states for locating mineral resources. At present, commercial exploitation of only coal, limestone and dolomite has been undertaken. Small scale mining in the informal sector is fairly widespread with 85% of the reported mines being active in the NE (Table 2.10). Western Himalayan region is a major provider of limestone while coal and metallic minerals are more common in the northeastern region. Overall, the states of IHR have witnessed growth of mining activities from 1998-99.

Geological reserves of coal are reported in many states such as Arunachal Pradesh, Meghalaya, Nagaland and Jammu & Kashmir. During 2005-06, Jammu & Kashmir produced 19 MT of coal from underground mines while Meghalaya produced 5781 MT (does not include private "rat-hole mining"). This Task Force endorses the suggestion of the Government of Meghalaya to make environmental clearance mandatory for mining irrespective of size (presently not essential for area less than 5 ha). Education and skill development for alternative livelihood opportunities to the laboures may be provided. Production of some major minerals from the Himalayan region is shown in Table 2.11.

Table 2.10. Number of Operational Mines in the IHR (2004-2005)	
State	**Reported Mines (Number)**
Jammu & Kashmir	8
Himachal Pradesh	28
Uttarakhand	30
Sikkim	21
Meghalaya	156
Assam	9
Source: Statistical Abstracts, India 2007	

Table 2.11. Production of Some Minerals from the IHR

State	Production in '000 ton (Values in parenthesis are Rs '000)						
	Coal	Limestone	Magnesite	Gypsum	Bayrite	Copper Concentrate	Steatite
J&K	19 (12889)	228 (52074)		32636 (16994)			
Himachal Pradesh		7585 (634998)			549 (714)		
Uttarakhand			56160 (43776)				98162 (41884)
Sikkim						157 (4038)	
Meghalaya*	5781 (8469165)	550 (97014)					
Assam	1100 (1798886)	406 (62550)					

** Does not include private mines where working conditions are very difficult.*

In the context of the fragility of the IHR, stringent zoning and clear environmental stipulations must precede any mining operation, especially for the large ones. Mandatory SEA for mining operations and identification of the most appropriate technology for extraction, processing and transportation is needed before new mining activities are allowed. Development of skills for doing this should be the first step.

2.5. VULNERABILITY TO DISASTERS

2.5.1. Earthquakes

The geological set up, high seismic vulnerability coupled with high precipitation collectively make the IHR highly prone to geological hazards like earthquakes, landslides and floods. The Himalayan frontal belt, flanked by the Chaman fault in the west and the Indus-Tsangpo suture zone in the north, is one of the most seismically active intra-continental regions of the world. Based on the seismic zonation map of the country, the state wise vulnerability of the IHR is presented in Table 2.12.

Despite recent advances in seismology and instrumentation, earthquakes still remain the most unpredictable phenomena among the natural disasters in the IHR. Sandwiched between the landmass of Asia and the northwardly advancing plate of India (moving northwards at the rate of approx. 5.5 cm/year), the Himalayan region is under very strong, persistent compression. The dissipation of strain manifests in the rupturing of the Himalayan crust. It has been estimated that approximately 60% of the Himalayan region has enough stored elastic energy to drive five to eight great earthquakes. Since an earthquake causes a complex ground motion, both horizontal and vertical, most man made structures as well as the steep slopes in the Himalaya come under considerable tensile and shear, in addition to compressive stress, cumulatively resulting in devastation. Earthquakes exceeding 8.0 in the Richter scale have been recorded in the past in IHR, causing enormous destruction and loss of life. Some of the major earthquake events which have occurred in the IHR are listed in Table 2.13.

Fig. 2.6. Schematic Plan for Disaster Mitigation in the IHR

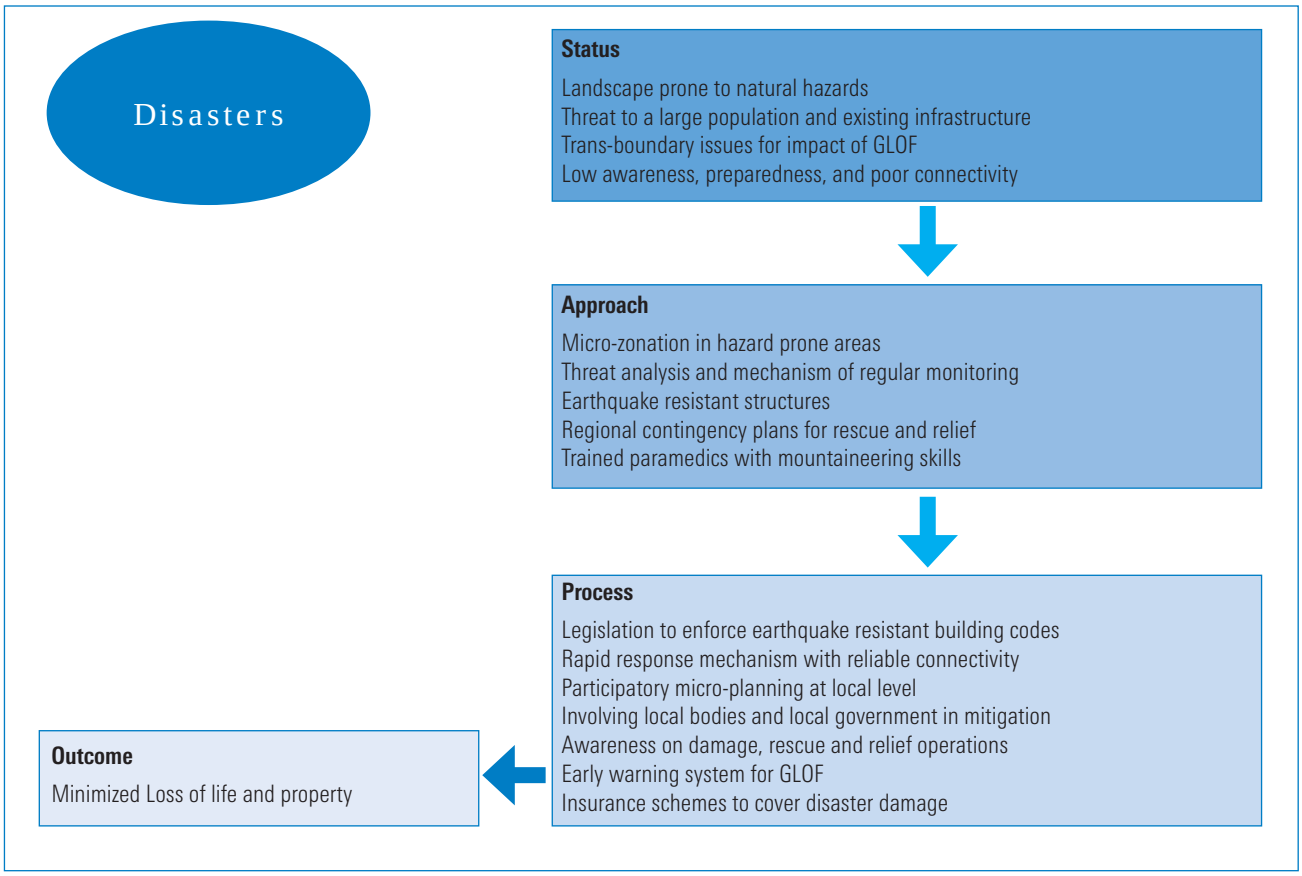


Table 2.12. Seismic Zonation of the IHR States

States	Intensity MSK[28]	Seismic Zone
Jammu & Kashmir	VIII to IX or more	IV & V
Himachal Pradesh	VIII to IX or more	IV & V
Uttarakhand	IX or more	V
Sikkim	VIII	IV
Meghalaya	IX or more	V
Assam	IX or more	V
Tripura	IX or more	V
Mizoram	IX or more	V
Manipur	IX or more	V
Nagaland	IX or more	V
Arunachal Pradesh	IX or more	V

Note: West Bengal hills fall in Zone IV

Source: BIS Seismic Zone, 2000.

28 Medvedev-Sponheuer-Karnik Scale, also known as the MSK or MSK-64, is a macroseismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the earthquake occurrence.

Table 2.13. Some Major Earthquake Events of the IHR				
Year	**State**	**Epicentre**	**Magnitude (Richter Scale)**	**Impact**
1869	Assam	25^0 N, 93^0 E	7.5	
1885	Assam	34.1^0 N, 74.6^0 E	7.0	
1897	Assam	26^0 N, 91^0 E	8.7	Caused destruction in 3,70,000 sq. km area and was responsible for 1542 deaths.
1905	Himachal Pradesh	32.3^0 N, 76.3^0 E	8.0	
1943	Assam	26.8^0 N, 94^0 E	7.2	
1950	Arunachal Pradesh	28.5^0 N, 96.7^0 E	8.5	Responsible for destruction in 46,000 sq. km. area. Raised the bed of the Brahmaputra river.
1967	Jammu & Kashmir	-	5.3-5.7	About 786 houses collapsed and 25,000 partially damaged.
1975	Himachal Pradesh	32.38^0 N, 78.49^0 E	6.2	
1986	Himachal Pradesh	32.1^0 N, 76.3^0 E	5.7	Responsible for six deaths.
1988	Manipur	25.13^0 N, 76.3^0 E	6.6	
1991	Uttarakhand	30.75^0N, 78.86^0 E	6.6	About 1000 people died, more than 30000 houses destroyed
1999	Uttarakhand	30.41^0 N, 79.42^0 E	6.8	Responsible for 100 deaths and collapse of 170 houses.
Source : Central Statistical Organization & IMD				

2.5.2. Avalanches & GLOFs

Avalanches, the fast flow of snow or ice descending from and on mountain slopes, with detritus carry huge potential and kinetic energy, altering land forms, wiping out forests and damaging settlements and infrastructure. The Snow and Avalanche Study Establishment (SASE) of the Defense Research and Development Organization (DRDO) has estimated that some 30 people are killed every year due to avalanches in the IHR. The losses caused by some major avalanche disasters in IHR are given in Table 2.14.

Global climate change may result in rapid melting of big glaciers, often forming huge lakes. Due to the fast rate of melting, accumulation of water in these lakes may increase rapidly and may lead to a sudden rupture, discharging large volumes of water downslope, along with debris. This phenomenon is known as GLOF (Glacial Lake Outburst Flood) The resulting flood may be catastrophic in the downstream areas with loss of life and property, destruction of forests, agricultural land, and costly infrastructure of the mountains.

In 2004, in a similar incident, the outlet of Pereechu lake in the Tibet region (35 km from India's border with China) had been blocked due to a landslide. In the last week of June 2005, the water pressure broke through the debris resulting in a very heavy discharge in the Sutlej River. Considerable damage to property and infrastructure was caused in the lower regions of the state of Himachal Pradesh. In the north-western part of the IHR out of 156 Glacial lakes of Himachal Pradesh 16 have been identified[29] as potentially dangerous while in the State of Uttarakhand there are 127 glacial lakes and

29 Ives J.D., Shresstha R.B., and Mool P.K., 2010. Formation of Glacial lakes in the Hindu Kush-Himalayas and GLOF Risk Assessment. ICIMOD, Nepal.

Table 2.14. Major Avalanches Reported from the IHR		
Year	**Area**	**Loss**
1979	Lahual & Spiti (HP)	237 people killed
1982	Ladakh (J&K)	100 people killed
1982	Ladakh (J&K)	27 people killed
1988	Jammu & Kashmir	70 people killed
1991	Himachal Pradesh	Road block for 40 days
1995	Himachal Pradesh	Flood caused by melting of snow brought by avalanche

none of them is dangerous. In north-eastern region, Sikkim has 266 glacial lakes and 14 have been rated as potentially unstable.

Some measures have been put in place in the Sutlej River basin[30] for monitoring, forecasting, and early warning to deal with flash floods, especially from cloudburst. As GLOFs are one of the causative factors in propagating flash floods downstream, these measures also act as an early warning system for a GLOF event.

2.5.3. Mass Movement/ Landslides

Landslides and land slips are common in the IHR especially during monsoons. These are induced by fragile geological conditions, faulty construction activities, and resultant blocking of natural drainage. Apart from loss of human lives, damage to infrastructure due to landslides is a serious recurring threat in the region. Table 2.15 shows some of the prominent landslide events that have occurred in IHR in the recent past.

2.5.4. Cloudburst

Cloud burst is another common natural hazard in the Himalayan region during the rainy season leading to devastating flash floods, triggering of landslides causing enormous loss of life and property and environmental degradation. Some of the cloudburst events that have occurred in the IHR are shown in Table 2.16.

Heavy Rains/Floods/Landslides in the IHR region bring enormous toll due to damage to houses, property, and crop land (Fig 2.7). The vulnerability of fragile landscape can be understood with the fact that in the year of extreme events (e.g., year 2003) this damage may account upto 73% of the total houses damaged and 89% of the total damage to crop area due to these reasons in the country.

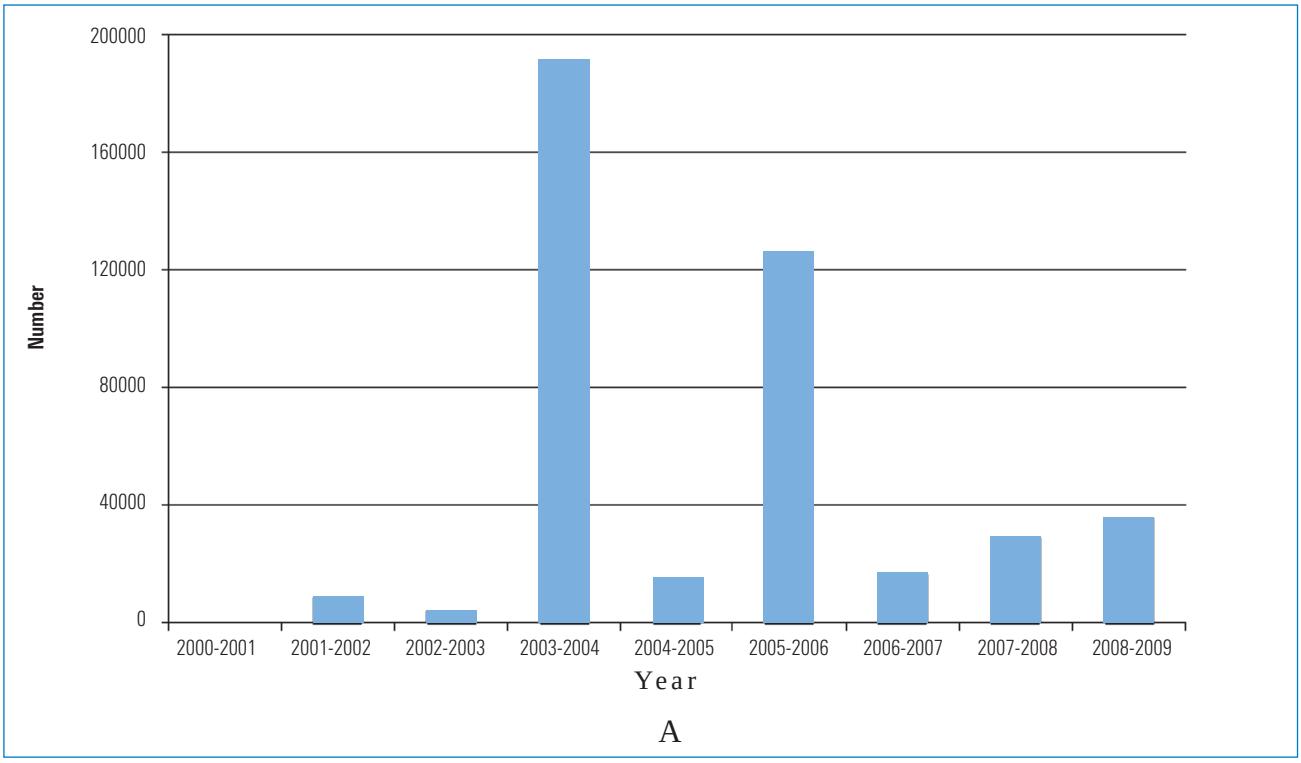
While little can be done to prevent the natural causes of such disasters, regulations and zoning can identify fragile and sensitive areas, prevent man induced disasters, and protect life and property to some extent. Legislations for enforcing building codes, ban on major activities and projects in fragile zones, and geologically sustainable surface connectivity projects are some of the essential measures that IHR states can ill afford to neglect. Simultaneously, planning and practicing for rapid response including evacuation, setting up of monitoring and early warning systems and technologies, with full people's participation, are other immediate measures. The bottom line is that the IHR is fragile and unstable; yet the treasure it contains in terms of water can only be protected if the country, the IHR states and its people first recognize the problems and gear up themselves for preventing the loss as much of it is humanly possible.

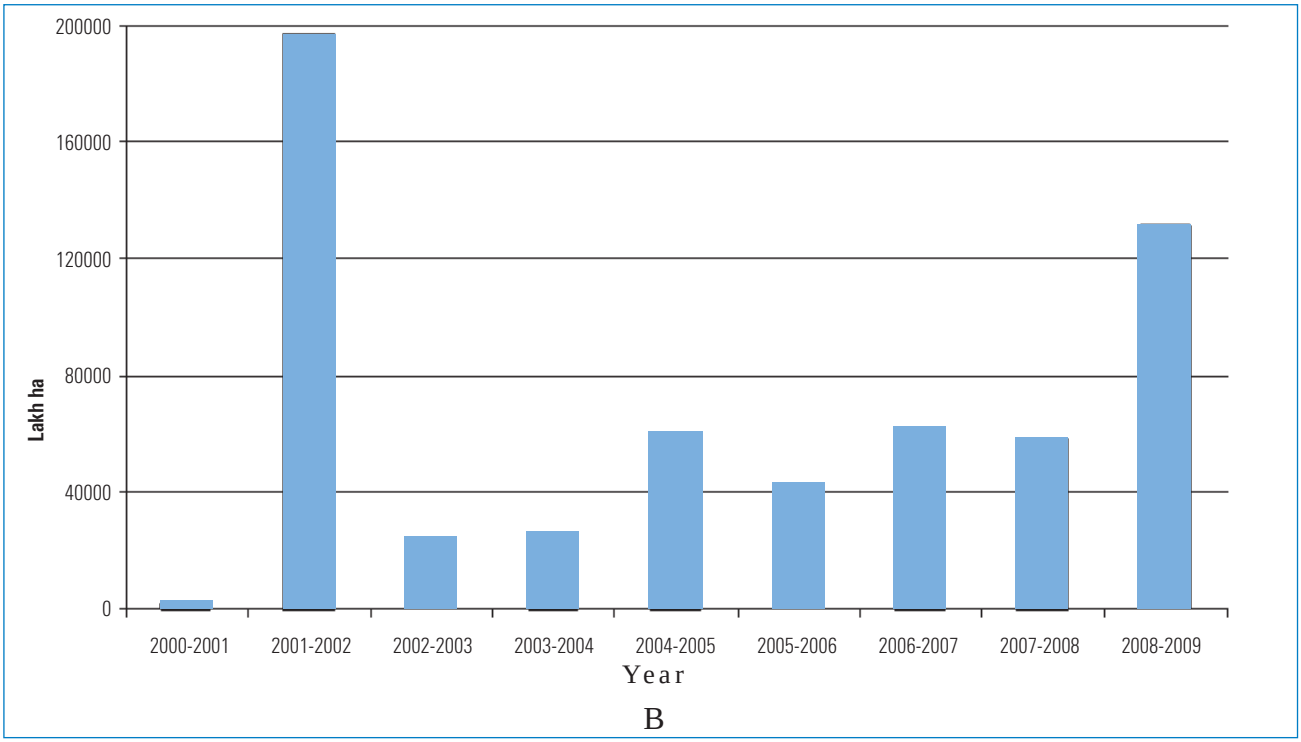
30 By Central Water Commission at the confluence of (i) the Parechu and Spiti rivers, and (ii) the Spiti and Sutlej rivers.

Table 2.15. Some Major Landslides that Occurred in the IHR		
Year	**District/State**	**Losses**
July 1991	Assam	300 persons killed
June 1993	Aizwal, Mizoram	4 persons were buried
July 1993	Itanagar, Arunachal Pradesh	25 persons buried alive
Aug 1993	Kalimpong, West Bengal	40 persons killed
Aug 1993	Kohima, Nagaland	200 houses destroyed, 500 persons died
May 1995	Aizwal, Mizoram	25 persons were killed
June 1995	Malori, Jammu	6 persons were killed
Sept 1995	Kullu, Himachal Pradesh	22 persons killed
Aug 1998	Okhimath, Uttarakhand	107 persons & 723 animals killed, 525 houses damaged
Aug 1998	Malapa, Kali river, Uttarakhand	21 persons killed
Sept 2003	Varunavat Parvat, Uttarkashi, Uttarakhand	Affected 300 persons
May 2005	Itanagar, Arunachal Pradesh	9 persons died and loss of property
May 2005	Mokokchung, Nagaland	12 persons died, 2 injured, 6 houses damaged
July 2006	Darjeeling, West Bengal	21 houses damaged
Aug 2006	Darjeeling, West Bengal	Loss of 2 lives, 8 houses damaged
Aug 2007	Dharla Village, Himachal Pradesh	14 houses and 60 lives lost
Sept 2007	Village Baram/Sialdhar, Dharchula, Dist. Pithoragarh, Uttarakhand	15 fatalities and loss of livestock
Aug 2007	East Sikkim	4 persons killed
Sept 2007	Kurseong/ Kalimpong, West Bengal	6 persons killed

Table 2.16. Some of the Major Cloudburst Events Recorded in the IHR		
Year	**Place**	**Casualties**
1982	Mandalkhal-Chenni	3 human & 80 animal lives and damage to 8 houses / cattle sheds.
1990	Nilkanth	100 human lives and damage to 10 houses / cattle sheds.
1991	Dewar-Khadora	24 human and 63 animal lives and damage to 38 houses/cattle sheds.
1992	Gadni	14 human lives and damage to 31 houses / cattle sheds.
1995	Bhimtal	13 human lives and damage to 6 houses / cattle sheds.
1997	Kinnaur and Shimla districts of H.P.	Cloudburst led to landslide damming the river Satluj and consequent flashflood in downstream areas Hundreds of person lost their lives apart from huge loss of cattle lives and property.
2000	Kinnaur	Cloudburst washed away 2 persons.
2009	Munsiyari	Village washed away along with loss of 40 human lives.

Fig. 2.7. Damaged due to Heavy Rains/Floods/Landslides in the IHR (A: number of Houses/Huts, and B: Crop Area in lakh ha)



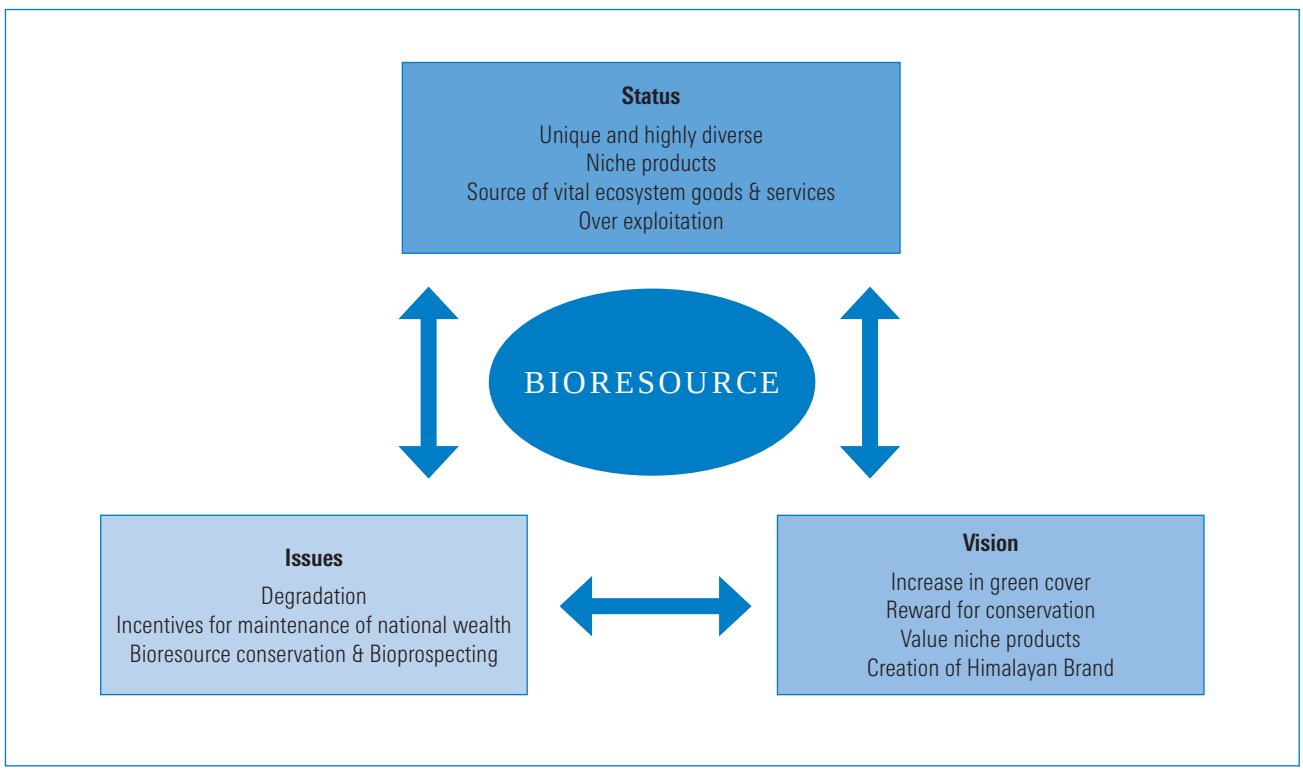


Source: India Statistics, 2010

CHAPTER 3

BIORESOURCES

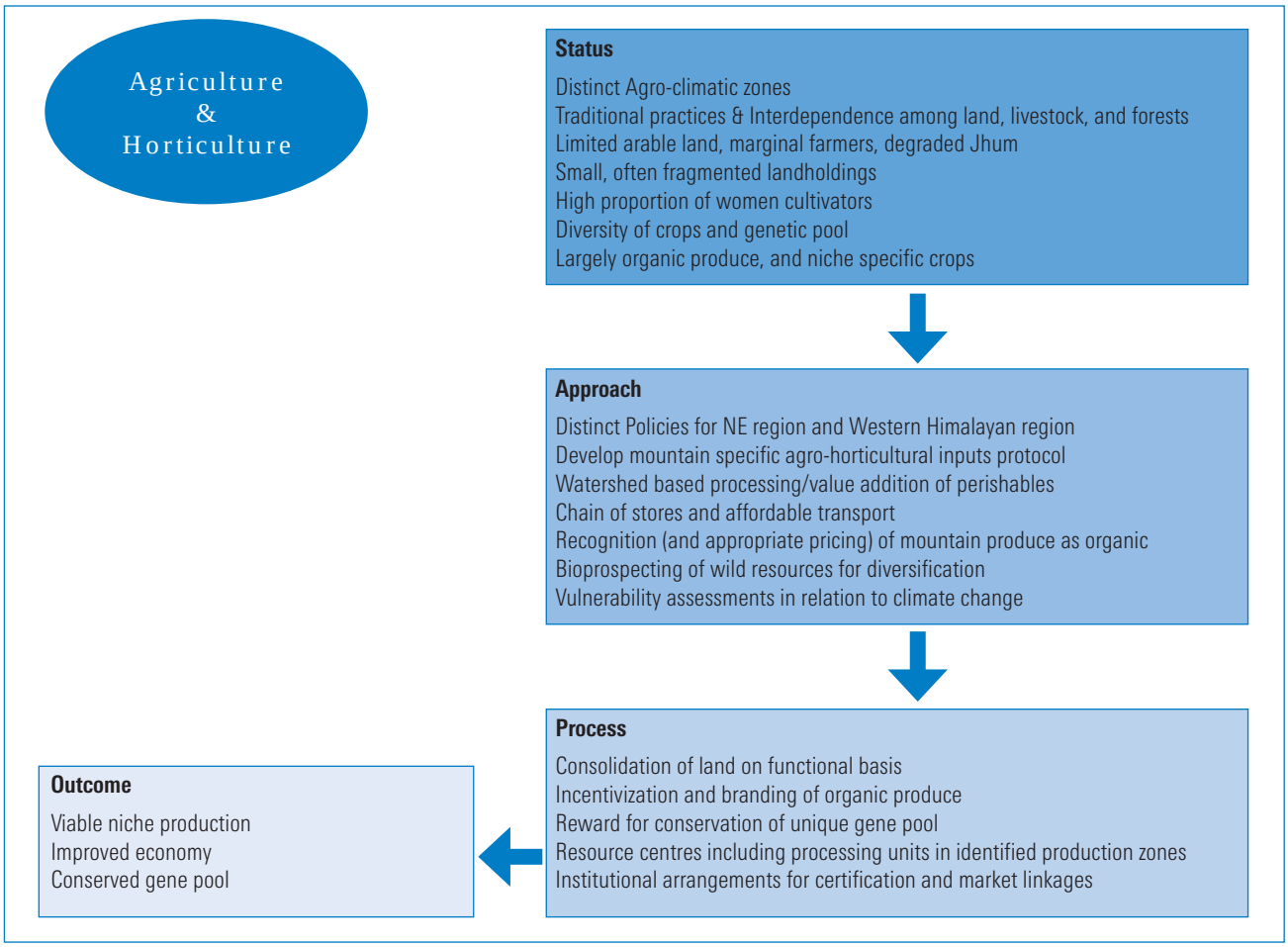
Fig. 3.0. Perspective for Bioresources Development in IHR



3.1 AGRICULTURE

Traditional agriculture in the IHR is organic by default, low in the use of fossil fuel based inputs and, therefore, results in lower greenhouse gas (GHG) emissions. Himalayan agriculture is based on traditional approaches exhibiting close interdependence among key resources -- land, livestock, and forests. According to the Central Statistical Organization (CSO), whereas the total GVA (gross value added) output of agriculture and allied activities of the IHR contribute a mere 3.5% to the GDP of the country (Table 3.1) the figure for horticulture (fruits and vegetables) is 7.1%.

Fig. 3.1. Schematic Plan for Agro-horticulture Development in the IHR



Though the yield of some traditional crops in the IHR is low, as compared to modern high yielding varieties grown in the plain areas of the country (Table 3.2), productivity of niche specific crops has been observed to be higher than the national average, e.g., coarse cereals in western Himalayan states, and potato in Tripura. Despite limited arable land in the IHR, which is less than 14% of the total area, agriculture still remains the mainstay of the economy for majority of the local people. Being essentially of low input and therefore, tailored to the capacity of IHR farmers, it contrasts with the high input, often unsustainable agriculture that increases productivity in the short duration, with considerable eco-concerns on the long term basis. Agricultural crop diversity, as well as genetic diversity within a single crop, is the key feature of mountain agriculture. Diverse production from small landholdings also provides insurance against crop failures. Scientists opine that such biodiversity may also enable production systems to survive changes in the climate.

Although the proportion of the total workforce engaged in agriculture in the IHR (58%) is the same as it is in the country, its composition differs significantly. At the national scale, less than one-third of the total workers (31.7%) are actual cultivators. However, in the IHR half of the total workers belong to this category (49.9%). The scenario stands reversed for agricultural labourers who constitute more than one-fourth of total agricultural workers in the country (26.5%) and only 8.4% in the IHR. The percentage of women cultivators is significantly higher (66.6%) in the IHR as compared to the national average (33%).

Table 3.1. Contribution of Agriculture and Allied Sectors to the Gross Domestic Product (2005-06) (Lakh Rs, at 1999-2000 Prices)

Region	Agriculture	Fruits & Vegetables	Kitchen Garden	Straw & Stalks	Total
IHR	692073	740906	4250	70328	1507557
India	29566154	10426735	224437	2349741	42567067

Source: Statistical Abstracts, India 2007.

Table 3.2. Contribution of Some of the IHR States to National Agricultural Production (2005-2006)

Crop	State	All India Ranking	% of Total		Average Yield (kg/ha)	
			Area	Production	State	National
Food Grains	Uttarakhand	17	0.85	0.76	1548	1715
Coarse Cereals	Himachal Pradesh	11	1.14	1.67	1715	1172
	Jammu & Kashmir	12	1.20	1.38	1344	
	Uttarakhand	14	0.93	0.94	1188	
Wheat	Himachal Pradesh	10	1.36	0.98	1894	2619
	Uttarakhand	11	1.51	0.94	1633	
	Jammu & Kashmir	12	0.94	0.63	1790	
Potato	Himachal Pradesh	11	1.00	0.40	6850	17058
	Tripura	12	0.38	0.39	17642	
Maize	Himachal Pradesh	9	3.95	3.67	1839	1938
	Jammu & Kashmir	10	4.22	3.06	1413	
Sugarcane	Uttarakhand	8	2.38	2.18	60733	66928

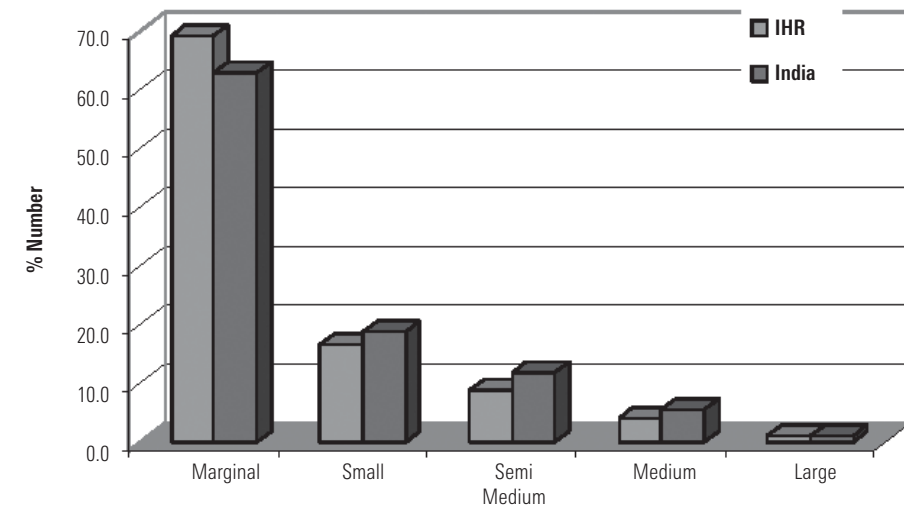
Source: Statistical Abstracts, India 2007.

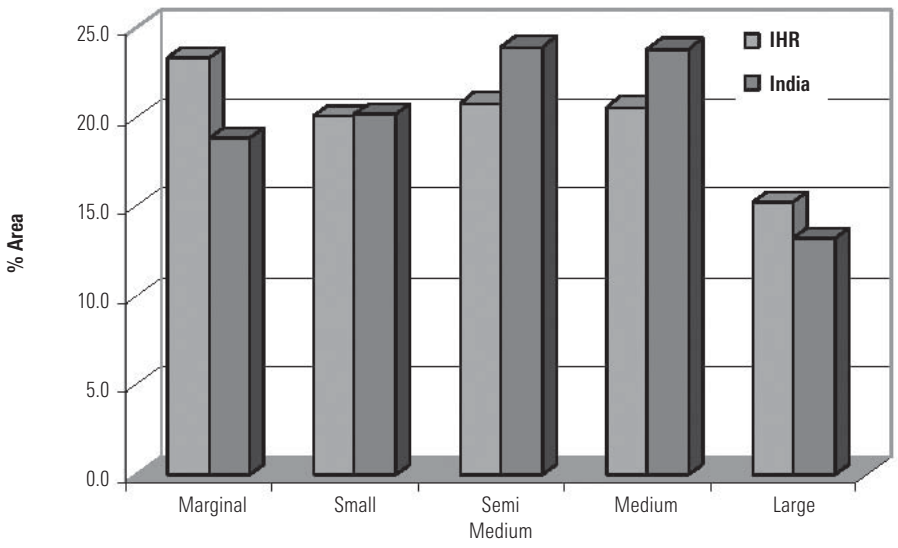
Dependence of a large population on agriculture, population growth and limitations on land expansion and irrigation have resulted in small landholdings and low productivity, albeit with large inter and intra product diversity. Most of the cultivators (69.3% of the total operational landholdings) belong to the marginal category (less than one hectare landholding) confined to less than one-fourth area (23.4%) of the total agricultural landholdings in the IHR (Fig. 3.2).

The Task Force members have noted that there has been an almost total absence of inputs emanating from research on small area and eco-friendly, high yielding, varieties of rain-fed mountain crops. As a consequence, the Himalayan states do not figure in the all India state-wise list of major crop producers.

Undulating topography, along with the aforementioned factors, pose considerable challenges towards development of agriculture in the IHR as reflected by the following in comparison to the rest of the country: low share of tractors (1.4%), diesel engines (0.1%), and electric pumps (0.4%), relatively high share of ploughs (5.4%) over machines, and use of electricity (less than 6%) while agriculture consumes nearly 23% of the total electricity consumption in the rest of the country (Central Electricity Authority, 2004-2005).

Fig. 3.2. Distribution of Operational Landholdings in Different Size Classes





Little scope for increasing output discourages Himalayan farmers from seeking financial assistance from banks. As reflected in the National Sample Survey (59th Round, 2003), less than one-fourth of the total farm households (24.3%) in the Himalayan region have institutional borrowings while the national figures are higher by a factor of 2 (48.6%).

Poor economy coupled with dominance of rainfed areas limit the use of chemical fertilizers and inorganic pesticides for increasing agricultural production; agriculture practiced in the IHR uses only 2.4% of the total N, P, and K, and 1.3% of the total pesticides consumed in the country (2005-06). But this situation, the Task Force members opine, is a blessing in disguise, and an opening for developing niche crops.

Besides natural reasons like dependence on

rain (Table 3.3), marginal, scattered nature of landholdings (Table 3.4), soil erosion, and poor soil fertility that result in low crop productivity, agriculture in the IHR does not offer great opportunities for value addition; essentially because of infrastructural and connectivity problems. In other words, with an improvement of these, the resultant improvement to individual income is bound to follow.

Table 3.3. Gross Irrigated Area (2006-07) in Various IHR States

State	Gross Irrigated Area (%)
Jammu & Kashmir	41.4
Himachal Pradesh	18.8
Sikkim	8.2
Meghalaya	24.9
Tripura	35.0
Mizoram	19.0
Manipur	23.0
Nagaland	27.4
Arunachal Pradesh	16.7
India	42.9

Source: Calculated from Agriculture Census Division, Ministry of Agriculture

To re-emphasise, this overall scenario is a blessing in disguise for the IHR. This is the opportunity, the Task Force feels, through policy support, to encourage the farming communities of the region to maintain high crop diversity, practice organic agriculture, and harness the full potential for off season and niche crops. The diversity and niche productivity of IHR cropping (vegetables and fruits in particular) should be maintained, if not increased, through IHR friendly methods and inputs (e.g., promotion of microbial inoculants, vermiculture, micro nutrient supplements). Niche products should be supported for branding, eco-friendly packaging and for selling as such to towns and cities of India and the rest of the world. Suitable institutional arrangements should be designed for promotion and marketing of low volume but high value organic products from the mountains such as organic turmeric from Meghalaya.

Box 6 - Organic farming in Mizoram

The Mizoram Organic Farming Act (2004)[31] has been passed with the aim –

- To notify areas of organic farming and to undertake such farming in such areas.
- To encourage the development of organic farming in private land and organic processing.
- To certifiy organic products in the state in conformity to the national standards.
- To facilitate marketing of organic products in the local, national, and international markets.
- To make infrastructure for organic farming, including permitted inputs or material, easily available to the intending farmers.

3.1.1. *Jhum* in the North-eastern region:

Jhum (shifting cultivation) is a prevailing age old agricultural practice in the north-eastern region of IHR. The Wastelands Atlas of India (Department of Land Resources, Ministry of Rural Development) categorizes *Jhum* as wasteland. It is actually a prominent traditional land use associated with the socio-cultural framework of the local communities of the north-eastern states[32,33] . The area under *Jhum* cultivation differs widely between the states (Table 3.5) and ownership (Table 3.6).

Table 3.4. Operational Holdings (2001): Less than 2 ha in Various IHR States

Jhum States	Meghalaya 80.3%, Tripura 89% Manipur 83.2%, Nagaland 9.8% Mizoram 81.5%
Non-*Jhum* States	J&K: 93.8%, HP: 86.3% Sikkim: 78.4%, UT: 88.2%

Source: Agriculture Census Division, Ministry of Agriculture

31 The Mizoram Organic Farming Act. 2004. Act No 6 of 2004, passed on 12.07.2004.
32 ICIMOD. 2006. Debating shifting cultivation in the eastern Himalaya.
33 Ramakrishnan, P. S. 1992. Shifting agriculture and sustainable development: an interdisciplinary study from north-east India. UNESCO.

Table 3.5. Variations in the Estimates of Area under *Jhum* Cultivation in Different States of the North-Eastern part of IHR

State	Sources and Area under Shifting Cultivation (km²)				
	Task Force MoA, 1983		Wastelands Atlas 2000	Satapathy, 2003	NRSA, 2005
	No of Families	Area			
Arunachal Pradesh	54000	700	3088.08	2610	1613.1
Assam	58000	696	8046.75	3100	3930.9
Manipur	70000	900	12014.10	3600	4816.6
Meghalaya	52290	530	2086.77	2650	743.8
Mizoram	50000	630	3761.23	450	4017.9
Nagaland	116046	192	5224.65	6330	1917.9
Tripura	43000	223	400.88	1080	395.2
Total area under Jhum cultivation		3869	34622.40	19820	17435.4
% of total Geographical area		2.0	17.7	10.1	8.9

Source: Report of the Task Force on Mountain Ecosystems [Environment and Forest Sector] for Eleventh Five year Plan. Planning Commission, Govt. of India. 2006

The *Jhum* cycle used to be longer than 15 years. This enabled regeneration of forests before the same land was cultivated again. However, in the recent past, due to increase in population, social and other changes in the traditional way of life of the local societies, the cycle has shrunk, in extreme cases, to as little as 1-2 years. As the *Jhum* cycle becomes successively shorter, the *Jhum* sites cannot remain under vegetal cover and degrade.

Following categories of *Jhum* in the NE region have been identified[34] -

(i) Long cycle *Jhum* is still practiced in the remote, sparsely populated areas of the Garo hills of Meghalaya and parts of Nagaland. Such *Jhum* is generally sustainable and is the best cropping method in areas where flat land is not available. The practice has survived the test of time and it enables the people to live in harmony with nature. A unique example of *Jhum* comes from the village Lazami of Nagaland where the farmers practice an unusually long cropping phase, and a weeding system with almost no fallow period.

(ii) Stressed *Jhum*: With an increase in population, villagers are forced to reduce the fallow period (even as short as 2 years); not sufficient for natural regeneration to take place; resulting in land degradation. This type of *Jhum* is neither productive nor sustainable. (Occurrence: many parts of Mizoram, Arunachal Pradesh, hills of Manipur, West Khasi hills of Meghalaya).

(iii) Modified *Jhum*: This includes land levelling, bunding, cultivation of multicrops including leguminous varieties with traditional crops in

Box 7 - Equitable Access to Shifting Cultivation patches – Traditional Institution of Manipur[32]

The land tenure system of the Tangkhuls in Ukhrul is a mix of private and community ownership. The traditional institution, known as Hangvu, decides on all matters relating to local governance, including landuse, access and control of resources. The Hangvu ensures equitable access of all households to shifting cultivation patches. The tenure system follow a broad framework as in the case of other upland communities.The local institutions, developed by communities that practice shifting cultivation, were found to be relatively strong by enhancing social security and cultural integrity.

34 Tiwari B.K. 2005.Shifting agriculture in north-eastern India: some insights in spatiotemporal patterns and processes. Paper presented in Workshop on shifting Agriculture, Environmental Conservation and Sustainable Livelihoods of Marginal Mountain Societies, 6-10 October 2005, NIRD, Guwahati.

Table 3.6. The Administrative Classes and Ownership Regimes of Forests Areas under *Jhum* Agriculture in Various States of the North Eastern part of IHR

State	Administrative classes of forests where Jhum is practiced	Ownership and Control	Area	
			(km²)	% of total
Arunachal Pradesh	Unclassed State Forests (USF)[35]	State Forest Department	32039	23
Assam	USF	District Council	5713	7.3
Mizoram	USF (with permission of Village Council)	State Forest Department/ Village Councils	5240	25
Manipur	USF	State Forest Department	11288	50.5
Meghalaya	USF	Traditional Durbars, District councils	7146	32
Nagaland	USF	Village Councils	7813	47
Tripura	USF	State Forest Department	2195	21

Source: Report of the Task Force on Mountain Ecosystems [Environment and Forest Sector] for Eleventh Five year Plan. Planning Commission, Govt. of India. 2006

the *Jhum* fields (e.g., green peas in Pomlakarai, Meghalaya; indigenous Kolar Beans, Rajma, in high altitude villages of Nagaland where rice cannot be grown). Such practices maintain soil fertility, and help augment household income.

Interventions for improvement of Jhum through developmental projects have been made in the states of Nagaland (NEPED - *Nagaland Environmental Protection and Economic Development* with support from India-Canada Environment Facility), Meghalaya, Manipur and hill districts of Assam (NERCORMP - *North- Eastern Region Community Resource Management Project* by IFAD and NEC). Improvement in livelihoods through promotion of tree husbandry and cash crops was achieved by NEPED while institution building and microfinance are NERCORMP's achievements. Programmes to manage *Jhum* through land leveling, contour bunding and multiple cropping offer great opportunities for improving *Jhum* and focus needs to be shifted from the total replacement of *Jhum* to improvement in the traditional practices.

Box 8 - Traditional Wisdom - Role of Trees

In Nagaland, Alder (*Alnus nepalensis*), a multipurpose tree species providing timber and fuel wood besides fixing nitrogen is maintained for enhancing soil fertility for growing horticulture crops by the tribal farmers. More than 200 years old alder trees can be seen growing in local farms. Agricultural crops together with alder trees form a very remunerative agro-forestry system for the people of the state. Knononome village in Kohima is proud of its alder plantation and alder tree based agriculture. Recognizing the value of this indigenous approach, Nagaland government has initiated a programme called Communitisation of Public Institutions and Services that shows appreciation of traditional wisdom by the government.

35 Unclassed State Forests (USF): The USFs are loosely under the dual control of the Revenue and Forest Departments, the former being responsible only for issuing Land Possession Certificates (LPC). These are claimed variously as private, clan and communal property and have been traditionally under the control of the community. Though termed as forest and even included in the statistics, the USF areas are not under the control of the Forest Department as the land does not vest with the state. No survey and demarcation has been conducted in these areas as no well defined land statute exists there.

3.2 HORTICULTURE

Outstanding horticulture is nature's gift to the mountains. It has the potential of boosting the economy of the people of the IHR while conserving its ecology. It is a welcome change in the land use that has yielded remarkable success (e.g., apple cultivation in the Himachal Pradesh) in some of the western states of IHR. While the first few Five Year Plans assigned priority to achieve self-sufficiency in food grain production, over the years, horticulture has emerged as an indispensable adjunct to agriculture, offering a wide range of choices for augmenting the income of the farmers through crop diversification (fruits, vegetables, potato and other tubers, ornamentals, medicinal and aromatic plants, spices, and plantation crops). The expansion has witnessed introduction of new farm activities such as mushroom cultivation, bamboo plantations and bee keeping. Further, horticulture provides opportunities for development of local agro-industries that also help in the generation of employment.

Due to various agro-climatic zones (sub-tropical to temperate), IHR has the potential for growing diverse horticultural crops. Ministry of Agriculture (Govt. of India) has launched an extensive Technology Mission for integrated development of horticulture in the IHR. All these efforts have collectively helped in increasing the area under various horticultural crops (Table 3.7). However, it would appear that in the absence of a planned focus, the share of IHR to the total horticultural area in the country has decreased from 5.2% to 4.3% during the above period.

Importance of fruit crops in the mountains can be assessed from the fact that the area under various fruit crops in the region is 55.2 % of the total area under fruits, vegetables, spices and flowers. Fruits account for 42.5% of the total horticultural production from the region, while vegetables, though occupying only one-fourth of the horticultural area, contribute substantially higher (52 %) than fruits to the total horticulture production from the region. Further, the region contributes nearly 6% of the total cut flower production of the country, and the major part of this production (95%) comes from the western Himalayan states.

Fruits and vegetables from the IHR contribute 13.2% while floriculture accounts for 10.2% of the total contribution made by floricultural products to the GDP (current price rate) of the country. It is evident from the foregoing statement that both contributions are higher than the total value of the agricultural output (3.6% from the IHR), and quite significant considering that the total area under the horticultural sector is less than 7% of the total horticultural area of the country. Further, the Himalayan region is either the exclusive home of some of the major national fruit and spice crops or the largest contributor to the national production for:

(i) Apple, almond, and walnut - total production of the country comes from the western IHR states of Himachal Pradesh, Jammu & Kashmir and Uttarakhand, contributing almost the entire apple production of the country (99.5%),

(ii) Saffron - only grown in the state of Jammu &

Table 3.7. Response of Technology Mission Programme for Himalayan States

Category	Additional area brought under horticulture (ha)	
	North-Eastern Region*	Western Himalayan Region
Fruits	54973	18925
Vegetables	20979	4658
Spices	26950	898
Plantation crops	5252	-
Medicinal plants	1652	170
Aromatic plants	4027	135
Flowers	4039	537

*including Assam

Source: Ministry of Agriculture, 2006-07

Kashmir (production in 2005-06 was 8.85 tons); however, reports indicate that both area under crop and production are declining,

(iii) Large cardamom – North-Eastern region is the mega producer and Sikkim alone contributes nearly 87% of the total cardamom production of the country. Other states include Nagaland and the hills of West Bengal,

(iv) Ginger – more than half of the total production of the country comes from north-eastern states of the IHR,

(v) Meghalaya is the only mega producer of the tree spice Tejpat; though it is found throughout the IHR,

(vi) Pineapple – more than one-fourth of pineapple production (26.4% of the country) comes from north-eastern states. Tripura (8.8%) and Manipur (7.7%) are the largest pineapple producing states in the IHR,

(vii) Several other fruits are commercially grown (e.g., peach, pear, plum, orange) in the mountains but do not figure in the list of major fruit crops of India and are pooled up in the "others" category of national statistics.

A number of wild fruits of the IHR play some role in the local, regional, and national economy. Kafal (*Myrica esculenta*) is one that is sold in the local market during the tourist season in Uttarakhand, providing local employment to villagers while squash/ juice extracted from the flowers of Buransh (*Rhododendron arboreum*) is available in the regional markets through local food processing industries.

A successful example of value addition of wild fruits is the development of "Leh Berry"; a product of local shrub commonly known as seabuckthorn (*Hippophae rhamnoides*) that grows abundantly in the wild in Ladakh (estimated production in Leh is ~12,000 ton) and also in some higher altitude areas of Uttarakhand, Himachal Pradesh and Sikkim. The Leh based laboratory of Defense Research and Development Organization (DRDO), namely Defense Institute of High Altitude Research (DIHAR) has developed the technology support necessary to increase the shelf life of the juice and to make it commercially viable. The DRDO generated a business of Rs 5-6 crores (Rs 50-60 million) through transfer of technology in 2004 and many more players are reportedly approaching them for the technology to manufacture "Leh Berry" products. The juice of Leh berry from different producers is already available in the national markets.

Tea is a major globally known product of geographical association (e.g., Darjeeling tea) but accounts for only 3.2% of the total tea production of the country (2007 production[36]). Of the total tea production from that state, tea production from hilly districts of Assam (two in number) and West Bengal (one district) accounts only 1.2% and 4.2%, respectively. Within the IHR region, north-eastern region is the major producer of tea (96.8% of the total from IHR; district Darjeeling alone contributes 31% of the total production of IHR, followed by Tripura, hilly districts of Assam, and Arunachal Pradesh).

IHR is the geographical and climatic niche for several other species of indigenous/ local varieties of fruit yielding crops (Table 3.8). Interestingly, Litchi is a fruit of the plains but is also grown in large scale in the IHR (representing 22% of the total area under cultivation in the country), yet it contributes only 7% of the total national production. Similarly, citrus fruits in general and some niche varieties in particular are grown in the IHR but their production is less than 5% of the country's production. A number of wild varieties of citrus are growing in a "citrus sanctuary" established in the state of Meghalaya. While there is a need to maintain its large diversity, efforts also need to be made to enhance their quality, productivity and marketability.

There seems to be some scope of expansion for niche horticultural crops in the IHR in spite of the non availability of cultivable lands.

(i) In the Western region, stone fruits like peach, plum and apricot at elevations between 900 and 1500m amsl with an annual rainfall of 90-100cm,

(ii) Apple, cherry and pear at elevations between 1500 and 2700 m amsl,

36 Tea Board of India, Ministry of Commerce & Industry, This includes only IHR states and hilly districts of Asssam & WB.

(iii) Nuts in the cold arid regions between 1,550 and 3,650m with annual rainfall of 25-40 cm, and novelty and lesser known products like Leh Berry.

All these are in addition to pineapple, citrus fruits, banana and papaya that need the moist conditions, available in the eastern IHR. However, production in the IHR needs to be enhanced organically and non-conventionally. Otherwise, the area will find it hard to compete with such production vis-à-vis the rest of the country. Adverse impacts have already become visible in many areas due to the heavy use of biocides. There has been a decline in the population of pollinators[37].

A supportive policy is concurrently required to establish infrastructure for marketing (storage, efficient transportation, forward linkages), and skill building on post-harvest techniques (including packaging) and value addition. Identification of new horticultural crops (including bio-prospecting of wild plants of horticultural value) and threat analysis should be mainstreamed for improving

Table 3.8. A Glimpse of Genetic Diversity in the Fruit Species of Munsyari (Gori sub-Watershed -31 villages) in Uttarakhand.[38]

Fruit Species	Cultivated Types (Number)	
	Indigenous	Introduced
Walnut	4	3
Peach	2	1
Banana	3	-
Orange	1	2
Pear	1	1
Apple	-	2
Plum	1	1

and sustaining the production. This can also be supported by creating retrievable state level databases on all commercially grown and other fruits contributing to the local economy, for planning and research.

Like niche agriculture, development of niche and off-season horticulture in the mountains, over other uses of land, is recommended and would prove beneficial to the local communities. IHR niche agro-horticulture need not fear low statistics vis-a-vis the production from the rest of the country; it will fetch better price, while saving the environment.

Box 9 - Declining Natural Pollinators Costing Farmers

In the early 90s farmers of Himanchal Pradesh estimated around 50% decline in apple productivity which continued to decline despite agronomic inputs. This decline was found to be associated with disturbance in the pollination processes; fewer insects were seen to hover in orchards and surroundings, and excessive use of insecticides had also taken its toll. This created a heavy demand for honeybees for pollination, and sufficient bee colonies are still not available to meet the demand. The use of honeybees for pollination has led to the growth of a new vocation. Beekepers charge Rs. 500 as security and another Rs 300 as pollination fee for one colony of honeybees per flowering season, and this has to be paid in advance. The security money is refunded only if the colonies are returned intact. [37]

3.3. ANIMAL HUSBANDRY & FISHERY

Livestock husbandry is integral to all rural systems across the IHR. Many local institutions and cultures revolve around domestic animals, especially among the Scheduled Tribes and nomadic communities. However, their produce does not reach the market essentially because of transport problems; but mainly due to the fact that these are not processed in a manner acceptable to the market.

The cattle population in the IHR is 5.3% of the total cattle population of the country. Nearly three-fourth of the cattle population in the region is of the indigenous variety (74.2% of the total cattle in the IHR) as compared to the cross bred cattle. This is particularly true in the eastern Himalayan region. Of the total cross bred cattle in the IHR, majority are reared in the western Himalayan states. In Tripura, the number of cross breeds as well as indigenous cattle have declined by 3.9% and

37 Pratap, U. and Ahamad, F. 2005. A new and more rewarding vocation for beekeepers in Himachal Pradesh, India. ICIMOD Newsletter 48:15-17.

38 Sharma, S. 2003. Bioprospecting of Munsyari region. FTR submitted to Department of Space, Govt. of India

7.7% respectively, between 1997 and 2003. During the same period other IHR states have also shown a decline in the indigenous cattle population, such as Jammu & Kashmir (-0.5%) and Manipur (-3.2%). The IHR is the exclusive home of the Yak and Mithun populations in the country (Table 3.9 and 3.10); both the animals are an integral part of the culture of local communities living in the high altitudes and tribal areas of the IHR. The importance of animals in the IHR, other than those used for agriculture, would be apparent from the fact that:

(i) A large population (horses and ponies ~30% and mules 36.4% of the total populations of the country, respectively) is used for transportation particularly in the western Himalayan states,

(ii) One-fourth of the total goat population of the country is in the IHR and though their contribution to the total milk production in the country is less than one per cent, it provides much needed protein in cold desert areas,

(iii) Goats and sheep produce one-fifth of the total wool of the country (Table 3.11),

(iv) Nearly 17% of the swine population of the country is reared in the north-eastern states of the IHR for protein.

The production of milk is also low in the Himalayan region (44.8%) as compared to the national average (54.4%). Poultry accounts for only 5% of the total poultry population of the country and contributes to only 3.2% egg production of the country (Table 3.11).

The gross output from animal husbandry sector of the IHR was Rs 76,211 million in 2005-06, contributing 4.7% of the total output value of country (Table 3.12), it was greater than the contribution of agriculture (3.7% of country).

Although, the veterinary facilities in the IHR are 11.8% and 19.8% of the hospitals and polyclinics, and dispensaries in the country respectively, their efficient functioning is hampered in the context of remoteness of area and difficult terrain. Veterinary aid centers in the region (semen banks/mobile dispensaries) which are indispensable for livestock development in a given region represent 6.6% of the total of such centers in the country.

Cultivated fodder crops (data limited to western Himalayan region only) is taken up only on one per cent of the total area under fodder crops; the bulk coming from natural production systems such as forests, grasslands, and alpine meadows. Changing cropping patterns and extension of area with high yielding crop varieties is responsible for

Table3.9. Livestock Population in the IHR (2003) (in thousands)

States	Cattle			Buffalo	Sheep	Goat	Yaks	Mithun
	Crossbred	Indigenous	Total					
Western Himalayan region								
Jammu & Kashmir	1320	1764	3084	1039	3411	2055	47	24
Himachal Pradesh	677	1559	2236	774	926	1125	2	0
Uttarakhand	228	1961	2188	1228	296	1158	0	0
North-eastern Region								
Arunachal Pradesh	13	445	458	11	19	231	9	192
Sikkim	80	79	159	2	6	124	7	0
Manipur	69	349	418	77	6	33	0	20
Meghalaya	23	744	767	18	18	327	0	0
Mizoram	9	27	36	6	1	17	0	2
Nagaland	243	208	451	34	4	175	0	40
Tripura	57	702	759	14	3	472	0	0

Source: Basic Animal Husbandry Statistics, Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture

a corresponding decline in hay and other fodder type by-products that traditional crops normally produced; hence the increased pressure on natural forests. Scarcity of fodder during the lean season remains a major concern. This is another reason for recommending traditional agriculture in the IHR; suitably supported by appropriate technologies and inputs.

Thousand of lives in the IHR depend on animal husbandry, especially those who travel with their animals and provide food to high altitude areas where growing food is a problem. These animals also produce wool for clothing, tents and household

Table 3.10. Population of Drought and Other Animals (2003) in the IHR (thousands)

States	Horse & Pony	Mule	Donkey	Pig	Poultry
Western Himalayan Region					
Jammu & Kashmir	172	40	24	2	5568
Himachal Pradesh	18	24	9	3	767
Uttarakhand	17	N.A.	1	33	1984
North-eastern region					
Sikkim	2	0	0	38	322
Arunachal Pradesh	7	0	0	330	1743
Manipur	2	0	0	415	2941
Meghalaya	2	0	0	419	2821
Mizoram	2	-	0	218	1125
Nagaland	1	-	0	644	2789
Tripura	0	0	0	209	3057

Source: Basic Animal Husbandry Statistics, Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture

Table 3.11. Some of the Major Animal Products from the Indian Himalayan region (2006-07)

States	Milk ('000 tonnes)	Eggs (Lakh Nos.)	Wool (000 kgs.)
Western Himalayan region			
Jammu & Kashmir	1400	6320	7400
Himachal Pradesh	872	772	1605
Uttarakhand	1213	1889	355
North-eastern region			
Sikkim	49	144	1
Arunachal Pradesh	49	73	14
Manipur	77	836	
Meghalaya	75	978	
Mizoram	16	348	
Nagaland	67	868	
Tripura	89	1193	
Total IHR (% of country)	3735 (3.70%)	11012 (2.2%)	9375 (20.8%)

Source: Basic Animal Husbandry Statistics, Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture

needs. Yaks in high altitudes and Mithuns in the NE region are life supporting. In many regions, animals are the surest way of transporting goods or evacuating people cut off by natural or man induced calamities. In lower altitudes, milk processing factories are a distinct possibility coupled with healthy, good milk yielding cows. In some regions, re-orientation of livestock development based on traditional systems is needed. Sikkim has already shown how this issue is to be approached. Swine husbandry with poultry in the north-eastern region, and development of indigenous breeds of ruminants in the western Himalayan region are considered to be good interventions. For the development of the animal husbandry sector, besides easily accessible micro credit and risk coverage, effective veterinary health care (of the type that provides such service door-to-door) is essential.

Endowed with numerous water bodies, the IHR is blessed with various fresh water fish; now considered to be the healthiest flesh. However, the potential remains largely untapped. The total inland production of fish in the IHR is only 2.4% of the production in the country (Table 3.13). The potential of inland fishery in the Himalayan region

Table 3.12. Livestock economy of the IHR - Output Values for Year 2005-06 (Lakh Rs, at 1999-2000 Prices)

State	Milk	Egg	Wool & Hair/Hides	Dung	Silk Worm Cocoons, Honey	Increment in Stock	Meat	Total
IHR	467445	23407	6710	68823	4402	46252	145108	762118
India	10749531	577733	29772	1282118	163320	512973	2792069	16107516
% of Country	4.3	4.1	22.5	5.4	2.7	9.0	5.2	4.7

Source: Basic Animal Husbandry Statistics, Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture

Table 3.13. Fish Production and the Central Assistance in the IHR (2004-05)

State/UT	Inland Fish Production(tons)	Inland Fishery Water Resource - Rivers & Canals (Km)	Funds Released (2007-08, Rs lakhs)
Western Himalayan Region			
Jammu & Kashmir	19100	27781	314.20
Himachal Pradesh	6901	3000	-
Uttarakhand	2566	2686	0.82
North-eastern Region			
Sikkim	140	900	12.48
Arunachal Pradesh	2704	2000	61.94
Manipur	17800	3360	40.40
Meghalaya	5638	5600	-
Mizoram	3680	1395	205.59
Nagaland	4900	1600	21.32
Tripura	19838	1200	58.83
Total IHR (% of Country)	**83267 (2.4%)**	**49522 (25.4%)**	**715.58 (27.7%)**

Source: Basic Animal Husbandry Statistics, Department of Animal Husbandry, Dairying & Fishries, Ministry of Agriculture

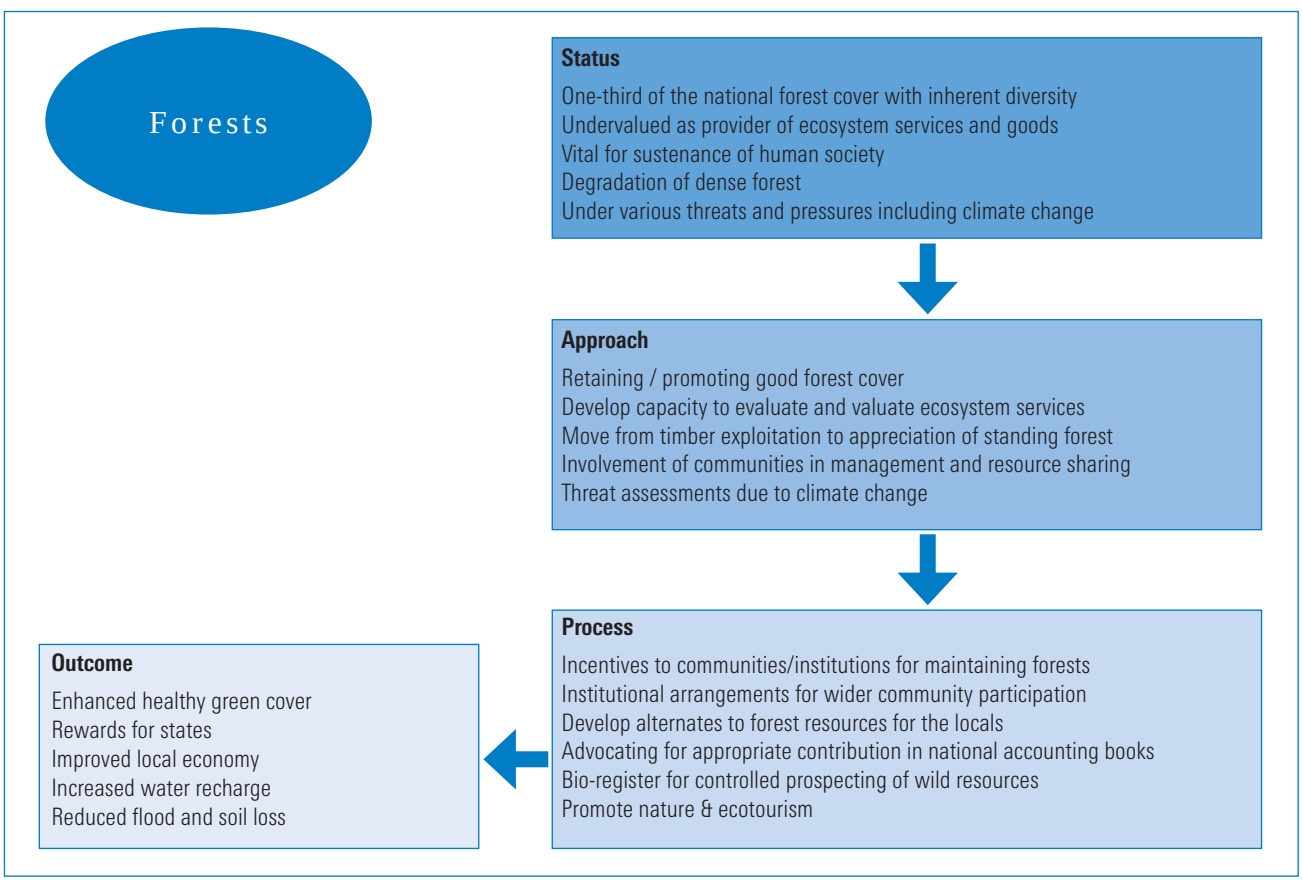
lies in its rivers & canals (25.4% of the country), but the varieties are bound to be exclusive.

The recently established National Fisheries Development Board (NFDB) has initiated a programme on reservoir fisheries in eight states of the country including Arunachal Pradesh and Tripura. Among the 10 fish seed hatcheries established by NFDB, seven are located in the IHR states of Manipur (5) and Mizoram (2). Central assistance to strengthen fisheries in the IHR was 27.7% of the total funds released for this purpose in the year 2007-08 (Table 3.13).

Fish farming in the north-eastern region requires aggressive promotion. Because of the high endemism in fish species that occurs in the Himalayan region, in comparison to the country (25.7% vs 8.7%, respectively), pisciculture, like agro-horticulture, has to concentrate on niche species including game fish and trout.

3.4. FORESTS

Fig. 3.3. Schematic Plan for the Development of Forest Resource in the IHR



Forest is major land use/land cover category (as recorded forest area) in the IHR which covers ~41% of geographical area in the region, against the national cover of 23.4%. The IHR landscape hosts (i) nearly one-third of the total forest cover of India, (ii) 45% of the very good forest cover, and (iii) 31.5% of the dense canopy forest of India (Table 3.14). The IHR forests contribute 8.8% to the GDP (current price), from the forestry sector, of the country, while contribution of industrial wood (16.3% of the total industrial wood) and non – timber forest products (19.3% of total NTFPs of the country) is greater than the total forestry sector output. A forested Himalayan landscape is vital for environmental stability and sustainability, not only for the region itself but also for the entire country.

Of the total forest area under the control of government Forest Departments (FDs) in various states of the IHR, Reserved Forest is 35.9%, Protected Forest is 30.5%, and the remaining one-third area is shown as Unclassed State Forest. Unfortunately, according to forest area assessments between 2001 and 2005, the forest cover in Arunachal Pradesh (2288 km^2), Manipur (937 km^2), Nagaland (937 km^2), and Tripura (937 km^2) has declined (calculated from FSI 2001 and 2005). However, considerable increase was observed in other states during the same period (FSI, 2005). As per a recent assessment (FSI 2009), the situation has further deteriorated in Arunachal Pradesh (lost forest cover 119 km^2), Tripura (100 km^2), Nagaland (201 km^2) and Jammu & Kashmir (3 km^2) between 2005 and 2007. Considering the improvement recorded in other states during the same period (FSI 2009), it is of some comfort that the IHR gained 20,488 km^2 forest cover between 2001 and 2007[39].

Majority of the forest area is managed by the State Forest Departments (FD) through working plans[41], under various categories: reserved forest, protected forest and protected areas in North-Western Himalayan region. However, category wise detailed information is not available for most of the North-Eastern states, except for Arunachal Pradesh which has only 2% of forest area under working plan. About 20,778 km^2 of forest area in some of the IHR states, namely Himachal Pradesh, Uttarakhand, Mizoram and Nagaland is outside the control of FD, and is under the control of (i) Revenue Department, (ii) Community ownership, and (iii) Private ownership. The pooled information available for the above four Himalayan states shows that considerable forest area in these states is private (42%), followed by area under community management (33%) and revenue department (25%). Interestingly, Uttarakhand is the only state where all types of ownerships exist, while Nagaland has mainly private forests.

The temperate zone in the IHR is the home to coniferous forests (99.2% of total coniferous forests of the country). Cedar (*Cedrus deodara*) forests in the country are exclusively confined to the IHR along with 98% of the pine trees in the country. IHR forests provide 97.6% of the total coniferous round wood and 99.4% of the total resin production of the country (2001-02). Of this, majority comes from the western Himalayan region, while Arunachal Pradesh accounts for ~2% of the total wood fuel in the country. It has been estimated that 6,182 metric tons of medicinal herbs were extracted from the western Himalayan region during 2001-02. NTFP collection varies across the IHR with greater collection of medicinal herbs and resin in the above mentioned states of the IHR, while bamboo, thatch, broom stick, umbrella handles,

Table 3.14. Contribution of the IHR to the Total Forest Cover of India (2007)

Region	Geographical Area (km^2) (values in per cent)	Forest Cover (km^2)			
		Very Dense	Moderate	Open	Total
IHR	537435 (16.3%)	37741 (45.2%)	100596 (31.5%)	84892 (29.4%)	223229 (32.3%)
India	3287263 (100%)	83510 (2.5%)[40]	319012 (9.7%)	288377 (8.8%)	690899 (21.0%)

Source: State of Forest Report 2009. Forest Survey of India

39 Calculated from FSI Assessments for 2001 and 2007.

40 Per cent of Total Geographical Area of the Country.

41 Percent of Sanctioned Working Plan to the total forest area is 99.8%, 66.3%, & 68.7% in Jammu & Kashmir, Himachal Pradesh, and Uttarakhand, respectively. Forestry Statistics India 2003. Indian Council of Forestry Research & Education.

and agarbatti (incense sticks) are common NTFPs from the north-eastern region.

There is a great potential for the growth of forest products in the IHR but natural limitations (climate and area not suitable for tree growth) prevent its expansion. An estimation by FSI, between 1981 and 1984, shows that more than half of the total area in Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh is not available for tree growth because the majority of this area (43.4% of the total geographical area of the five states of the IHR, and 34% of the entire IHR) is either under permanent snow or alpine pasture (Table 3.15).

Forest output, not in terms of additional area, but as biological productivity, becomes important in comparison to the competing demand for land for supporting human population and related land use (water bodies, agriculture, etc.). Despite the limitations for expansion of forests, IHR provides valuable forest ecosystem services to the country (Table 3.16) including climate regulation, and maintenance of hydrological cycles. According to some conservative estimates[42], the alpine meadows of the western Himalayan region provide ecosystem services equivalent to Rs 37.79 million, and the forests of the IHR provide ecosystem services amounting to Rs 944.33 billion (based on the year 1994, Table 3.17). Forest ecosystems of IHR provide vital support to the agro-ecosystems of the region through transfer of biomass and energy, thus helping to provide food security, and in maintaining a large number of landraces of food crops.

Standing forests as a resource have not been recognized; indeed, they have been under valued in terms of its contribution to ecosystem goods and services. Their value is not reflected in the country's GDP. According to a conservative estimate, the value of energy, fodder, and fuel is close to Rs 30,000 crore (Rs. 300,000 million/ year[43]).

There is, therefore, a clear need for scientific valuation of ecosystem services provided by forests of the IHR in order to highlight their contribution to the national economy and the quality of life. It would follow from such estimation that the nation must be willing to pay for maintaining such services.

Table 3.15. Proportion of Forest Cover of the Total Geographical Area excluding area above 4000m amsl (FSI 2009)

State	Total geographical area (km^2)	Snow Cover(km^2) & (%)	Forest Cover (km^2)	Geographical area (G.A.) > 4,000 m (km^2)	Forest cover excluding areas > 4,000m (%)
Arunachal Pradesh	83,743	837.4 (1.0)	67,353	6,514	87.2
Himachal	55,673	4954.9 (8.9)	14,668	21,119	42.5
Jammu & Kashmir	222,236	39113.5 (17.6)	22,686	141,313	28.0
Sikkim	7,096	816.0 (11.5)	3,357	3,161	85.3
Uttarakhand	53,483	4385.6 (8.2)	24,495	11,028	57.7
Total	422,231	50107.4 (47.2)	132,559	183,135	55.5

42 Singh, S.P. Himalayan Forests Ecosystem Services: Incorporating in national accounting. CHEA, Nainital 2007.
43 National Forestry Action- Programme India, MoEF 1999.

Table 3.16. Some of the Ecosystem Services Provided by the Himalayan Forests

Sector	Services
Water & Hydrological Cycle	Provisioning of water and its recharge, soil conservation, flood control, food
Agriculture	Soil fertility maintenance, pollination and enhanced crop productivity
Climate Change	Micro-climate regulation, carbon sequestration
Conservation	Biodiversity maintenance
Societal	Recreational, cultural, aesthetic and spiritual

Table 3.17. Forest Ecosystem Services provided by the Different States of IHR

Himalayan State	Value of Ecosystem Services as of 1994 (Billion Rs)
	Western Himalayan States
Jammu and Kashmir	118.02
Himachal Pradesh	42.46
Uttarakhand	106.89
	North-Eastern States
Sikkim	14.02
Arunachal Pradesh	232.95
Manipur	59.67
Meghalaya	55.16
Mizoram	56.61
Nagaland	49.39
Tripura	20.40
Total IHR	944.33

Source: Singh, S.P. 2007. Himalayan Forests Ecosystem Services: Incorporating in National Accounting. CHEA, Nainital

Table 3.18. Change in Forest Cover between Two Assessments (2001 & 2007)

	Forest Cover (km^2)		
	Dense	**Open**	**Total**
India	7353	29648	37001
Himalaya	9977	10511	20488
Rest of the Country	-2624	19137	16513

Calculated from FSI Assessments of 2001 & 2007

While the rest of the country is witnessing reduction in the dense forest cover, the situation in the IHR has improved (FSI assessments of 2001 and 2007, Table 3.18). The reason, it is generally believed, is because many strong local governance institutions exist (formal and informal, e.g., Van Panchayat, JFM Committees, Mangma, NERCORMP, etc.) for the management of natural resources in general, and forests in particular. Retaining the good forest cover of the Himalayan region is a challenge for managers where in spite of many afforestation programmes, open forest cover is increasing. There is, therefore, urgent need for supporting community protection initiatives as well as for innovative, site specific strategies like the Wadi model for managing *Jhum*.

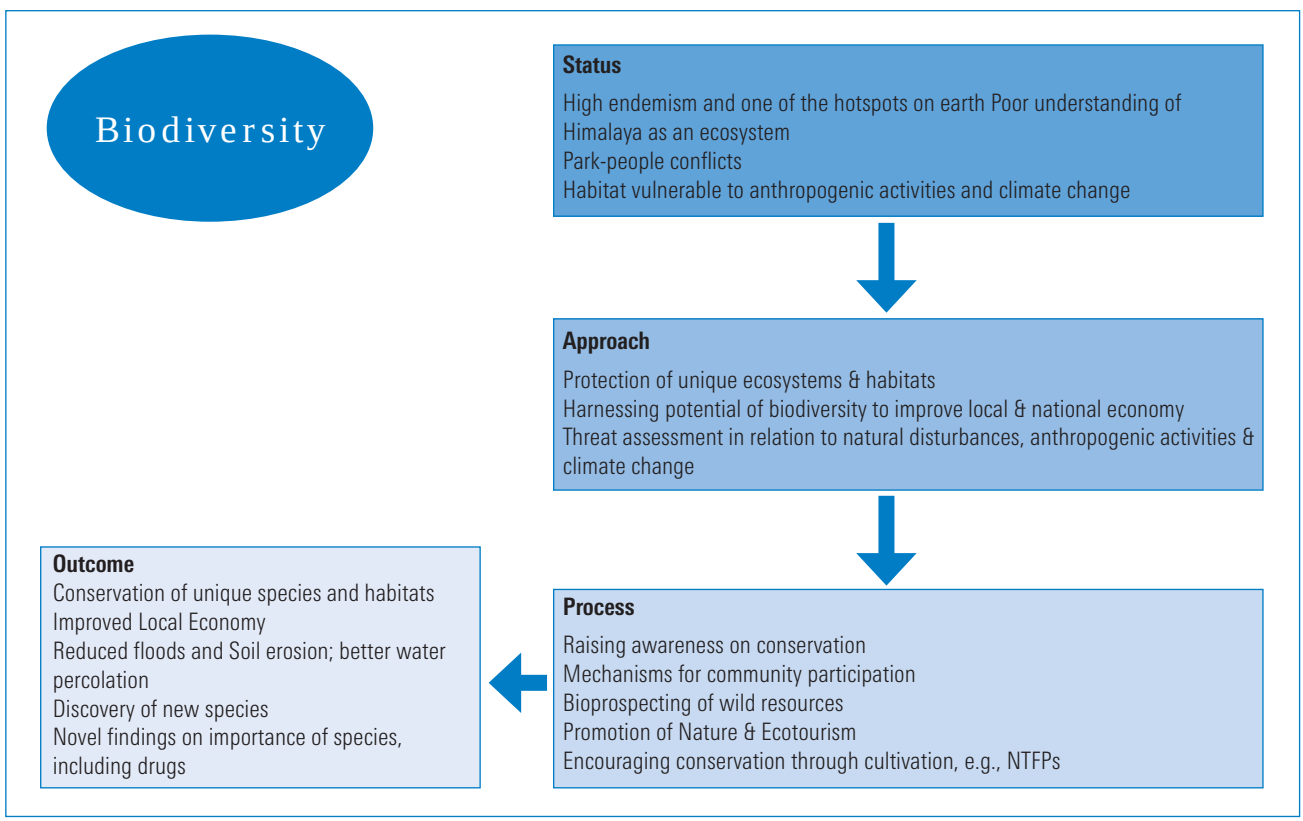
Box 10 - Empowering Women Saving Forests[44]

A successful example of forest revival through empowering women to manage 300 hectares of forests is in Jamatia village of Toirupha in Tripura. This tribal village, inhabited by tribe Jamatis, depends heavily on forest resources. In the seventies, when the community experienced severe depletion of forests, the village elders decided to revive the DAIKONG BOLONG or community forestry, renaming it ASHA VAN (Forests of Hope). Unique feature of this is that it is protected entirely by the women of the village.

A case is also being made out that, in view of the importance of forests in the IHR, road connectivity must bypass protected areas unless absolutely unavoidable from the engineering, not financial, point of view.

3.5 BIODIVERSITY

Fig. 3.4. Vision and Approach for Biodiversity Conservation



44 http://siteresources.worldbank.org/EXTSARGETOPWATERS/Resources/Paper_12_Community Forestry_final.pdf

India is one of the 18 mega biodiversity countries of the world. Many IHRs landscapes are part of the Himalayan[45] biodiversity hotspot or a part of the Indo-Burma[46] biodiversity hotspot.

The floristic studies in the Himalaya, dating back to the last quarter of the eighteenth century, have so far revealed over 18,500 taxa, belonging to various groups of plants. The Himalayan region with only 16% of India's land area houses 81.4% of the country's stock of gymnosperms, 47% of angiosperms, 59.5% of lichens, 58.7% of pteridophytes, 43.9% of bryophytes and 53.07% of fungi found in India[47]. Orchidaceae with over 750 genera represents the largest angiosperm family in the Himalaya.

The vertebrate faunal elements in the Himalaya provide a high degree of diversity at species level. Of the 372 mammalian species recorded in the country so far, as many as 241 species are recorded in the Himalaya; and of the 1,228 bird species as many as 528 species and subspecies occur in the region. Likewise 149 species of reptiles, 74 species of amphibians and 218 species of fishes have been documented from the Himalaya which amount to 35%, 36% and 17% of known species in the country, respectively[47].

The NE region, according to Dr D. C. Goswami, is reported to have about 7233 animal species that include 195 mammalian, 607 bird, 115 reptile, 54 amphibian, 267 fish and 4953 insect species. About 67 of these species (32 mammalian, 28 birds, 6 reptiles and 1 amphibian) are considered endangered.

The insects occupy a dominant role both in term of diversity and adaptiveness in the Himalayan fauna, and quite a few are providing ecological services. For example, Himalayan species of bee (*Apis cerana*) is reportedly better for pollinating during adverse weather conditions, when European bee (*Apis mellifera*) stop flying[38]. The Task Force feels that this is an area which needs greater research and awareness generation. Occasionally, the print media reports on the smuggling of insects from the IHR by collectors outside the country but according to Meena Haribal, an ecologist who has written a book on the butterflies of Sikkim, quoted by Outlook magazine, "Insect species are of great ecological value in our fragile ecosystem. Unfortunately, considering the number of species found in the subcontinent, nobody in India is studying the population trends of insects! Everyone seems to concentrate on pests and pest management." According to the same report, the Eastern Himalayas and Western Ghats are prime hunting grounds for smugglers of rare Indian butterflies and beetles. They're in demand internationally for private collections, butterfly parks, traditional medicine, and also to be encased into jewellery. Among the sought-after species are: Pale Jezebel, Banded Apollo and Kaiser-I-Hind butterflies; Rhinoceros, Long-horned and Jewel beetles (2008 August). The Zoological Survey of India has a centre in Solan, Himachal Pradesh for carrying out insect related studies.

The IHR nurtures an amazing faunal diversity. The mammalian diversity in the IHR is one of the richest in the country. Foothills of the IHR are habitats for three major terrestrial flagship species (tiger, elephant, rhino,) out of five across the globe, and aquatic flagship species (river dolphin) also occur. High altitude habitats nurture some of the charismatic and unique faunal species (snow leopard, red panda, hangul, chiru, musk deer, serow, and Himalayan tahr). New discoveries[48] are still being made from the IHR.

The Himalayan states fall in three bio-geographic zones[49] viz., Trans-Himalaya, Himalayan, and North-east India (Table 3.19).

It is a matter of pride that the initial conservation efforts in the country took off from the IHR in 1935 with the establishment of the Corbett National Park (second in the country for hosting more than a hundred tiger population[50]). By the year 2009, 25

45 http://www.biodiversityhotspots.org/xp/hotspots/himalaya/Pages/default.aspx
46 http://www.biodiversityhotspots.org/xp/hotspots/indo_burma/Pages/default.aspx
47 Thematic Report on Mountain Ecosystems. 2002. Ministry of Environment & Forests, Govt. of India
48 New catfish (*Erethistoides senkhiensis*), Arunachal Macaque (*Macaca munzala*)
49 Rodgers, W.A. & Panwar, H.S. 1988. Planning a Biogeography Based Protected Area Network for India. 2 Vols. Wildlife Institute of India, Dehradun
50 Tiger Census 2001-02.

Table 3.19. Protected Areas in Different Bio-geographic Zones of the IHR			
Bio-geographic Zone	**Number of National Parks and Sanctuaries**	**Area (km²)**	**Area of Bio-geographical Zone (%)**
Trans-Himalaya	7	16247.56	8.7
Himalaya	77	23432.77	11.1
North-East	49	6092.62	3.5
Source: National Wildlife database, Wildlife Institute of India, 2009			

national parks (of the total 99 in the country) were established all across the IHR (Table 3.20) bringing 15,210 km² under a dedicated conservation programme. Further, additional protection by creating Wildlife Sanctuaries (98 in the IHR) has added an area of 29,143 km² under the Protected Area Network (PAN) (Table 3.20). Approximately 8.3% of the total geographical area of the Himalayan region is under PAN (4.8% in the country). Nearly 5% of the PAN and a quarter of the National Parks of the country lie in the IHR. Five Biosphere Reserves and three Tiger Reserves are also located in this region (Table 3.21) covering 4.1% of total geographical area and 0.7% area, respectively. Besides the tiger conservation programme, some of the designated Elephant Reserves are also located in the region, viz., Kameng in Arunachal Pradesh, Garo Hills in Meghalaya, and the Siwalik in Uttarakhand. Several other proposals for Elephant Reserves in the IHR are in the pipeline. More than one third of the declared internationally important wetlands[51] of India are located in the IHR.

Table 3.20. Protected Area Network in the Himalayan Region– National Parks[52] & Wildlife Sanctuaries[53]						
States/Regions	**National Park**		**Wildlife Sanctuary**		**Total Area (km²)**	**% of total area**
	No.	**Area (km²)**	**No**	**Area (km²)**		
Jammu & Kashmir	4	3925	15	10243.11	14168.11	6.4
Himachal Pradesh	2	1430	33	6171.11	7601.11	13.7
Uttarakhand	6	4915.44	6	2418.61	7334.05	13.7
Sikkim	1	1784	7	399.1	2183.1	30.8
West Bengal hills	2	166.6	3	166.14	332.74	10.6
Meghalaya	2	269.44	3	34.2	303.64	1.4
Assam hills	-	0	4	360.86	360.86	1.9
Tripura	2	36.71	4	566.93	603.64	5.8
Mizoram	2	150	8	1090.75	1240.75	5.9
Manipur	1	40	1	184.4	224.4	1.0
Nagaland	1	202.02	3	20.34	222.36	1.3
Arunachal Pradesh	2	2290.82	11	7487.75	9778.57	11.7
IHR	25	15210.03	98	29143.3	44353.33	8.3

51 9 out of 25 Ramsar Sites.
52 http://oldwww.wii.gov.in/nwdc/nparks.htm
53 http://oldwww.wii.gov.in/nwdc/sanctuaries.htm

Table 3.21. Protected Area Network – Biosphere and Tiger Reserves[54]

State	Biosphere Reserve		Tiger Reserve	
	Name	(Area km²)	Name	(Area km²)
Uttarakhand	Nanda Devi*	5860.69	Corbett	1318.54
Himanchal Pradesh	Cold desert	7770.00	-	-
Sikkim	Khangchendjunga	2619.92	-	-
Meghalaya	Nokrek	820.00	-	-
Mizoram	-	-	Dampa	500.00
Arunachal Pradesh	Dehang-Debang	5111.5	Namdapha	1985.245
			Pakhui-Nameri	1206.00

**World heritage site Nanda Devi Biosphere Reserve*

Many of the plants (collected/ harvested/ utilized) in the IHR are endemic to these mountain ranges, particularly in the high altitude, and alpine/sub alpine areas. Across various groups of the plant kingdom, high endemism was observed in higher taxa, i.e., flowering plants/ angiosperms (Fig. 3.5), while the same is true for the amphibians in the animal kingdom (Table 3.22). As has been stated earlier, high endemism in fish species occurs in the Himalayan region in comparison to the country (25.7% vs 8.7%, respectively). The Himalayan flora represents 71 endemic genera and 32% endemic species. Also, five families are endemic to the region (i.e., Tetracentraceae, Hamamelidaceae, Circaeasteraceae, Butomaceae, and Stachyuraceae), while over 90% of the species in Berberidaceae and Saxifragaceae are endemic to the Himalaya. A large number of orchids, many representing neo endemic taxa, have been reported from Sikkim and Arunachal Pradesh.

Several animal species are confined to the mountains only. Among other endemic animals, yak and mountain quail have been placed in the "critical" category (Red Data Book, IUCN 1994). Among plants, rhododendrons are highly valued and endangered. Out of 36 species of rhododendron (occurring in Sikkim), eight have been assessed as endangered.

Of the total 622 endangered plants listed so far in the Red Data Book, 137 occur in the Himalayan region. Of the 137 species, 71 are from the Eastern Himalaya, 56 from the Western Himalaya, and ten species are common to both these regions. In addition to the listed threatened taxa, literature and herbaria surveys suggest that about 450 plant species of the region are endangered (Table 3.23). Among others, these include *Panax pseudo-ginseng, Calamus inermis, Phoenix rupicola, Dioscorea deltoidea, Coptis teeta,* and *Picrorhiza kurrooa*, etc., and a large number of orchids. The endangered avian species include Himalayan Bearded Baza, Tibetan Snowcock, Mountain Quail, Tibetan Blook Pheasant, Western Tragopan, Satyr's Tragopan, Blyth's Tragopan, Temmincks Tragopan, Himalayan Monal Pheasant, Elwee's Eared Pheasant, Cheoe Pheasant, Koklass Pheasant, Black necked Crane, Rufous neckled Hornbill, etc. Most of the endangered avian species are recorded from Central or North-West Himalaya. The endangered reptilian species include such widely distributed forms as Indian Rock Python, and the only endangered amphibian in the region is Himalayan Newt in Darjeeling Himalaya[47].

High endemism makes the IHR a highly significant area from the conservation and resource planning point of view. Many drugs and metal substitutes

Box 11 - Conservation through Beliefs

Sacred groves/landscape are present in a variety of ecological situations where patches of forests and other type of landscapes are attached with sacred values. The philosophy is more visible in North-Eastern region but present in other states too e.g., Mawsmi in Cherrapunji, Demaazong in Sikkim, Lakes of Chhiplakot and Hemkund in Uttarakhand.

54 http://oldwww.wii.gov.in/nwdc/tigerreserves.htm

are being produced from items of biological origin. In future, biodiversity, not mineral wealth is expected to bring prosperity to the people living in biodiversity rich areas. There is, therefore, an overwhelming need, with community participation, to make special plans and provisions for initiating activities that will facilitate the maintenance, protection, conservation and wise use of the biodiversity in the IHR.

Fig.3.5. Endemism in Various Plant Groups of the IHR

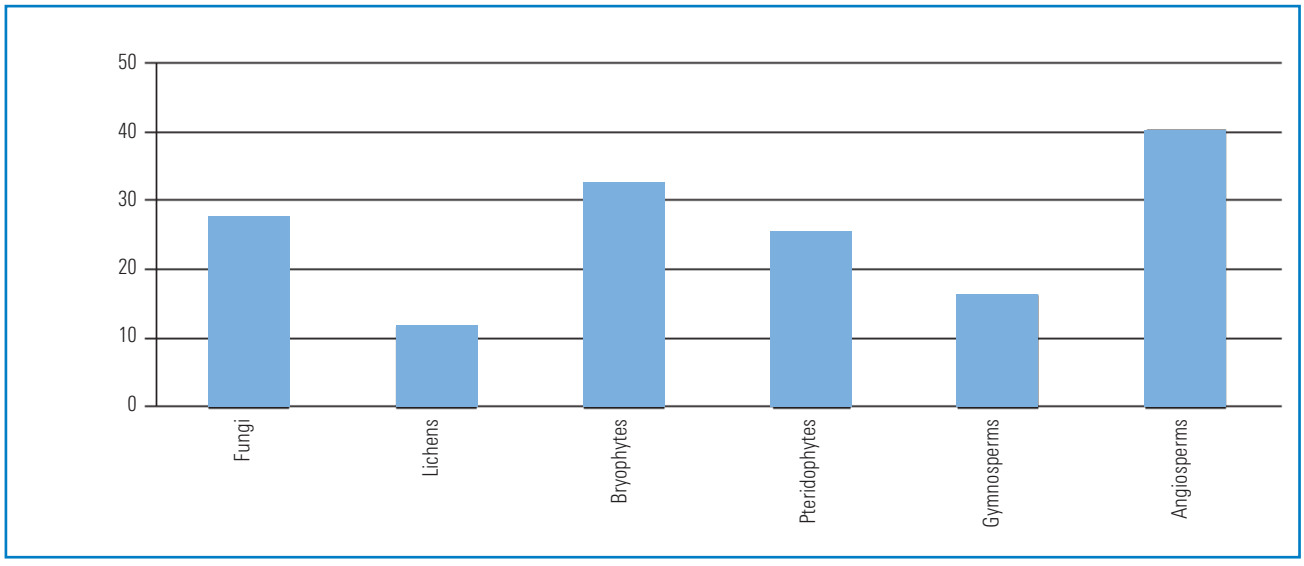


Table 3.22. Endemism in Various Animal Groups of the IHR.

Group	Known Species	Endemic Species
Amphibians	74	35
Fishes	218	56
Reptiles	149	29
Birds	528	NA
Mammals	340	12

Source: Wildlife Institute of India

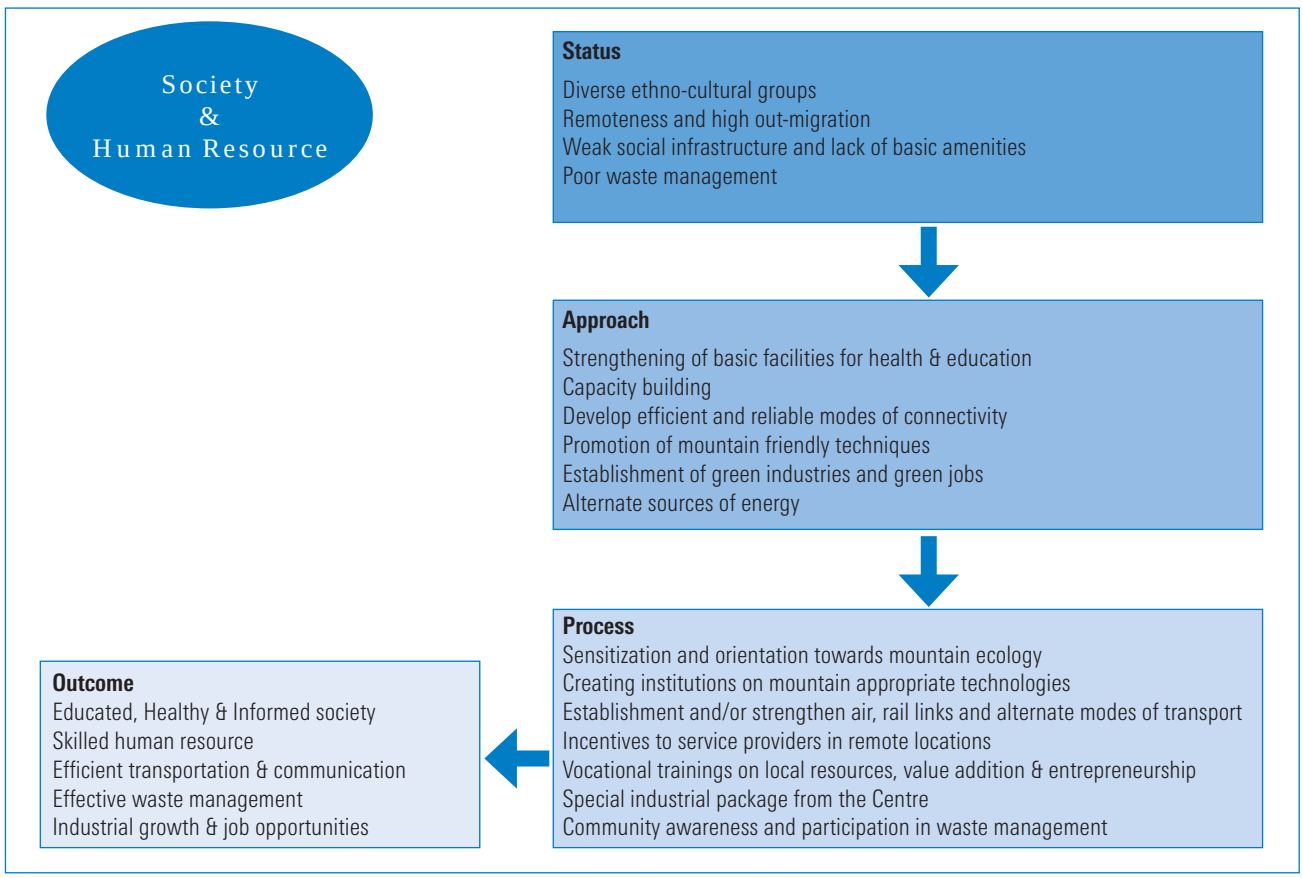
Table 3.23. Status of Some of the High Altitude Plants of Himalayan Region

Red Data Book Status	Species
Vulnerable	*Aconitum deinorrhizum, A. falconeri var. latilobum, A. ferox, Allium stracheyi, Berberis affinis, Coptis teeta, Dioscorea deltoidea, Inula racemosa, Nardostachys grandiflora, Panax pseudoginseng, Picrorrhiza kurrooa*
Indeterminate	*Angelica nubigena, Pittosporum eriocarpum*
Rare	*B. kashmiriana, Codonopsis affinis, S. bracteata*
Endangered	*Sausssurea costus*

CHAPTER 4

SOCIETY AND HUMAN DEVELOPMENT

Fig. 4.0. Schematic Plan for Societal Development in the IHR



4.1. Human Resource

4.1.1. Demography

Population variables are thought to be both the determinant as well as the consequence of development processes in any region. The density of population in the IHR (74 persons/km^2) is low in comparison to the rest of the country (324 persons/km^2) and varies widely across the IHR states; the most densely populated being Tripura: 304 persons/km^2, while the lowest density: 13 persons/km^2 is in Arunachal Pradesh. Some demographic parameters of the states of the IHR according to 2001 Census are presented in Table 4.1.

The population size of most of the IHR districts, is less than 4 lakhs (0.4 million) with only 10 districts having a larger population. Darjeeling (West Bengal hills) is the most populated (16,05,900; 2001 census) district, while Upper Siang (Arunachal Pradesh) is the least populated (only 33,140). During the past four decades the population of the IHR recorded an increase of 2.7 times. While during the last census block (1991-2001), the population growth rate (25.43%) showed a significant decline, it was, however, still higher than the national growth rate (21.35%). Except Nagaland and Jammu & Kashmir, all other IHR states, including the hill region of Assam and West Bengal, have recorded a declining trend in growth rate during the past four decades. Interestingly, the growth rate in the IHR is much higher than the national average.

The literacy rate in the IHR (67%) is marginally higher than the country's average (65.38%) as recorded in 2001. Among the various states of the region, literacy is highest (88.5%) in Mizoram and least (54.46%) in Jammu & Kashmir. Districts of these states also reflect a similar trend, e.g., Aizawl (Mizoram) with 96.64% and Badgam (Jammu & Kashmir) with 39.54%. At the national level, population growth rate is negatively correlated with the literacy rate; to some extent this trend is also visible in the IHR.

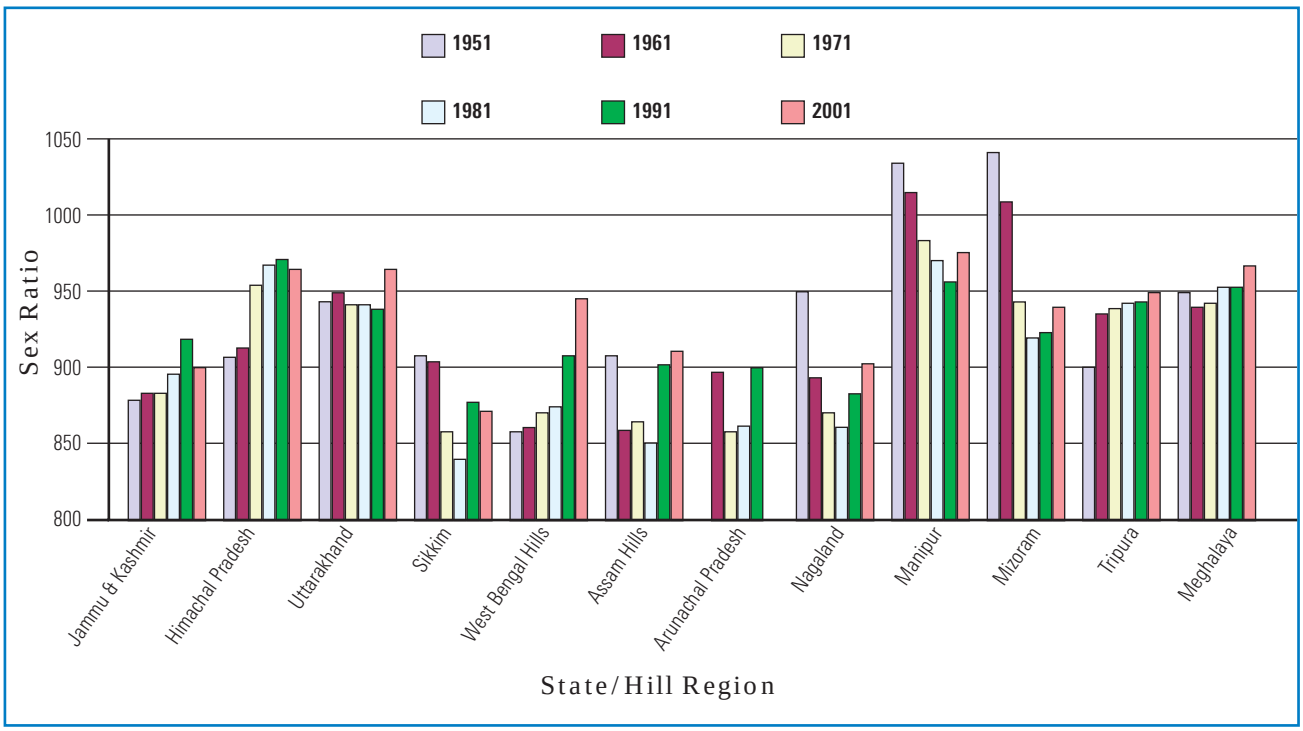
Table 4.1. Selected Demographic Parameters for IHR

States/regions	Percent contribution to the total IHR population	Decadal Growth rate (1991-2001)	Annual average exponential growth rate (1961-2001)	Population density (per km^2)	Sex ratio (females/ 1000 males)	Literacy rate (+7yr) (%)
Jammu & Kashmir	25.41 (0.98)	30.46	2.60	99	900	54.46
Himachal Pradesh	15.34 (0.59)	17.53	1.93	109	970	75.91
Uttarakhand	21.40 (0.83)	20.27	2.16	159	964	72.28
Sikkim	1.36 (0.05)	32.98	3.01	76	875	69.68
West Bengal hills	4.05 (0.16)	23.54	2.38	510	943	72.87
Meghalaya	5.82 (0.22)	29.94	2.74	103	975	63.31
Assam hills	2.52 (0.10)	22.74	2.56	65	915	60.68
Tripura	8.05 (0.31)	15.74	2.57	304	950	73.66
Mizoram	2.25 (0.09)	29.19	3.02	42	938	88.49
Manipur	6.03 (0.23)	30.02	2.80	107	978	68.87
Nagaland	5.02 (0.19)	64.41	4.21	120	909	67.11
Arunachal Pradesh	2.75 (0.11)	26.21	2.94	13	901	54.74
IHR	100.00 (4.08)	25.43	2.47	74	940	67.00
India	- -	21.35	2.12	324	933	65.38

Note: Values in parenthesis are % contribution of the respective states/regions to the total population of the country.

Source: Census 2001

Fig. 4.1. State wise Change in Sex Ratio (1951-2001) in the IHR



The sex ratio (females per 1000 males) is mainly an outcome of the interplay of sex differentials in mortality and selective migration. Changes in sex composition largely reflect the underlying socio-economic and cultural pattern of a society in different ways. The sex ratio in the IHR (940 as compared to 933 at the national level) seems to be under threat due to changing social norms (Fig. 4.1). Two states in the north-east, i.e., Manipur and Sikkim recorded the highest (978) and the lowest (875) sex ratios, respectively, in the IHR. At district level, Almora in Uttarakhand has the highest (1147) and West Kameng, Arunachal Pradesh the lowest (749) sex ratio.

4.1.2. Scheduled Tribe Population

The tribes and their tracts constitute a very significant part of the country, comprising about 8.13% and 18.70% of the population and area of the country, respectively. In India, about 700 tribes have been recognized and scheduled in the constitution. A tribe is considered to be a group with traditional territory, specific name, common language, distinct culture, strong kin and clan relation, unique decision making structure and authority, and a strong belief in the divinity expressed through nature and natural phenomenon. As far as the percentage of tribal population vis-à-vis the rest, Mizoram tops the list (94.5%), followed by Nagaland (89.1%) and Meghalaya (85.9%).

4.1.3. Scheduled Caste Population

The Scheduled Caste (SC) population constitutes about 16.33% of India's total population. In the IHR, the percentage of SC population is 13.5 % (excluding the SC population of Jammu & Kashmir), which is lower than the national average. Among the states of the IHR, the percentage of SC population is highest in Himachal Pradesh (42.71), while the north-eastern states have the lowest.

Table 4.2. Tribes and their Population in the IHR as per 2001 Census		
State	**Percentage to India's total Scheduled Tribe Population**	**Percentage to Total Population of State**
Arunachal Pradesh	0.84	64.2
Himachal Pradesh	0.29	4.0
Jammu & Kashmir	1.31	10.9.
Manipur	0.88	32.3
Meghalaya	2.36	85.9
Mizoram	1.0	94.5
Nagaland	2.1	89.1
Sikkim	0.13	20.6
Tripura	1.18	31.1
Uttarakhand	0.3	3.0
West Bengal	5.2	5.5
Assam	3.9	12.4

4.2. SOCIAL INFRASTRUCTURE

4.2.1. Health Facilities

Robust health, as is well known, is an important component of socio-economic development. It is an essential input for the development of the human resources and improving the quality of life of a nation or region. A positive health status is defined as a state of complete physical, mental and social well being and not merely the absence of disease or infirmity. Likewise, availability of medical infrastructure is an essential component of the development process, but not sufficient.

Availability of primary health care infrastructure[55] in the IHR is shown in Table 4.3. However, a shortfall remains in numbers of Sub-Centres, PHC and CHC required in north-eastern region (Meghalaya, Nagaland, and Tripura for Sub-Centre, and others in Tripura) as well as Female Health Worker/ANM at Sub-Centres in few states of the IHR (Jammu & Kashmir, Himachal Pradesh, Arunachal Pradesh, and Tripura). Availability of ANM/ Female Health Workers at Sub-Centres was better in the north-eastern region than the Western Himalayan region.

Box 12 - Health Care in Remote Areas – New Initiatives

Boat clinics in Brahmputra - Akha

In an innovative effort to bring better health to communities in the Brahmputra valley, the Centre for North East Studies and Policy Research has designed and developed Akha (A ship of hope in a valley of floods) to provide mobile health services to the poor and marginalized population on the river islands of Assam. In addition to human health care, veterinarians also go to these islands where large cattle populations live because these habitations are one of the primary centres of milk production in Assam, but like their owners, have no access to health treatment.

108 Mobile Health Service in Uttarakhand

Uttarakhand has la\unched Emergency Health Services in partnership with EMRI offering health care to the people across the state. An ambulance equipped with paramedical staff, police and fire brigade personnel, life saving drugs, oxygen cylinders and first-aid material reaches at the desired spot within an hour, even in the remote locations, by simply dialling 108 telephone number. This facility has become the symbol of efficiency in catering to people's health care needs during emergencies. This facility is now available in some other states too.

55 Rural Health Bulletin, March 2008, Ministry of Health & Family Welfare.

Table 4.3. Number of Functioning Primary Health Centres, Sub-centres and Community Health Centres in the IHR (as on March 2008)

State	Primary Health Centres (PHC)	Sub-Centres	Community Health Centres (CHC)	Shortfall in Health Workers at Sub-Centres
Jammu & Kashmir	375	1907	85	380
Himachal Pradesh	449	2071	73	166
Uttarakhand	239	1765	55	-
Sikkim	24	147	4	-
Meghalaya	103	401	26	-
Tripura	76	579	11	24
Mizoram	57	366	9	-
Manipur	72	420	16	-
Nagaland	86	397	21	-
Arunachal Pradesh	116	592	44	375

Source: Rural Health Bulletin, March 2008, Ministry of Health & Family Welfare

For the overall improvement of the IHR, its health scenario has to be focused for quick improvement. This can be done, in the first instance, by delivering both preventive and curative services; found on a supportive, efficient and extensive infrastructure. The former requires planning for and ensuring the deployment of adequately trained quality staff. There also appears to be a need for addressing the declining availability of alternate systems of medicine traditionally relied on and believed in by the IHR people. The IHR states must take full advantage of these issues, especially with the support of the Ministry of Health and Family Welfare, Government of India.

4.2.2. Education

There are about 53,294 primary/junior basic schools, 13,918 upper/senior basic schools and 9,253 high/higher secondary schools in the IHR (Table 4.4). The three larger states (viz., Jammu & Kashmir, Uttarakhand and Himachal Pradesh) share about 66% of the total primary schools in the region. Uttarakhand has the largest number of schools in the region, besides a reasonably good infrastructure for higher education.

Box 13 - Remoteness demands incentives for effective delivery of social services

A study[56] conducted in Uttarakhand reveals that in spite of the presence of health centres in remote locations, availability of trained & specialized staff decreases with increasing remoteness, i.e., distance from the road. Incentive based mechanisms are required to ensure efficient delivery of social services in remote areas of the IHR.

The highest population served by a junior basic school (JBS) is in Tripura, followed by Nagaland, and the hill area of West Bengal. The lowest number served by a JBS is in Meghalaya, followed by Assam hills and Himachal Pradesh. All the hill states/ regions falling fully under the IHR classification have a university. Table 4.5 depicts the student-teacher ratio in different levels of school education in the IHR.

Appropriate policy support is needed for attracting and producing quality teachers, from amongst the locals, particularly for the remote areas. Introduction of mountain relevant syllabi, including

56 Rawat D.S. & Sharma, S. 1997. Mountain Research & Development, 17(2): 117-126.

Table 4.4. Educational Institutions in the IHR (2007-2008)

State	Primary/ Jr. Basic School	Upper/ Middle/ Sr. Basic School	Secondary/ High/ Higher Secondary/ Intermediate/ Jr. College	Arts, Science & Commerce Colleges	Professional educational institute	University/ Deemed university/ Institute of National Importance
Jammu & Kashmir	13369	5202	1498	65	35	7
Himachal Pradesh	11517	5009	2964	110	62	5
Uttarakhand	15356	4263	2362	107	94	11
Sikkim	772	221	164	5	4	1
West Bengal hills	775	53	84	NA	NA	NA
Meghalaya	6618	2259	774	58	4	1
Assam hills	3079	568	240	NA	NA	NA
Tripura	2151	1021	713	14	8	2
Mizoram	1700	1081	581	22	1	1
Manipur	2563	769	804	58	8	2
Nagaland	1662	465	406	42	24	1
Arunachal Pradesh	1561	664	260	10	2	2

Notes - Professional Educational Institutes include Engineering, Technology & Architecture Colleges, Medical Colleges, & Others (including Law, Management, MCA/IT, Agriculture, etc).

Sources: 1.- Abstracts of Statistics of School Education, 2007-08, Department of School Education and Literacy, Ministry of Human Resource Development, Government of India. 2.- Abstract of Selected Educational Statistics 2006-07, Department of Higher Education, Ministry of Human Resource Development, Government of India. 3.- District Elementary Education Report Card 2007-08, National University Educational Planning and Administration, New Delhi.

for vocational education, is another essential. Recruitment rules that favour area-wise, if not position-wise appointments are expected to negate pressures of moving to cities leaving vacancies in vulnerable areas. Full advantage of distant learning institutions, especially in the private sector (e.g., IGNOU, NIIT), must be taken. Policy support for this would imply satellite connectivity.

4.2.3. Population below the Poverty Line

Despite decades of research and debates a universally acceptable definition for drawing the poverty line is absent. Perhaps this will never be possible; because the context is people with livelihood differentials in needs and expectations. State wise population below poverty line in the IHR is given in Table 4.6.

Table 4.5. Student-Teacher Ratio in Different Categories of Educational Institutions/ Schools in the IHR

State	Primary	Upper Primary	Secondary	Higher Secondary
Jammu & Kashmir	39	10	11	14
Himachal Pradesh	18	13	34	25
Uttarakhand	25	16	23	25
Sikkim	16	15	8	8
Meghalaya	47	15	34	34
Tripura	27	19	26	26
Mizoram	19	7	12	13
Manipur	33	22	27	23
Nagaland	20	15	24	31
Arunachal Pradesh	33	24	24	25
Assam	37	21	18	8
West Bengal	51	70	60	51

Source: Statistics of School Education, 2007-08, Ministry of Human Resource Development

Table 4.6. State wise number (in lakh) and % of population below poverty line in the IHR

State	1973-74		1977-78		1982-83		1987-88		1993-94		1999-2000		2004-05	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Jammu & Kashmir	20.48	40.83	21.72	38.97	15.60	24.24	16.95	23.82	20.92	25.17	3.46	3.48	5.85	5.4
Himachal Pradesh	9.73	26.39	13.04	32.45	7.41	16.40	7.52	15.45	15.88	28.44	5.12	7.63	6.36	10.0
Sikkim	1.19	50.86	1.54	55.89	1.35	39.71	1.36	36.06	1.84	41.43	2.05	36.55	1.14	20.1
Meghalaya	5.52	50.20	6.79	55.19	5.62	38.81	5.48	33.92	7.38	37.92	8.23	33.87	4.52	18.5
Tripura	8.54	51.00	10.61	56.88	8.95	40.03	8.84	35.23	11.79	39.01	9.89	34.44	6.38	18.9
Mizoram	1.82	50.32	2.31	54.38	1.96	36.00	1.70	27.52	1.94	25.66	1.85	19.47	1.18	12.6
Manipur	5.86	49.96	7.06	53.72	5.65	37.02	5.29	31.35	6.80	33.78	7.19	28.54	3.95	17.3
Nagaland	2.90	50.81	3.74	56.04	3.50	39.25	3.66	34.43	5.05	37.92	5.49	32.67	3.99	19.0
ArunachalPradesh	2.66	51.93	3.36	58.32	2.82	40.88	2.83	36.22	3.73	39.35	3.98	33.47	2.03	17.6

Notes – Poverty Ratio of Assam is used for Sikkim, Arunachal Pradsh, Meghalaya, Mizoram, Manipur, Nagaland, and Tripura. Data for Uttarakhand and hill regions of Assam and West Bengal are not available.

Source: Perspective Planning Division, Planning Commission

4.3. DEVELOPMENT INDICATORS

4.3.1. Human Development Index (HDI) in the IHR

Human Development Index (HDI) is a composite of variables capturing attainments in three pivotal dimensions viz., economic, educational and health of the citizens of a nation. The HDI provides an alternate to gross domestic product (GDP) to assess socio-economic development at the state and district levels. These have been captured by per capita monthly expenditure adjusted for inequality; a combination of literacy rate and intensity of formal education; and a combination of life expectancy at age 1 with infant mortality rate. Other parameters include access to safe drinking water, proportion of household with *Pucca* (brick and cement) houses, etc. The HDI status for different IHR states is presented in Table 4.7.

For most of the IHR states, and particularly in the north eastern states, shelter and accessibility to safe drinking water have been found to be relatively poor, and there is a need to strengthen these urgently. In urban areas the situation is much better as far as access to amenities and literacy are concerned, though the progress has been rather slow. A substantial gap exists between rural and urban areas, particularly in relation to per capita expenditure and level of poverty.

4.3.2. Gender Equality Index (GEI)

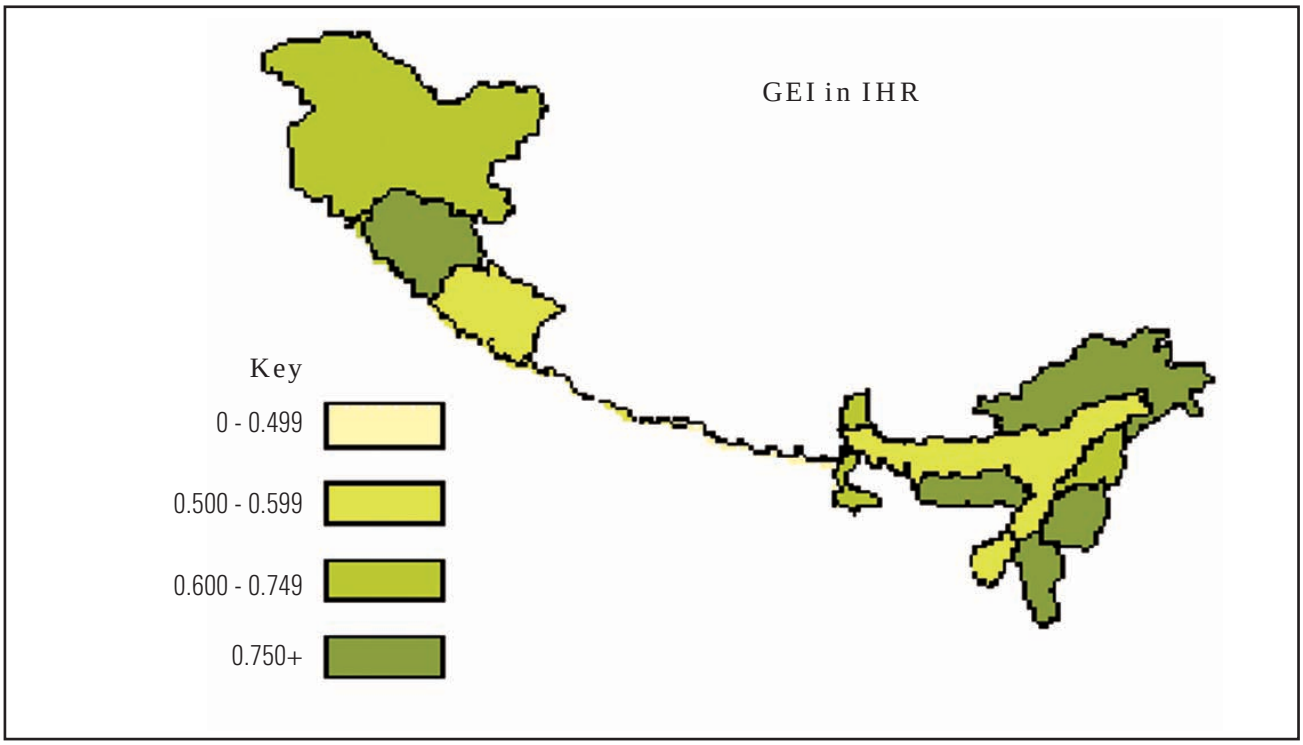
The Gender Equality Index (GEI) represents inequality attainments on human development indicators between females and males. The index is a ratio of attainments for females to that of males. A value higher than 1 would imply that females have better attainments than males, though in reality the observed values generally remain between 0 and 1. The economic attainments for males and females are captured by taking the respective worker-population ratio, which is a direct measure of the empowerment that females have in a given society, and thus differs from the HDI in which use of per capita monthly income is taken into consideration. The GEI at national level was 0.620 in the 1980s, which improved to 0.676 in the 1990s. The states of Manipur, Meghalaya, Himachal Pradesh and Nagaland of the IHR ranked high in GEI during 1980s at the national scale (Figure 4.2). However, the IHR state of Himachal Pradesh showed highest GEI in the country during 1990s. It was observed that female literacy had a direct impact on improving GEI.

Table 4.7. The IHR states: Human Development Index

State/District	2001	1981		1991	
		Value	Rank	Value	Rank
Jammu & Kashmir	NA	0.337	19	0.402	21
Himachal Pradesh	0.43	0.398	10	0.469	13
Uttarakhand	NA	-	-	-	-
Sikkim	0.53	0.342	18	0.425	18
Arunachal Pradesh	0.51	0.242	31	0.328	29
Meghalaya	0.52	0.317	21	0.365	24
Mizoram	0.67	0.411	08	0.548	07
Manipur	0.59	0.461	04	0.536	09
Nagaland	0.62	0.328	20	0.486	11
Tripura	0.59	0.287	24	0.389	22
Darjeeling (WB)	0.65	-	-	-	-
Karbi Anglong (Assam)	0.49	-	-	-	-
North Cachar hills (Assam)	0.36	-	-	-	-
India	**0.56**	**0.302**		**0.381**	

Source: National Human Development Report 2001 and State HDRs

Fig. 4.2. Gender Equality Index in the IHR



Source: National Human Development Report 2001

4.3.3. Human Poverty Index (HPI)

The Human Poverty Index is a negative composite of variables capturing deprivation in three dimensions of human development viz., economic, educational and health. These dimension are captured by proportion of population below poverty line, proportion of population without access to safe drinking water/sanitation/electricity, health care facilities at birth/vaccination, type of dwellings (*kutcha/pucca* houses); literacy/ children not enrolled in schools, and proportion of population not expected to survive beyond 40 years of age. Thus, HPI reflects derivational perspectives on development and the inability of the people to have access to basic services. The HPI takes a value between 0 and 100. A value closer to 100 means higher deprivation showing that majority of population is deprived of basic minimum attainments. The HPI in 1991 has shown improvement for all the IHR states over 1981 values, though there was a large variation among different states. Arunachal Pradesh, Tripura, Meghalaya, and Sikkim had high HPI value (50-60) in 1981 (Table 4.7). In 1981 only Himachal Pradesh among the IHR states was better than the national situation (lower HPI than the national average) while in 1991 three other Himalayan states had also been included in this list (Table 4.8).

In whatever manner development and welfare is viewed, the need for measures that directly address the indicators of development and welfare is evident. While it is up to the respective States to design these interventions and ensure effective implementation, the Task Force is of the opinion that mountain specific skill development with education will enable the people themselves to avail of the services on offer, either within the region or beyond. States just need to provide opportunities for this to happen, within the boundaries of area fragility and resource conservation.

Table 4.8. Human Poverty Index for the IHR (1981 and 1991)

State	1981		1991	
	Value	Rank	Value	Rank
Himachal Pradesh	34.05	08	26.21	08
Mizoram	47.97	18	32.20	14
Jammu & Kashmir	46.94	16	34.19	16
Sikkim	52.76	25	34.84	17
Manipur	50.82	21	41.63	21
Nagaland	49.37	19	42.07	22
Tripura	51.86	22	44.89	24
Meghalaya	54.02	26	49.19	28
Arunachal Pradesh	59.86	32	49.62	30
India	**47.33**		**39.36**	

Source: National Human Development Report 2001

CHAPTER 5

SUPPORTIVE AMENITIES AND INFRASTRUCTURE

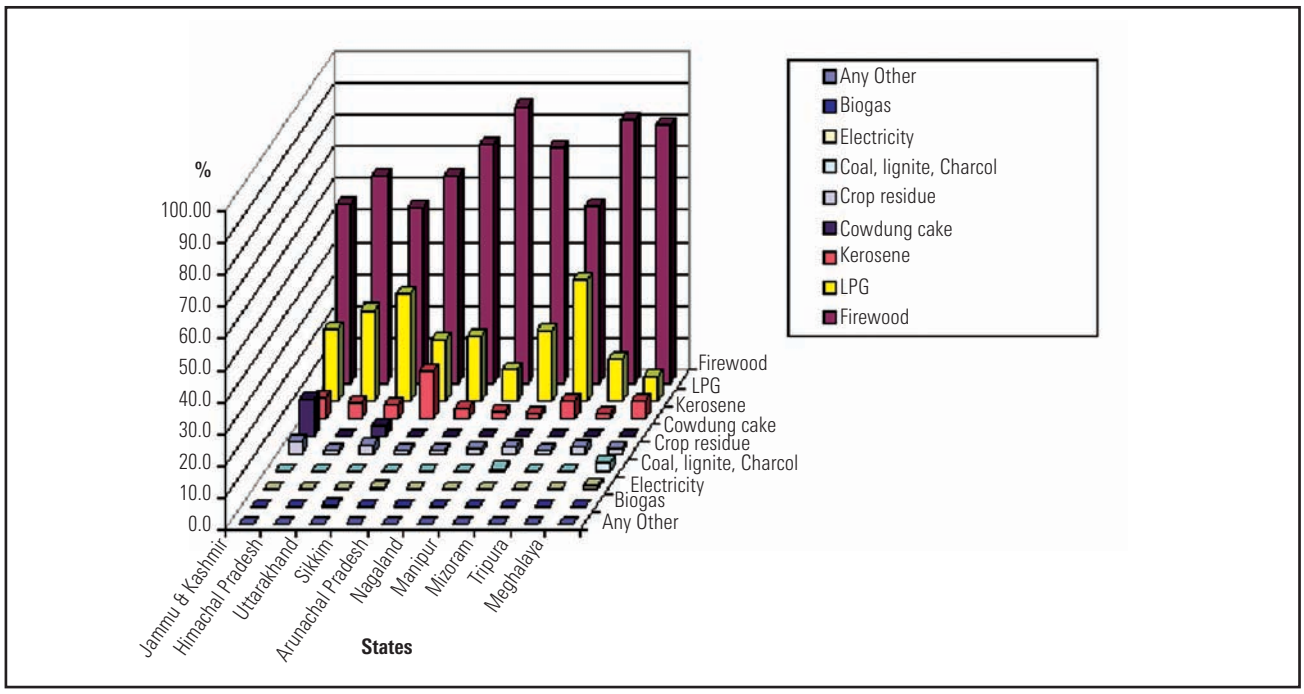
5.1. DOMESTIC ENERGY

About 6.66 million of the total households of the country live in the IHR. Domestic energy needs in the mountains are primarily for cooking, lighting, and space heating. Firewood remains the primary source of cooking for a majority of households (4.31 million; 66.0%) in the IHR. Across the states, dependency on firewood varies from 54.6% (Uttarakhand) to 86.3% (Nagaland). Among other kitchen fuels, LPG is used most widely for cooking (1.58 million households; 23.7%) followed by kerosene (4.6%), cow dung cake (3.6%) and crop residue (2.1%). Use of LPG for cooking in different states of the IHR varies from 7.7% (Meghalaya) to 37.6% (Mizoram). This implies a general lack of access to clean energy sources and dependency on biomass based fuel to a larger extent in the region (Fig. 5.1).

Urban households in the north-eastern region use considerable amount of firewood (22.3 – 54.3% of total urban households) as compared to states located in the western region of the IHR (3.6 – 15.3% households). Among all the states, Sikkim has the lowest percentage of urban households using firewood. Though, LPG remains the first choice of urban households in majority of the states; firewood is the predominant source of cooking in urban Nagaland (54.3% households; Fig. 5.2).

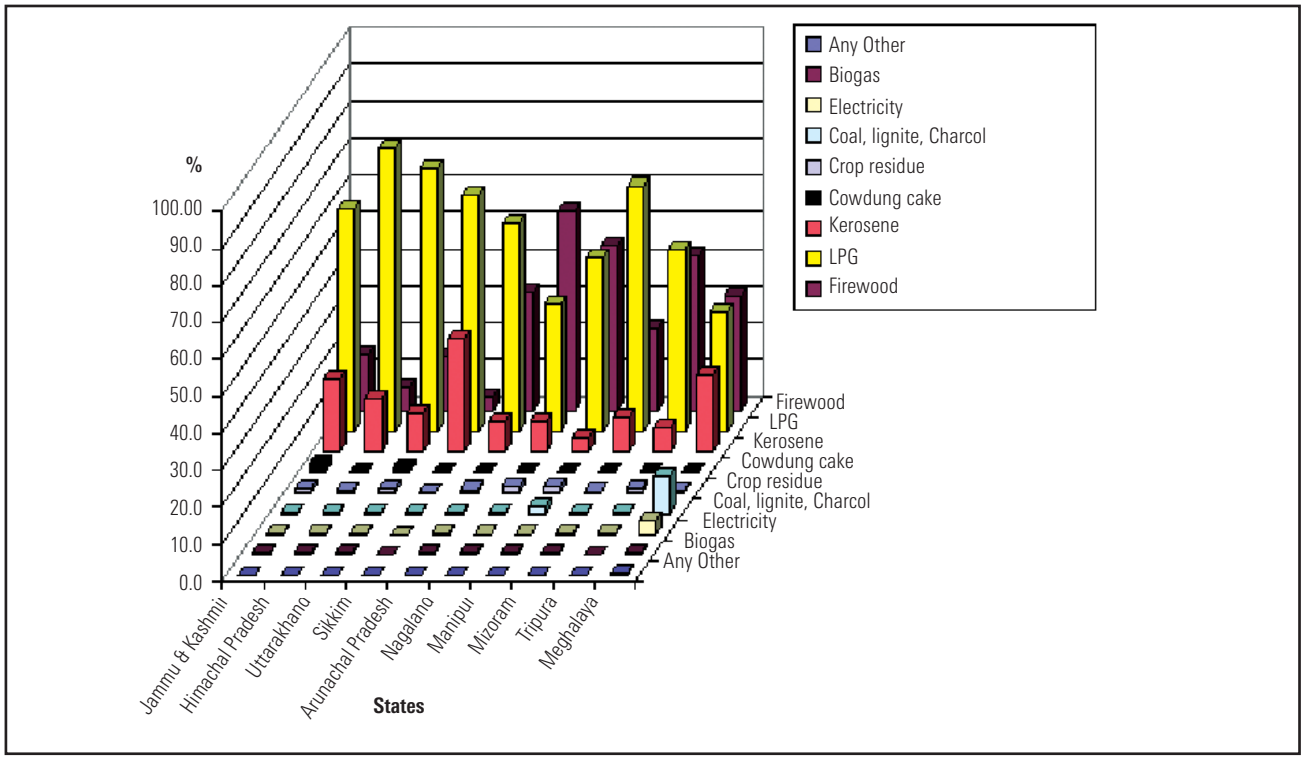
Use of firewood in rural areas has been higher (67.5% - 94.3% households) than urban areas. In the north-eastern states of IHR where *Jhum* cultivation (wood as a by- product during land clearing) prevails, the number of households using firewood is higher (82.8 – 94.3% rural households) than the states located in non-*Jhum* practicing areas (67.5 – 73.3%). Use of LPG shows the reverse trend between these culturally different areas (9.4 – 21.8% non-*Jhum* states vs 1.1 – 13.2% *Jhum* practicing states; Fig. 5.3). Prime social concerns associated with the use of firewood are drudgery of women and poor quality of life, as they traverse long distances to collect (more so in the western Himalayan states) a head load of firewood. There is little or no time left for them to engage in other meaningful and quality of life activities. Use of biomass for cooking is also responsible for many health hazards for womenfolk, due to long periods of exposure to smoke in the kitchen, as compared to male members of the family. Crop residues burnt as cooking fuel is a loss of valuable agricultural biomass that has the potential to be utilized as fodder.

Fig. 5.1. Cooking Energy (Primary Source) & Use Pattern of Himalayan Households



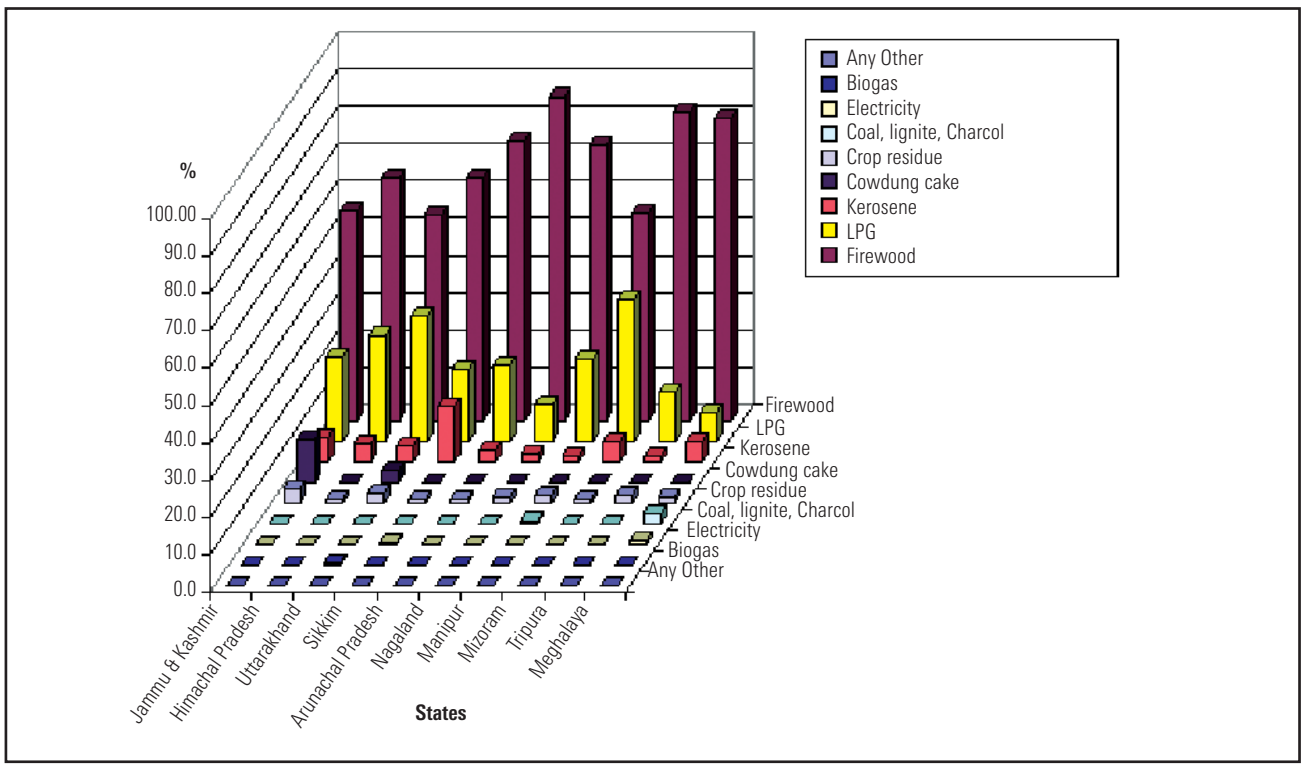
Source: Census 2001

Fig. 5.2. Use Pattern of Cooking Energy by Urban Himalayan Households



Source: Census 2001

Fig. 5.3. Use Pattern of Cooking Energy by Rural Himalayan Households



Source: Census 2001

Since a demand for changing over from firewood to LPG is emerging, all the IHR states, the Task Force recommends, should capitalize on it.

Increasing the availability of cylinders, especially the conveniently transportable or head loadable sizes, options for localized piped gas connections; and making LPG use mandatory for all hotels and eateries, whatever the size are corollary recommendations.

OTHERS FORMS OF ENERGY

In the IHR, households using electricity for lighting purpose range from 41.8% (Tripura) to 94.8% (Himachal Pradesh). Kerosene based lighting is generally the pattern in the north east dominating over electricity in Tripura (57.5%) and Meghalaya (55.9%). Solar energy is used only in a limited scale in different states of the IHR such as Uttarakhand (1.9% households), Jammu & Kashmir (0.7%), and Mizoram (0.5%).

Box 14 - Encouraging government policies for energy generation and conservation

Uttarakhand:- The state of Uttarakhand has a policy for harnessing renewable energy sources through private sector/community participation which targets power generation as well as power conservation. Accordingly, power generation can be done by individuals, Gram Panchayats, Registered Societies, and Private Companies. The State has also launched a scheme for BPL families that provides stove and first cylinder to support and encourage use of LPG among such households.

Himachal Pradesh:- State has a policy to allocate an additional quota of clean fuel (kerosene) to hilly areas in order to prevent deforestation. This is 20 litres per month for households having no LPG connection, and 3 litres per month for families having a single LPG cylinder.

Among other sources of energy production, solar photovoltaic would be of use, especially in the cold desert regions, but its spread is limited by the high investment needed, and perhaps, lack of facilitators. Wind & Biomass based power generation in the IHR is yet to be addressed.

5.2. TOURISM

The snowy Himalayan ranges with its blue lakes, the high altitude meadows, the sub alpine forests and the lifestyle and culture of its people are bound to become great attractions for stressed souls living in the plains of the country and beyond. Mountains, we all know, have always provided inspiration to artists and nature lovers, as well as to adventurers.

Across the globe, tourism is the fastest growing sector that contributes 10.6% to the GDP and engages 10.2% of the workforce. The industry has wide-ranging influence on the destination areas as it brings income, employment and provides incentive to the development of physical infrastructure. There are a number of multiplier effects that transcend beyond the local and regional domains of a particular tourist area. Though the IHR has been a sought after destination for varied forms of tourism, such as religious, nature, adventure, and leisure, its potential has largely been untapped.

Table 5.1 depicts the number of domestic and foreign tourist visits to different states of the IHR for the year 2006. It needs to be stated that 2006 witnessed a growth of 17.8% in domestic tourists and 18.1% of foreign tourists over 2005 in the region. The top five states in terms of domestic tourist visits in 2006 were Uttarakhand, Himachal Pradesh, Jammu & Kashmir, Meghalaya and Sikkim. These states accounted for over 98.5% of the total domestic and foreign tourist visits in 2006.

In general, the level of knowledge and information of tourists intending to travel to India is poor[57], particularly of those coming to the IHR. Other challenges for the tourism sector are related to marketing of IHR as a preferred destination, and include lack of systematic information on places of interest, poor transportation and accommodation facilities, unreliable price structure (e.g., unrecognized taxi services) and associated travel costs, untrained guides and tour operators as well

Table 5.1. State-wise Domestic and Foreign Tourist Visits in the IHR 2006

State	Tourist Visits (Numbers)		Percentage share (All India basis)		All India Rank	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
Arunachal Pradesh	80137	607	0.02	0.01	32	32
Himachal Pradesh	7671902	281569	1.66	2.40	12	11
Jammu & Kashmir	7646274	46087	1.66	0.39	13	19
Manipur	116984	295	0.03	0.00	31	35
Meghalaya	401529	4287	0.09	0.04	25	27
Mizoram	50987	436	0.01	0.00	33	33
Nagaland	15850	426	0.00	0.00	35	34
Sikkim	292486	18026	0.06	0.15	28	22
Tripura	230645	3245	0.05	0.03	29	28
Uttarakhand	16666525	85284	3.61	0.73	7	15

Source: Central Statistical Organization

57 Only about 25% of travelers know enough about India. India Tourism Statistics, Ministry of Tourism, 2006.

as promotional support. However, promotion to tourism also needs a balanced approach as unregulated tourism, apart from having an adverse impact on the environment, also causes alarming negative effects on the ecology, the local culture and traditional value systems of the local society[58]. In the absence of mechanisms, lack of environmental regulations and regulators that come down heavily on deviant behaviour, monitoring awareness, the much lauded economic gains are often capitalized by only a few individuals (frequently from outside the region), while the social and environmental costs are borne exclusively by the local communities.

Mountain tourism does not find a distinct place in the National Tourism Policy except in the field of adventure tourism. However, the general recommendations and cautions of the Tourism Policy apply to mountain areas as well. The Task Force would only highlight that IHR tourism must be an area of special focus, but built on the foundation of skill development of the locals, and environmental "benign-ness". The general cautionary recommendations of the National Tourism Policy would become crucial when viewed in the context of the IHR and, therefore, needs to be specifically noted by States.

5.3. INDUSTRIES

The entire IHR has considerable potential for environmentally benign industrial development. Though the region doesn't have a high population density, human capital and locally available resources could be harnessed to realize the industrial potential of the region. The region is well known for its rich bio-diversity, hydro-electric potential, oil and natural gas, coal, limestone and the forest wealth including NTFPs. Table 5.2 presents the summarized features of all industries in the IHR for which information is readily available.

Results of the third census of Small Scale Industry Units in various states of the IHR reveal that only 3.85% of the total SSIs of the country are located in the IHR of which 5.36% represent closed units (Table 5.3).

Table 5.2. Some Information on the State of Industries in the IHR. (Values in Rs. Lakhs, others in Numbers)

Charateristics	All India	J & K	HP	Uttarakhand	Nagaland	Manipur	Tripura	Meghalaya
Number of Factories	129074	342	530	679	120	45	269	47
Fixed Capital	47333140	38189	571383	218176	2768	579	4966	10691
Working Capital	11923101	18704	157138	89458	2835	246	6340	7647
Invested Capital	67959853	66566	697916	416974	6449	804	11805	15674
Outstanding Loans	28977564	36405	467984	84016	3835	415	4831	6278
Number of Workers	6086908	21993	27636	27592	2356	1090	13105	1773
Total Persons Engaged	7870081	26952	36753	41561	2802	1231	14508	2228
Wages to Workers	3047777	8562	12261	23868	401	182	2008	496
Total Emoluments	5833675	12897	28170	46881	584	218	2701	919

Source: Central Statistical Organization

58 Loss of biodiversity & wetlands, deforestation, pollution of air, water and soil, siltation of water bodies, congested settlements & landscape alterations, loss of land titles, social alienation, change in lifestyle and traditions (Joshi, R. & Dhyani, P.P. 2009. Current Science, 97(1):33-41).

Table 5.3. State-wise Distribution of Working and Closed SSI Units in Various States of the IHR (registered SSI sector)

S. No.	State	Number of Permanently Registered SSI Units	Working units		Closed Units	
			Number	%	Number	%
1.	Jammu & Kashmir	39680	16699	30.2	22981	49.3
2.	Himachal Pradesh	17432	11092	20.0	6340	13.6
3.	Uttarakhand	27415	15907	28.7	11508	24.7
4.	Sikkim	338	158	0.3	180	0.4
5.	Arunachal Pradesh	579	361	0.7	218	0.5
6.	Nagaland	698	503	0.9	195	0.4
7.	Manipur	5778	4746	8.6	1032	2.2
8.	Mizoram	4217	2890	5.2	1327	2.9
9.	Tripura	2039	995	1.8	1044	2.2
10.	Meghalaya	3768	2023	3.6	1745	3.7
11.	**IHR**	**101944**	**55374**	**3.8**	**46570**	**5.4**
12.	**All India Total**	**2305725**	**1437704**	**100.0**	**868021**	**100.0**

Source: Central Statistical Organization

Investments in this sector have to be regulated in order to protect the fragility of the region. Only in limited areas is it advisable to set up industries so that the adverse effect on the terrain and the water regime can be accepted if not countered. There is, however, a good potential for development of small and cottage industries for adding value to locally available raw material, mainly of plant and animal origin, as well as a few items that use up the mineral wealth without seriously affecting the water and land surface. This will also provide dispersed employment.

5.4. TRANSPORT

An efficient transport system is *sine qua non* for sustained economic development of any region; more so for areas with dispersed population and resource spots. A reliable transport infrastructure is essential not only for reaching services, nurturing development and linking producers with local and extra local markets, it also plays a significant role in the opening up of remote and backward regions and for promoting national integration. Although the sector has expanded in the past decades of planned development, it is still far from being basic both in terms of its spread and carrying capacity. It still suffers from a number of deficiencies and bottlenecks.

Himachal Pradesh has a road network of 28,208 km, including eight national highways (NHs). Railway tracks exist, connecting Punjab with a few towns -- Shimla, Solan and Una. There are three domestic airports in the state—Shimla, Bhuntar (Kullu) and Gaggal serving Kangra and Dharamsala.

While most of the major cities of Uttarakhand, located in the plains, are accessible throughout the year by road and rail, most towns and villages in the higher altitudes remain cut off for large periods in a year due to landslides and snowfall. At present there are only two airports in the state viz., Jolly Grant (Dehardun) and Pantnagar (Udham Singh Nagar district).

Sikkim does not have any airport or railhead. The closest airport is at Bagdogra (124 km away from Gangtok) in West Bengal. A regular helicopter service, taking thirty minutes connects Gangtok to Bagdogra; but the flight operates only once a day. The closest railway station is at New Jalpaiguri in

West Bengal, situated 16 kilometres from Siliguri. NH-31A links Siliguri to Gangtok.

In Nagaland, the railway network is just till Dimapur. The length of the National Highway is only 365.38 km whereas that of state roads is 1094 km. The solitary airport is located at Dimapur (70 km away from the State Capital) though another is being planned at Kohima.

Tripura is connected with the rest of the country (takes about 36 hours) by a meter gauge railway line extending to Lumding and Silchar in Assam. National Highway-44 also connects it to Assam and the rest of India. Agartala Airport, the main airport in Tripura provides flights to Kolkata, Guwahati, Bangalore, Chennai, Delhi and Silchar.

Meghalaya is a land locked state with a large number of small settlements in remote areas. Roads are the only means of transport within the state. While the capital city Shillong is relatively well connected by road and air (the state has an airport at Umroi, about 40 km from Shillong on the Guwahati-Shillong highway but operation is limited to only 50 seater aircraft, and the flights are often irregular due to erratic weather conditions). There is also a helicopter service between Guwahati and Shillong. Most of the arrivals into Meghalaya are through Guwahati in Assam, which is nearly 103 km away by road.

Assam has a major railhead as well as an airport with regular train and air services respectively, to and from the rest of the country.

Mizoram is connected by National Highway 4. It has only one airport at Lengpui, near the state capital Aizawl but because of its peculiar topography that traps clouds and smoke, landing has often to be aborted. Mizoram is accessible by rail (primarily for goods) up to Bairabi which is about 110 km from the Aizawl, but most goods are transported by road, via Silchar in Assam. Given the poor road conditions and unstable topography, the travel by the road within Mizoram is generally uncertain. The Central Government is reportedly in the process of developing a waterway with the port of Akyab Sittwe in Myanmar along Chhimtuipui river.

Geographically, Arunachal Pradesh is the largest and remotest state in the North Eastern IHR. The state has two highways; the 336 km long National Highway-52 that connects Jonai with Dirak and another highway which connects Tezpur in Assam with Tawang. Goods are carried to the interior

Table 5.4. Road and Rail Network (km) in the States of the IHR

States	Road (2004)		National Highway (2008)	Rail Route (2000-2001)
	Surfaced	Total		
Jammu & Kashmir	8962	21095	1245	96
Himachal Pradesh	17956	32582	1208	269
Uttarakhand	16783	58054	1991	356
Sikkim	1652	2063	62	-
Meghalaya	6687	9701	810	-
Tripura	9080	23856	400	45
Mizoram	2764	4898	927	2
Manipur	3839	12599	959	1
Nagaland	6570	20647	494	13
Arunachal Pradesh	6062	15712	392	1

Note: Inter connectivity of state capitals of the NE states envisaged through railway network under the NE REGION VISION 2020 launched by the Hon'ble Prime Minister.

Source: Road Transport Year Book (2009), Ministry of Road Transport & Highways (http://www.dorth.gov.in); Central Statistical Organization

places by porters but in case of inaccessible areas, air dropping is the only way out. Small airports/ helipads are located at Daparjio, Ziro, Along, Tezu, Pasighat, Amni, and Vijayanager. However, owing to unpredictable weather conditions, these airports can only handle a few flights per week. Table 5.4 provides a summarized overview of road and rail networks in the hill states of the IHR.

The local economy of most of the hill states of India is still dependent on agriculture and horticulture. Yet, surplus production of agriculture or horticulture makes no sense unless these can be carried, on time, conveniently and cheaply to the places of consumption. The health and cultural welfare of the people of the IHR is also dependant on the connectivity to service centers. Construction of roads is, however, difficult and expensive in the IHR. Therefore, the quality of roads is relatively better in the plains as compared to roads in high altitude and high rainfall mountainous areas.

It has been suggested that wherever roads have been laid in the mountains, traffic has increased and slopes have become unstable resulting in frequent landslides. The rate of deforestation has also increased. Task Force members have observed that road networks along the valleys support deforestation in the upper slopes as felled trees have just to be rolled down to the roadside and then quickly, often clandestinely, transported away. Ridge alignment, on the other hand makes it difficult for felled timber to be carried uphill.

So, it would appear that solution that meets both these ends lies in finding and supporting road making technologies that are sensitive to, and also in conformity to the characteristics of mountain ecology and geology. Ridge alignment rather than along river valleys, efficient side drains, bio proofing of slopes below and above roads (tea bushes, bamboos and the like that bind the soil through intricate latticework of roots as well as a thick canopy that arrests raindrops from directly hitting the soil), location specific designs, and loops (networks interlinked in the region itself) are obvious choices that must be preferred.

Transport planning in the IHR should not discard age old practices that have stood the test of time: e.g., rope bridges and ropeways. It is much cheaper to construct steel wire suspension bridges across chasms than roads around them. Small vehicles and trucks can ply along them easily to carry local produce as well as for reaching welfare services.

The framework for the IHR communication sector must be a combination of geo-sensitive roads, loop-linking producers with markets within the IHR; two loop railway lines (one in the eastern and another in the western sectors) to evacuate the produce from the road transport; and a small airfield in each State to evacuate the perishables to markets in the rest of the country and abroad.

5.5. TELECOM AND INFORMATION TECHNOLOGY INFRASTRUCTURE

Access to skills and information has already been identified as a prerequisite for sectoral development. It is always not possible to set up physical infrastructure for imparting skills or knowledge, especially when such knowledge is of a specialized nature. The next best alternative is, therefore, the establishment of satellite supported connectivity from thousands of small sets throughout the IHR to specialized skill and knowledge imparting institutions in the country and beyond. One way of addressing this issue is through the existing internet providing services, but at most locations in the hill states dial-up services, broadband, lease line connectivity will continue to be difficult on account of the challenges posed for laying optical fibre cables along hill terrains. Tower based wireless connectivity may also not work. So, the expensive alternative seems to be direct satellite connectivity. The SATCOM division of National Informatics Centre has nearly 3000 VSATs connecting all the Districts/States/UTs of India including in the IHR. This service needs to be augmented. Simultaneously, optical cable networks, along existing road and rail networks, must be invested on even if the costs are higher than in the plains. Such investments will directly benefit human capital of the IHR and in the medium term generate employment in the service sector. There is every reason to believe that the IHR can become the business and service processing and software development region of the country. Appropriate restrictions may, however, have to be imposed in the border areas.

OTHER MODES OF COMMUNICATION:

The entire IHR is covered by 20 centres of All India Radio and 17 community radio stations. The region is also well covered by 16 Doordarshan studios. Owing to low population density the average population served by a post office in the IHR is comparatively lower than the national average (Table 5.5).

Table 5.5. Average Area and Population Served per Post Office in Various States of the IHR

Postal Circle	Average Area Served (in km^2)	Average Population Served
Jammu & Kashmir	135.57	4711
Himachal Pradesh	20.15	1849
Sikkim	34.80	2009
Meghalaya	46.37	3643
Tripura	14.62	3853
Mizoram	53.14	1738
Manipur	32.36	2656
Nagaland	51.56	3812
Arunachal Pradesh	284.69	2925
India	21.32	5477
Data for Uttarakhand and hill regions of Assam and West Bengal are not available.		
Source: Rajya Sabha Unstarred Question No. 3247 dated 25.04.2000		

5.6. URBAN SETTLEMENTS

Limited livelihood earning opportunities, lack of adequate and quality social infrastructure such as for health and education, and changing socio-economic aspirations are some of the key factors responsible for large-scale migration of rural communities to smaller towns within the IHR and also to various towns and cities in the plains. Unregulated development of urban and urban-like centres in the IHR has been creating the usual problems but in this case problems associated with environmental concerns. Rivers and river basins have become dumping grounds affecting the most valuable treasure the IHR. Unplanned settlements are degrading the quality of its soil, and air, besides increasing the vulnerability of the region to natural disasters.

Real estate development is also causing significant change in the mountain environment and to the local communities. As such, entire IHR has several urban settlements and sizable number of Cantonment Boards (Table 5.6).

The Task Force members felt it unnecessary to suggest ways of solving the problems related to urbanization as it is a phenomenon emerging for the whole country and many options, including PURA (the plan to Provide Urban amenities to Rural Areas) are being considered. For the IHR, the Members felt, it would be sufficient to flag the imperative to zone stable areas for human settlements paying due attention to soil and slope conditions and proximity to natural drainage network and fault zones. Regulations governing the type of construction permissible within approved zones, heavy penalties for violation, compulsory rain water harvesting structures for all residences and commercial buildings above a prescribed plinth area, and for all offices; sewage disposal, solid waste management and drinking water supply should form the basic part of such master plan and regulation.

Table 5.6. Number of Towns in the IHR (2001)												
State/region	C.T.	C.B.	T.C.	M.C.	M.B.	M.Cl.	M	M.Corp.	N.P.	N.A.C.	Other towns	Total
Jammu & Kashmir	2	2	5	3	-	-	-	-	-	63	-	75
Himachal Pradesh	1	7	-	4	-	16	-	1	28	-	-	57
Uttarakhand	12	9	-	-	32	-	-	1	30	-	2	86
Sikkim	1	-	-	-	-	-	-	-	-	-	8	9
W. Bengal Hills	-	-	-	-	-	-	3	1	-	1	4	9
Meghalaya	6	1	3	-	4	-	2	-	-	-	-	16
Assam Hills	-	-	9	-	-	-	-	-	-	-	-	9
Tripura	10	-	-	-	-	1	-	-	12	-	-	23
Mizoram	21	-	-	-	-	-	-	-	-	-	1	22
Manipur	5	-	-	-	-	7	-	-	20	-	1	33
Nagaland	1	-	8	-	-	-	-	-	-	-	-	9
Arunachal Pradesh	17	-	-	-	-	-	-	-	-	-	-	17

C.T. Census Town; C.B.: Cantonment Board/Cantonment; T.C.: Town Committee/Town Area Committee; M.: Municipality; M.B.: Municipal Board; M.C.: Municipal Committee; M.Cl.: Municipal Council; M.Corp. Municipal Corporation; N.P.: Nagar Panchayat; N.A.C.: Notified Area Committee/Notified Area Council

Source: Census 2001

CHAPTER 6

CLIMATE CHANGE

There is enough evidence to indicate that a warming of the World's climate is happening. What is still being debated is how much, where and what will be the effects. So, without going into the specifics, the Task Force members recommended that the report should highlight a couple of major issues that the IHR states must start recognizing[59] and, therefore, start planning for.

When the temperature increases, rainfall will become erratic. Conventional food crops are likely to face moisture stress[60]. The pattern of pollination and pest incidence may also change. Consequently, there will be a fall in output[61] . This will generate pressures and movements to increase agricultural area as a measure of compensation. In the context of the IHR, encroachment is likely to take place in forests. Though forests and tree crops are bound to be more tolerant to climatic changes, traditional agriculturists cannot be persuaded to depend on these as a substitute for conventional food crops. Hence, IHR states must begin planning for such contingencies, including the possible mass movement into protected forest areas.

With uncertain rainfall, the conventional Water Towers may also experience stress. With shortage of water, both for crops and life, distribution problems may arise. If animal needs are neglected in the process, the livelihood of a large number of nomadic herder families will be in danger[62] .

Planning options may range from better water channeling projects, alternate irrigation methods (pitcher, drip, etc), improved, moisture stress resistant crops, better storage technologies (thereby, reducing losses), crop diversification[63], improved soil and moisture conservation methods, in situ pollinators, and so on. Changes in occupation, shifting from agriculture to something allied are also scenarios to be considered. Indirectly, the alternate opportunities that may be thrown open through skill upgradation and training may absorb some of the strain.

Besides agriculturists, climate change is likely to affect the movement pattern of herdsmen. Consequential pressures, again on alpine pastures, forests and localized water sanctuaries, are likely to increase. Options for this sector have to be studied post haste.

59 An upward movement of saplings of Himalayan pine (*Pinus wallichiana*) has been observed in higher altitudes. This pine is sensitive to climate change at its upper elevational limit in western Himalaya. (Dubey, B., Yadav, R.R., Singh, J. and Chaturvedi, R. 2003. Current Science, 85(8):1135-1136.

60 Under limited water availability, Water Use Efficiency (WUE) is critical relative to photosynthesis for the performance of plants. A decrease in WUE has been observed in case of Himalayan barley (*Hordeum himalayens*) with increasing temperature. Photosynthesis was also sensitive to higher temperature in this species and reduced with increasing temperature. The common barley (*Hordeum vulgare*) showed much less sensitivity to rise in temperature (Joshi SC and Palni LMS. 2005. Current Science, 89(5):879-882).

61 Despite an increase in the extent of land under apple orchards, total production is decreasing in district Kullu of Himachal Pradesh. This has been attributed to the changes in climate. During 1900s increase in maximum and minimum temperature has been recorded along with a decline in precipitation (average rainfall and snowfall) over the previous decade. (Ram, SC, Kuniyal, JC, and Rao KS. 2003. Climate changes and its impact on Apple cropping in Kullu valley, North-Western Himalaya, India. International Symposium on Temperate Zone Fruits in the Tropics and Subtropics. 14-18 October 2003, University of Horticulture and Forestry, Nauni-Solan, H.P).

62 Rhododendron and other woody species have already begun to invade alpine meadows, lush grazing fields, in the Valley of Flowers of Uttarakhand. (Singh, SP, Singh, V., and Skutsch, M. 2010. Climate and Development, 2:1:13; doi:10.3763/cdev.2010.0048)

63 It is possible to link livelihood issues to conservation in a way that leads to enhanced forest carbon stocks. For example, development of fodder based on grasses and legumes can reduce the need for people to lop tree branches. (Singh, SP. 2007. Climate change: An overview. Proceedings of the 15th National Symposium on Environment: Mitigation of Pollutants for Clean Environment. Macmillan India, Mumbai. pp. 24-29).

Climate change will mostly affect the most vulnerable. IHR states must have a special safety net for such people till they can be provided alternate livelihood options. It must also be remembered that many inhabitants of the IHR have, at various points of time faced unpredictable changes in weather, some extending over long periods. They may have learnt to recognise the natural telltale signs, popularly termed as 'bio-indicators' (e.g., early flowering in *Rododendron arboreum*). A study of these and an enumeration of their responses may not only help design acceptable remedial or reactive programmes, but indeed, may make these comprehendible. Scientific tables and graphs may not cut much ice with illiterate farmers or livestock herders. At this point, Task Force felt it necessary for flagging the issue to be critical for the future development of the IHR.

CHAPTER 7

GOOD GOVERNANACE

The Task Force has made its recommendations in as objective manner as was possible. Yet, the Task Force members are aware that decision taking at the level of State Governments is bound to be subjective and would be guided by political and pressure group interests. This is true for most recommendations and as economists believe, Government will ignore a recommendation from their advisors unless it suits them "and yet the economists routinely advise Government to act in the economy's interests rather than their own." [64]

Hence, the Task Force members hope that its recommendations would be discussed and debated at all levels of IHR Government including in the Panchayati Raj Institutions (PRIs) and the VI Schedule Areas for mass acceptance. The recommendations that are localized in nature (e.g. relating to zoning) need particular discussion at the community level so as to make the implementation acceptable, and therefore, possible.

Two broad areas of governance have primarily to be tackled at the level of IHR State Governments. The first one is infrastructure, and the second is service delivery. The approach to these two would guide the relevant supportive policy. Creating infrastructure is relatively easy; maintaining it and running it for the purpose meant is hugely difficult. An essential part of good governance would be to match all these three, in one package.

Service delivery is of two types. One is infrastructure based where beneficiaries have to come and seek services; the other is where service is delivered to a family at their doorstep. For the IHR, the Task Force recommends a preponderance of the second type. For instance, instead of expecting a householder to come to the hospital with her sick cow, the paramedics should first reach her in her home and only if home based treatment is not possible, she should be advised to take the sick animal to the hospital.

For effective service delivery, the cry of the country, including in the IHR, is for convergence. The Task Force would recommend that all the 8 IHR States should agree on a "Mission Convergence" that will dovetail all the State and national development/welfare projects for focused delivery. The strengths of one programme or the expertise of one programme management need to be leveraged by another that is weak in that aspect. To give a specific example, a self-help group (SHG) in the IHR that is effectively marketing local products outside the IHR should also be persuaded to take up the marketing responsibility of another self-help group which is weak in this. Each self help group need not duplicate all functions. Likewise, one SHG that trades in pulses may first serve the needs of another that buys pulses from the market for a school feeding programme. The Forest Department, likewise, may also promote fodder in its afforestation effort if the immediate need of the people is feed for their livestock.

Convergence of economic programmes at the field level can be specifically tasked to District Lead Banks under the supervision of district administration in consultation with the PRI or the traditional governance structure under the VI Schedule. Likewise, convergence of natural resource utilization and conservation, welfare and empowerment of its members can best be done by the PRIs/VI Schedule structure as they have the Constitutional and local mandate for this. Quite obviously, the PRIs, the Area and Village Councils, as well as the district administration will have to be supported through skilled consultants for bringing about such imaginative synergy and dovetailing.

In the VI Schedule areas, it is equally important that operating guidelines and rules are designed for laying down a framework for financial and administrative transactions. This will, to a large extent, take care of the apprehension of some north east state governments in releasing funds and functionaries to autonomous councils and village

64 Kausik Basu. Indian Express, 11th March, 2010, Delhi Edition

bodies. The Panchayat Raj Ministry is reportedly working out such guidelines, in consultation with the concerned states.

However laudable are the recommendations of any Task Force or the objectives of any policy on development and welfare, ultimately, it boils down to the efficiency of the delivery mechanism, with its systems, for translating intentions to outcomes. Upgrading the standards of administration in the (IHR) is a task that the Task Force recommends, has to be specifically addressed by all the IHR States, preferably with the help of professionals and academic bodies. The contents of the plan must cover personnel policies that identify the best persons for the task; allow sufficient tenure and equipment for task fulfilment; simultaneously develop technical systems that support efficient data collection, analysis, targeting and monitoring; reward performers; discipline non-performers; link inputs on a time schedule with the output target; fix direct as well as supervisory responsibilities to outputs; design outputs that can be measured and so on. The Task Force recommends the Convergence Mission to also look into issues of delivery in the IHR. Whether this should be in the form of a Himalayan Sustainable Development Forum, as was recommended by the Declaration following the Himalayan Chief Ministers' Conclave, October 30, 2009, Shimla, or in any other form is a decision best left to the IHR States. In this regard a recent publication25 may be taken note of, which forms part of broader climate change adaptation strategy, and puts together key guidelines related to the governance and management of the Himalayan Ecosystem, along with best practices.

There are some measures that are great confidence builders; these bridge the gap between decisions, programmes and the beneficiaries. Directly these also strengthen the link between the people behind policy making, programme implementation and the recipients. Two such confidence building measures are being highlighted and recommended by the Task Force.

One is the right to property. Every cultivable or liveable land and every habitation must be settled with the rightful occupier or a new allottee. The settlement has to be done jointly with the husband and the wife. Following such settlement, the confidence of the right holders to demand services will increase. Studies show that welfare programmes, if targeted to women instead of men, have a greater beneficial impact on the physical and mental health of the children of that family. Hence, all the welfare programmes that will, hopefully emanate from the recommendation of the Task Force, should be given to women.

The second confidence builder is an effective and functioning grievance redressal structure and machinery. This structure should primarily address grievances relating to land, drinking water, food and general health. But no separate mechanism or institutions is needed; with convergence, the existing general revenue administrative machinery and the PRIs / VIth Schedule institutions should be enabled to undertake this task. For instance, it should be possible for a person, wrongly ousted from his property to approach the block development officer or the concerned revenue or forest official surely, either in his or her office or in camp courts (which was in vogue earlier in many States) and get justice in an open and transparent manner. If refused, he or she should understand why. The chances of extremists taking advantage of the absence of such a situation must be curbed at this stage itself before it goes totally out of hand. If mechanisms that inform, like the educated press, public meetings, radio, television, even internet, are encouraged to function, and the authorities entrusted with the redressal of grievances or for providing development and welfare are ever alert, the people of the IHR are bound to join in wholeheartedly in all the initiatives.

Some believe that the building up of the "Force for the Future" should come from the country's youth. The Members of the Task Force are in agreement with this and strongly recommend the initiation of programmes that will "ignite" the young minds of the IHR; a word that was very dear to our earlier President.

The Task Force members believe that good governance is possible only with good politics, and that equity in social justice and delivery of services will lead to development which will benefit all. The IHR States must take a call on this.

CHAPTER 8

RECOMMENDATIONS

The issue wise recommendations of the Task Force have been made in the critically relevant chapters as well as in the chapter titled "Distilled Wisdom". The Task Force has deliberately not touched upon all conventional aspects and issues essentially because it sees no merit in the recommendations becoming a national plan document for the IHR. Instead, just the crucial items have been discussed with the hope that if these basics are addressed, the rest would flow and follow automatically.

This chapter is a further distillation of just the "super-critical" items and issues.

DEVELOPMENTAL ZONES

To maintain the primacy of the 'colours' based on eco-sensitivity, the Task Force recommends that the balance between natural resource exploitation and conservation should tilt in favour of the latter. Zones must be identified for appropriate activities such as:

- Zones of snow, alpine, sub-alpine areas and sacred landscapes to be protected at any cost, for maintaining the flow of vital ecosystem services and for respecting and preserving religio-cultural values,
- All natural water zones (glaciers, rivers, lakes, and springs) must be strictly protected. Activities in any of the zones that, in any way, adversely impact on water resources should be barred. Areas that harboured natural Springs must be converted to "Spring Sanctuaries" and this concept should be incorporated in all planning,
- Forest zones should be conserved and augmented for environmental services and biodiversity values. Such zones should also be available for sustainable bio and NTFP, including bamboo, prospecting, and for eco-tourism,
- Zones of fertile river valleys at lower altitudes should be utilized for maximizing agricultural production but conversion of agricultural land to other uses in such zones

should not be allowed. Areas where shifting or terraced agriculture is practiced should be earmarked for unique crops, organic agriculture, horticulture, agro-forestry, and for introducing better management practices,

- River zones for decentralized electricity production should be earmarked to meet the household and small industrial power requirements,
- Zones for habitation, especially of urban spaces: no construction should be undertaken in areas having slope above 30° or areas which fall in hazardous zones or areas falling on spring and aquifer lines and first order streams. Efficient sewage & municipal waste management systems should be mandatory in such places, and
- Zones for industry should only be in non fragile areas and include only those activities favourable to mountain conditions, processing non-toxic, preferably locally available raw materials, and generate local employment, while demonstrating efficient CSR and CER practices.

ROAD, RAIL AND AIR CONNECTIVITY

The recommendations of this Task Force will find acceptance if the people of the IHR are enabled to travel outside their village or towns for work or leisure; service providers are enabled to reach distant corners, and local produce is facilitated for reaching markets. This can be achieved only if there is a good combination of road, rail and air connectivity, each supporting the other. The Task Force has already commented on the road network. Now the Task Force recommends two loop railway lines – one for the Western Himalayan region connecting Jammu & Kashmir, Himachal Pradesh, and Uttarakhand, and the other for the North-Eastern Region. These two loops should be linked to each other through the existing national network of the northern and eastern railway. The road network of the IHR must link up with the rail network at appropriate places for performing the aforementioned functions. The road network should also be linked up with air services so as to provide opportunities for perishable goods and persons needing emergency health care to reach the rest of the country or outside. The Task Force recommends that every IHR state should have at least one small air-strip for accepting large helicopters and short take-off and landing planes. The airport should be located near the major production centre rather than the capital city of the state.

OTHER RECOMMENDATIONS

1. Mountain Perspective and Sensitization

Mountains are and should be treated as national treasures: of resource and opportunity; for today and tomorrow. Indeed, survival of the north and eastern plains of India, with their large population, will be difficult if IHR plans are faulty and short sighted. This would also mean that national policies[65] have to have a mountain perspective so that decisions taken for the rest of the country do not adversely affect the mountain environment, its resource and its people. Planners and policy makers particularly, have to be sensitized regarding the vulnerabilities as well as the importance of the IHR.

2. Education and Skill Development

Designing of mountain specific courses and skills for planners, administrators, engineers, social scientists, especially on all aspects of mountain ecology, geology, and marginal socio – economic conditions of the local population is of essence. Every IHR state is expected to continue to face a huge shortfall of qualified teachers, health care attendants and technicians, and architects in the next decade. IHR states must plan for meeting this demand with their human capital. Indirectly, this will ensure that basic livelihood issues will not lead to the destruction of the IHR's natural resources. All universities, institutes and training centres, especially in the IHR must expand their activities and redesign their courses to meet these challenges.

The Task Force also recommends that all the State, Central and major private sector

65 For example - Different norms for cost calculations in developmental projects like transportation cost of material from plains and on alternate mode of transportation than on motor vehicle., e.g., Ministry of Chemical & Fertilizer provides freight of Rs. 283 per MT on P & K fertilizers from railhead to consumption centres while the actual freight is Rs. 800-900 per ton in HP hence suppliers are reluctant to supply on account of loss.

funded academic and skill development and training institutes should be linked to each other through administrative as well as internet based structures. The aim is to ensure focussed and coordinated output, aimed at achieving the objectives of the IHR plans. Institutes within a state may decide on a Nodal institute for this purpose; and all such Nodal Institutes be included under a network that allows annual interactions, if not earlier, on a rotational basis. A State wise list of institutes functioning in the IHR states is given in Annexure III.

3. Natural Resource Analysis and Advisory Centre (NRAAC)

The Task Force recommends the upgradation of an existing institute or the establishment of a new institute on Natural Resource Analysis and Advisory Centre (NRAAC). This institute should have full digital data on the resource base of the IHR; should be able to analyse data to detect changes or see trends; and should be able to guide policy makers and planners on any activity that is likely to affect any resource or the environment of the region. Consultation with this body should be mandatory before any major activity in the IHR is undertaken. For effectively carrying out all the recommendations, and to support their planning as well as for much needed monitoring, all IHR states need to join in and establish a user friendly digital databank (spatial and non-spatial).

4. Strategic Environmental Assessment

A new perspective to replace the practice of project based environmental impact assessment (EIA), with Strategic Environmental Assessment (SEA) needs to be introduced.

5. Financial Incentives, Rewards, and Relaxations

Since the Task Force is recommending that the IHR states should be very restrictive in the use of their resources as this will be in the long term interest of the IHR as well as the country, it is logical then to suggest that the IHR states be compensated for this self denial of short term gain. The Task Force recommends the setting up of a dedicated, non lapsable Gap Fund and a compensation mechanism[66] for IHR states. The Gap Fund must, however, not be open ended; indeed, it should be linked to Good Politics and Good Governance. IHR states that do not show this, as per the perception of the Himalayan Development Forum, suggested in the Chapter on Governance, should not be able to leverage the funds. Such non conventional measures are recommended in the context of the importance and fragility of the IHR.

Norms for centrally sponsored schemes should be formulated on geographical parameters (climate & season[67], distance, topography, accessibility) rather than conventional parameters like human population[68]. In this regard certain welcome steps have been introduced in recent times by way of relaxation in norms under Centrally Sponsored and other Central Schemes for Hill Areas (e.g., Pradhan Mantri Gram Sadak Yojna, Sarva Shiksha Abhiyan, and National Rural Drinking Water Programme; details in Annexure IV). Different price policy for inputs and transportation of organic/niche specific crops of the mountains is required, coupled with an enabling framework to encourage the development IHR brand (e.g., eco-mark, energy star label). Relaxation in banking norms need to be considered for extending credit in areas where the traditional land tenure system restricts personal ownership or where land rights have not been surveyed and settled. In such situations (especially north-eastern region) social capital should be considered as a surrogate to land ownership.

6. Resource Sharing between IHR States

There is need for establishing resource sharing mechanisms and/or inter-exchange between the IHR states. For instance, extraction of petroleum and petroleum gas from Assam may first be used to satisfy the need and demand of the neighbouring IHR states. Likewise, IHR states should have

66 12th Finance Commission had set additional Rs. 1000 crore for maintenance of forests by States.
67 Modification in building codes with reference to the location, e.g., use of Solar energy in Laddakh.
68 Example -1st order priority for providing connectivity to unconnected habitations in mountains under PMGSY instead of 500+.

first charge on electricity generated in the region. Such policies will generate a great degree of goodwill.

7. Waterways and Ropeways

Of the three inland national waterways declared[69] so far in the country, the Sadiya-Dhubri stretch of river Brahmaputra (891 km) is in the IHR. The road network should match with this waterway to optimize the cost of transportation. Ropeways, steel-rope bridges and the like must be encouraged to continue providing time saving and environment friendly transport alternatives in the mountains. The legal frame work of Himachal Pradesh[70] can form the basis for the development and extension of such methods in the IHR.

8. Waste Management

Waste management is a challenging issue for the IHR. If not addressed right away, it may become the major cause of pollution of all the critical riverine systems and valleys. The easy alternative of burning, if adopted, would pollute the air and contribute towards warming of the localized climate. The Task Force, therefore, recommends immediate attention of the IHR states to this problem and suggests the formulation of schemes that address it from the production stage to the disposal. Financial incentives with legal control are recommended. Full advantage should be taken of national programmes for strengthening the capacity of local bodies for segregation, recycling and reuse of municipal solid and liquid waste, and for creating community awareness and community imposed self discipline. A small state like Mizoram has organized its youth to provide garbage bins at every roadside market, and remove the collection at the end of each day. Unfortunately, not knowing what to do with the waste, they are burning it along the hill slopes.

9. Disaster Preparedness and Mitigation

It is imperative, the Task Force feels, to zone stable areas for human settlements paying due attention to soil and slope conditions and proximity to natural drainage network and fault zones. Unstable zones must be identified and made strictly out of bounds for any human activity. Regulations governing the type of construction permissible within approved zones, heavy penalties for violation, compulsory rain water harvesting structures for all residences and commercial buildings above a prescribed plinth area, and for all offices; sewage disposal, solid waste management and drinking water supply should form the basic part of such master plan and regulation. Strict regulations during festivities and pilgrimages, estimating the carrying capacity of habitations, earthquake and fire resistant buildings, proper vacant spaces for refuge in times of emergency, forecasting and early warning systems, and rapid response mechanisms are measures that should be put in place at each sensitive location. IHR states should have no hesitation for spending money on competent consulting organizations that provide disaster management services.

10. Industries

Investments in this sector have to be regulated in order to protect the fragility of the region. Only in limited areas is it advisable to set up industries so that the adverse effect on the terrain and the water regime can be accepted if not countered. There is, however, some potential for development of small and cottage industries if imaginatively linked to tourist circuits. This will add value to locally available raw material, mainly of plant and animal origin, as well as some items that use up the mineral wealth. This will also provide dispersed employment.

11. Climate Change

Without going into the specifics, the Task Force members recommended that the IHR states must anticipate impending warming of the earth's climate, and therefore, encourage predictive research in order to plan for mitigating the adverse consequence.

69 Inland Waterway Authority of India.
70 The Himachal Pradesh Aerial Ropeways Act, 1968.

12. National Mission for Sustaining the Himalayan Ecosystem (NMSHE)

The launch of NMSHE, the only location specific mission, along with seven other thematic missions under the National Action Plan for Climate Change, is a clear indication of the importance being given to the Himalayan region at the highest level. The major recommendation of the Task Force is also to echo similar sentiments, and to suggest that this region should be accorded its rightful place in the planning process, giving due emphasis to mountain specificities. Since many factors well beyond the national boundaries, greatly influence this region, suitable policy framework will need to be put in place to take care of the need to exchange information with the South Asian countries and regional neighbours those who share the Himalayan ecology, as also recognized in the Mission document on NMSHE[71] .

First Step –

The IHR States must agree to a common essential platform for regular interaction and from therein, decide on a common essential plan for the region. Establishment of a Himalayan Development Forum for all IHR States is recommended. Planning inputs must come from existing institutions till NRAAC is established.

The plan must prioritise the zoning of the regions so as to be sure as to what is to be done or permitted where. This is likely to take care of the environmental and resource concerns.

Simultaneously, extensive grass root engaged programmes to develop mountain specific skills, technology and education must be launched. This will enable production of niche crops, using up least amounts of precious water, releasing minimal wastes, reaching easily accessible markets. Equally important would be the opportunities thrown up, for the people of the IHR, for providing specialized services to existing and emerging sectors of the local economy, to the rest of the country and abroad.

IHR governance must be designed to listen, deliver, and appreciate. The treasure house of the IHR must be enabled to grow as its people grow, and for this, the plan cannot follow the same pattern as for (like) or for (benefit of) the rest of the country.

71 National Action Plan on Climate Change, GOI (2008). http://pmindia.nic.in/Pg01-52.pdf

Annexure

List of Abbreviations

ACRP	Agro-Climatic Regional Planning
amsl	Above mean sea level
APDRP	Accelerated Power Development and Reform Programme
BPL	Below Poverty Line
BSNL	Bharat Sanchar Nigam Limited
CAT	Catchment Area Treatment Plan
CCTA	Cabinet Committee on Tribal Affairs
CEA	Central Electricity Authority
CER	Corporate Environmental Responsibility
CHEA	Central Himalayan Environment Association
CIC	Community Information Centres
C-NES	Centre for North East Studies and Policy Research
CSO	Central Statistical Organization
CSR	Corporate Social Responsibility
DRDO	Defence Research and Development Organization
EIA	Environment Impact Assessment.
EMP	Environmental Management Plan
EMRI	Emergency Management and Research Institute
FDI	Foreign Direct Investment
FD	Forest Department
FSI	Forest Survey of India
GBPIHED	G.B. Pant Institute of Himalayan Environment & Development
GDP	Gross Domestic Product
GEI	Gender Equality Index
GHG	Green House Gas
GIS	Geographical Information System
GLOF	Glacier Lake Outburst Flow
GOI	Government of India
GVA	Gross Value Added
HADP	Hill area development programme.
HDI	Human Development Index
HEP	Hydro Electric Power
HP	Himachal Pradesh
HPI	Human Poverty Index
HRD	Human Resource Development
ICT	Information and Communication Technology
IFAD	International Fund for Agricultural Development
IHR	Indian Himalayan Region
ISDN	Integrated Service Digital Network
ISP	Internet Service Providers
IUCN	International Union for Conservation of Nature
J&K	Jammu and Kashmir
JBS	Junior Basic School
JFM	Joint Forest Management
K	Potassium
LPG	Liquefied Petroleum Gas

LDO	Light Diesel Oil
Mcm	Million Cubic Meters
MECL	Mineral Exploration Corporation Limited
MoEF	Ministry of Environment & Forests
MSK	Medvedev-Sponheuer-Karnik Scale
MT	Metric Tons
MW	Mega Watts
N	Nitrogen
NAP	National Agriculture Policy
NE	North East
NEC	North Eastern Council
NEIIP	North East Industrial and Investment Policy
NEP	National Environment Policy
NEPED	Nagaland Environmental Protection and Economic Development
NERCORMP	North – Eastern Region Community Resource Management Project
NEREGA	National Rural Employment Guarantee Act
NFDB	National Fisheries Development Board
NHP	National Health Policy
NH	National Highways
NMSHE	National Mission for Sustaining the Himalayan Ecosystem
NPRR	National Policy on Resettlement and Rehabilitation
NRAAC	Natural Resource Analysis and Advisory Centre
NRSA	National Remote Sensing Agency
NTFP	Non-Timber Forest Products
NW	North West
P	Phosphorus
PAF	Project Affected Families
PAN	Protected Area Network
PURA	Providing Urban amenities in Rural Areas
ROI	Return On Investment
SASE	Snow & Avalanche Study Establishment
SATCOM	Satellite Communication Group
SC	Scheduled Castes
SEA	Strategic Environmental Assessment
SEIAA	Strategic Environment Impact Assessment Act
SEZ	Special Economic Zone
SKO	Super Kerosene Oil
SOI	Survey of India
SSI	Small Scale Industries
ST	Scheduled Tribes
STOL	Short take-off or Landing
UNDP	United Nations Development Programme
UT	Union Territory
VP	Van Panchayat
VSAT	Very Small Aperture Terminal
WB	West Bengal

1 Million = 10 Lakh

Annexure - I

No.M-13055/1/Task Force/2008-MLP
Planning Commission
(MLP Division)

Yojana Bhavan, Sansad Marg,
New Delhi-110 001
Dated: April 2, 2008

ORDER

Subject: Task Force to look into the Problems of Hill States and Hill Areas to suggest ways to ensure that these States and Areas do not suffer in any way because of their peculiarities.

In pursuance of the concluding observations made by the Hon'ble Prime Minister in the 54th Meeting of the NDC, a Task Force is set up for analyzing the problems of hill States and hill areas and for preparation of a proposal for comprehensive development of these States and areas over the next three to four years.

2. The composition of the Task Force is as under:

(i)	Shri G.B.Mukherji, Secretary, Ministry of Tribal Affairs	- Chairman
(ii)	Shri Haukhum Hauzel, Chief Secretary, Government of Mizoram	- Member
(iii)	Shri Lalhuma, Chief Secretary, Government of Nagaland	- Member
(iv)	Shri Deepak Sanan, Secretary, Department of Health, Government of Himachal Pradesh	- Member
(v)	Dr. Tej Pratap, Vice Chancellor, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur, Himachal Pradesh	- Member
(vi)	Prof. Mahendra P. Lama, Vice Chancellor, Sikkim University	- Member
(vii)	Shri Sanjoy Hazarika, Managing Trustee, Centre for North Eastern Studies and Policy Research, New Delhi	- Member
(viii)	Dr. Uppeandra Dhar, Director, G.B.Pant Institute of Himalayan Environment and Development, Almora	- Member
(ix)	Shri M.K. Khanna, Pr. Adviser (MLP), Planning Commission	-Member Convener

3. The Terms of Reference of the Task Force are as follows:

(i) To analyze the problems of hill States and hill areas relating to (a) connectivity (telephone/internet/transport) and (b) social infrastructure;

(ii) To identify the issues related to environmental sustainability and use of land and water resources. and their impact on the development process in these States;

(iii) To identify the norms in the Centrally Sponsored Scheme which need to be relaxed in order to ensure flow of funds to the Hill States.

(iv) To identify the requirements for training in various trades for enhancing the employability of educated unemployed youth;

(v) To suggest measures to ensure that economic and human resource development do not suffer because of the peculiar geographical conditions of these hill States / hill areas.

(vi) To suggest mechanisms(including PPP) and measures for capacity building which can deliver services more effectively as well as enable transparency and accountability.

4. The Task Force may entrust an Institution to collect, compile and analyze the findings and recommendations of various academic studies and reports on the subject as well as information as may be required for the preparation of the Report.

5. The Task Force will have powers to coopt institutions and individuals as experts as well as to provide supporting funds for travel to National and International institutions and field sites for getting the work done.

6. For official members, TA/DA will be met from the budgets of their own Departments. In case of non-official members, TA/DA as admissible to Class I officers of the Government of India will be borne by the Planning Commission.

7. The Task Force will submit its report within six months from the date of its constitution.

8. The Task Force will be serviced by MLP Division, Planning Commission. Dr. Indu Patnaik, Deputy Adviser(MLP), Planning Commission, Room No. 304, Yojana Bhavan, Tel. No. 23096525, Fax No. 23719900; email ipatnaik@nic.in, will be the nodal officer of this Task Force and any further query/correspondence in this regard may be made with her.

(S. Kesava Iyer)
Under Secretary to the Government of India

To

Chairman, Members and Member Convenor of the Task Force

Copy to :

1. Principal Secretary to the Prime Minister
2. PPS/PS to DCH/MOS/Members
3. PS to Secretary, Planning Commission
4. PPS/PS to all Principal Advisers/ Senior Advisers/ Advisers/JS(SP), Planning Commission

(S. Kesava Iyer)
Under Secretary to the Government of India

No.M-13055/1/Task Force/2008-MLP
Planning Commission
(MLP Division)

Yojana Bhavan, Sansad Marg,
New Delhi-110 001
Dated: June 16, 2008

ORDER

Subject: Task Force to look into the Problems of Hill States and Hill Areas to suggest ways to ensure that these States and Areas do not suffer in any way because of their peculiarities.

In supersession of the Task Force, set up vide Order of even number dated April 2, 2008, for analyzing the problem of Hill States and Hill Areas and for preparation of a proposal for comprehensive development of these States and Areas over the next three to four years, the revised composition of the Task Force is as under:

(i)	Shri G. B. Mukherji, Secretary, Ministry of Tribal Affairs	Chairman
(ii)	Shri Haukhum Hauzel, Chief Secretary, Government of Mizoram	Member
(iii)	Shri Lalhuma, Chief Secretary, Government of Nagaland	Member
(iv)	Shri Deepak Sanan, Principal Secretary, Department of Health, Government of Himachal Pradesh	Member
(v)	Dr. Tej Pratap, Vice Chancellor, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidhyalaya, Palampur, Himachal Pradesh	Member
(vi)	Prof. Mahendra P. Lama, Vice Chancellor, Sikkim University	Member
(vii)	Shri Sanjoy Hazarika, Managing Trustee, Centre for North Eastern Studies and Policy Research, New Delhi	Member
(viii)	Dr. L. M. S. Palni, Director Incharge, G. B. Pant Institute of Himalayan Environment & Development, Almora	Member
(ix)	Dr. Uppeandra Dhar, Former Director, G. B. Pant Institute of Himalayan Environment & Development, Almora	Member
(x)	Principal Adviser (MLP), Planning Commission	Member-Convener

2. The Terms of Reference of the Task Force will remain the same which are as follows:

(i) To analyze the problems of hill States and hill areas relating to (a) connectivity (telephone/internet/transport) and (b) social infrastructure;
(ii) To identify the issues related to environment sustainability and use of land and water resources and their impact on the development process in these States;
(iii) To identify the norms in the Centrally Sponsored Scheme which need to be relaxed in order to ensure flow of funds to the Hill States.

(iv) To identify the requirements for training in various trades for enhancing the employability of educated unemployed youth;
(v) To suggest measures to ensure that economic and human resource development do not suffer because of the peculiar geographical conditions of these hill States / hill areas.
(vi) To suggest mechanisms (including PPP) and measures for capacity building which can deliver services more effectively as well as enable transparency and accountability.

3. The Task Force may entrust an Institution to collect, compile and analyze the findings and recommendations of various academic studies and reports on the subject as well as information as may be required for the preparation of the Report.

4. The Task Force will have powers to coopt institutions and individuals as experts as well as to provide supporting funds for travel to National and International institutions and field sites for getting the work done.

5. For official members, TA/DA will be met from the budgets of their own Departments. In case of non-official members, TA/DA as admissible to Class I officers of the Government of India will be borne by the Planning Commission.

6. The Task Force will submit its report within six months from the date of its constitution.

7. The Task Force will be serviced by MLP Division, Planning Commission. Dr. Indu Patnaik, Deputy Adviser (MLP), Planning Commission, Room No. 304, Yojana Bhavan, Tel. No. 23096525, Fax No. 23719900; email ipatnaik@nic.in, will be the nodal officer for this Task Force and any further query / correspondence in this regard may be made with her.

S. Kesava Iyer 16/6/08

(S. Kesava Iyer)
Under Secretary to the Government of India

To

Chairman, Members and Member Convener of the Task Force

Copy to :
1. Principal Secretary to the Prime Minister
2. PPS/PS to DCH/MOS/Members
3. PS to Secretary, Planning commission
4. PPS/PS to all Principal Advisers/ Senior Advisers/ Advisers/JS(SP), Planning Commission

S. Kesava Iyer 16/6/08

(S. Kesava Iyer)
Under Secretary to the Government of India

No.M-13055/1/Task Force/2008-MLP
Planning Commission
(MLP Division)

Yojana Bhavan, Sansad Marg,
New Delhi, Dated the 10th November, 2008

ORDER

Subject: Task Force to look in to the Problems of Hill States and Hill Areas to suggest ways to ensure that these States and Areas do not suffer in any way because of their peculiarities - Extension of period- regarding.

A Task Force was set up, under the Chairmanship of Shri G.B.Mukherji, Secretary, Tribal Affairs, vide Order of even number dated 2.4.2008, to look into the Problems of Hill States and Hill Areas to suggest ways to ensure that these States and Areas do not suffer in any way because of their peculiarities. The Task Force was to submit its report within six months from the date of its constitution i.e. by 2.10.2008.

2. It has now been decided with the approval of the Competent Authority to grant extension of six months i.e. up to 2.4.2009 for submitting the report.

S. Kesava Iyer 10/11/08
(S.Kesava Iyer)
Under Secretary to the Government of India.

Copy to:

1. Shri G.B.Mukherji, Secretary, Ministry of Tribal Affairs	Chairman
2. Shri Haukhum Hauzel, Chief Secretary, Government of Mizoram	Member
3. Shri Lalhuma, Chief Secretary, Government of Nagaland	Member
4. Shri Deepak Sanan, Secretary, Department of Health, Government of Himachal Pradesh	Member
5. Dr. Tej Pratap, Vice Chancellor, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur, Himachal Pradesh	Member
6. Prof. Mahendra P. Lama, Vice Chancellor, Sikkim University	Member
7. Shri Sanjoy Hazarika, Managing Trustee, Centre for North Eastern Studies and Policy Research, New Delhi	Member
8. Dr. L.M.S.Palni, Director Incharge, G.B.Pant Institute of Himalayan Enviornment and Development, Almora	Member
9. Dr. Uppeandra Dhar, Ex-Director, G.B.Pant Institute of Himalayan Enviornment and Development, Almora	Member
10. Principal Adviser (MLP), Planning Commission	Member – Convener

Copy for information to:

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2.PPS/PS to DCH/MOS/Members
3.PS to Secretary, Planning Commission
4.PPS/PS to all Principal Advisers/Senior Advisers/JS(SP), Planning Commission

S. Kesava Iyer 10/11/08
(S.Kesava Iyer)
Under Secretary to the Government of India.

No. M-13055/1/Task Force/2008-MLP
Planning Commission
(MLP Division)

Yojana Bhavan,Sansad Marg,
New Delhi, Dated 8th May,2009.

ORDER

Subject: Task Force to look in to the problems of Hill States and Hill Areas to suggest ways to ensure that these States and Areas do not suffer in any way because of their peculiarities-Extension of period-regarding.

A Task Force was set up, under the Chairmanship of Shri G.B.Mukherji, Secretary, Ministry of Tribal Affairs, vide order of even number dated 02.04.2008, to look into the Problems of Hill States and Hill Areas to suggest ways to ensure that these States and Areas do not suffer in any way because of their peculiarities. The Task Force was to submit its report within six months from the date of its constitution. Later, the term of the Task Force was extended by another six months i.e. upto 02.04.2009.

2. It has now been decided with the approval of the Competent Authority to grant further extension of six months i.e. up to 02.10.2009 for submitting the report and to modify the composition of the Task Force to include Shri Vanhela Pachuau, Chief Secretary,Government of Mizoram as the Member in place of Shri Haukhum Hauzel.

(S.Kesava Iyer) 8/5
Under Secretary to the Government of India

Copy to:

1.	Shri G.B.Mukherji, Secretary, Ministry of Tribal Affairs	Chairman
2.	Shri Vanhela Pachuau, Chief Secretary,Government of Mizoram	Member
3.	Shri Lalhuma, Chief Secretary, Government of Nagaland	Member
4.	Shri Deepak Sanan, Secretary, Department of Health, Government of Himachal Pradesh	Member
5.	Dr.Tej Pratap, Vice Chancellor, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur, Himachal Pradesh	Member
6.	Prof. Mahendra P. Lama, Vice Chancellor, Sikkim University	Member
7.	Shri Sanjoy Hazarika, Managing Trustee, Centre for North Eastern Studies and Policy Research, New Delhi	Member
8.	Dr. L.M.S.Palni,Director Incharge, G.B.Pant Institute of Himalayan Enviornment and Development , Almora	Member
9.	Dr. Uppeandra Dhar, Ex-Director, G.B.Pant Institute of Himalayan Enviornment and Development , Almora	Member
10.	Principal Adviser,(MLP), Planning Commission	Member-Convener

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2. PPS/PS to DCH/MOS/Members, Planning Commission
3. PS to Secretary, Planning Commission
4. PPS/PS to all Principal Advisers/Senior Advisers/JS(SP), Planning Commission

(S.Kesava Iyer) 8/5
Under Secretary to the Government of India

No.M-13055/Task Force/2008-MLP
Government of India
Planning Commission
(MLP Division)

Yojana Bhavan, Sansad Marg,
New Delhi, dated the 4th January, 2010

ORDER

Subject:- Task Force to look into the problems of Hill States and Hill Areas to suggest ways to ensure that these States and Areas do not suffer in any way because of their peculiarities – Extension of period – regarding.

A Task Force was set up, under the Chairmanship of Shri G.B. Mukherji, Secretary, Ministry of Tribal Affairs, vide Order of even number dated 2nd April, 2008, to look into the problems of Hill States and Hill Areas to suggest ways to ensure that these States and Areas do not suffer in any way because of their peculiarities. The Task Force was to submit its report within six months from the date of its constitution. Later, the term of the Task Force was extended on two occasions for six months each i.e. upto 02.10.2009.

2. It has now been decided with the approval of the Competent Authority to grant further extension of six months (i.e. upto 02.04.2010) to the Task Force for submitting its report.

(S. Kesava Iyer)
Under Secretary to the Government of India

Copy to:-

1.	Shri G.B. Mukherji, Secretary, Ministry of Tribal Affairs	Chairman
2.	Shri Vanhela Pachuau, Chief Secretary, Government of Mizoram	Member
3.	Shri Lalthara, Chief Secretary, Government of Nagaland	Member
4.	Shri Deepak Sanan, Secretary, Department of Health, Government of Himachal Pradesh	Member
5.	Dr. Tej Pratap, Vice Chancellor, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur, Himachal Pradesh	Member
6.	Prof. Mahendra P. Lama, Vice Chancellor, Sikkim University	Member
7.	Shri Sanjoy Hazarika, Managing Trustee, Centre for North Eastern Studies and Policy Research, New Delhi	Member
8.	Dr. L.M.S. Palni, Director In-charge, G.B. Pant Institute of Himalayan Environment and Development, Almora, Uttarakhand	Member
9.	Dr. Uppeandra Dhar, Ex-Director, G.B. Pant Institute of Himalayan Environment and Development, Almora 11, SBI Apartments, Sector 46, Faridabad	Member
10.	Adviser (MLP), Planning Commission	Member-Convener

Copy for information to:-

1. Principal Secretary to the Prime Minister
2. PPS/PS to DCH/MOS/Members, Planning Commission
3. PS to Secretary, Planning Commission
4. PPS/PS to all Principal Advisers/Senior Advisers/JS(SP), Planning Commission

(S. Kesava Iyer)
Under Secretary to the Government of India

No.M-13055/1/Task Force/2008-MLP
Government of India
Planning Commission
(MLP Division)

Yojana Bhavan, Sansad Marg,
New Delhi, dated the 15th April, 2010

ORDER

Subject:- Task Force to look into the problems of Hill States and Hill Areas to suggest ways to ensure that these States and Areas do not suffer in any way because of their peculiarities – Extension of period – regarding.

A Task Force was set up, under the Chairmanship of Shri G.B. Mukherji, Secretary, Ministry of Tribal Affairs, vide Order of even number dated 2nd April, 2008, to look into the problems of Hill States and Hill Areas to suggest ways to ensure that these States and Areas do not suffer in any way because of their peculiarities. The Task Force was to submit its report within six months from the date of its constitution. Later, the term of the Task Force was extended on three occasions for six months each i.e. upto 02.04.2010.

2. It has now been decided with the approval of the Competent Authority to grant further extension upto 31.07.2010 to the Task Force for submitting its report.

(S. Kesava Iyer)
Under Secretary to the Government of India

Copy to:-

1.	Shri G.B. Mukherji, Secretary, Ministry of Tribal Affairs	Chairman
2.	Shri Vanhela Pachuau, Chief Secretary, Government of Mizoram	Member
3.	Shri Lalthara, Chief Secretary, Government of Nagaland	Member
4.	Shri Deepak Sanan, Secretary, Department of Health, Government of Himachal Pradesh	Member
5.	Dr. Tej Pratap, Vice Chancellor, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur, Himachal Pradesh	Member
6.	Prof. Mahendra P. Lama, Vice Chancellor, Sikkim University	Member
7.	Shri Sanjoy Hazarika, Managing Trustee, Centre for North Eastern Studies and Policy Research, New Delhi	Member
8.	Dr. L.M.S. Palni, Director In-charge, G.B. Pant Institute of Himalayan Environment and Development, Almora, Uttarakhand	Member
9.	Dr. Uppeandra Dhar, Ex-Director, G.B. Pant Institute of Himalayan Environment and Development, Almora 11, SBI Apartments, Sector 46, Faridabad	Member
10.	Adviser (MLP), Planning Commission	Member-Convener

Copy for information to:-

1. Principal Secretary to the Prime Minister
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3. PPS to Secretary, Planning Commission
4. PPS/PS to all Principal Advisers/Senior Advisers/JS(SP), Planning Commission

(S. Kesava Iyer)
Under Secretary to the Government of India

Annexure – II

OVERVIEW OF THE PAST APPROACHES FOR DEVELOPMENT IN THE IHR:

1. National Commission on Development of Backward Areas (1981)

The Commission under the Chairmanship of Sri B. Shivaraman devoted one volume of its report to development of backward hill areas of the country, its key recommendations were:

- The focus of development planning should be on (i) complimentarily of the hills and plains within a regional and national frame or and (ii) integrated approach encompassing ecological, economic and sociological dimensions.
- Developmental plans should be made at two levels, i.e. the region, and sub watersheds within the region.
- The strategy of development should include people's (especially women's) participation as a central feature.
- Agro-forestry and pasture development should be given due importance.
- Forests being the single largest land-use category – development of forests with emphasis on increasing productivity of reserved forest, proper management of community lands and participatory plantations for waste land development, should be given importance.
- Increased agricultural productivity through appropriate technological intervention that are profitable, create jobs, and reliable, and should be the major means of increasing purchasing power of the people. Land consolidation should be attempted keeping economic and ecological conditions in view. Promotion of animal husbandry should be the integral part of all development plans.
- The pivotal role of women in the process of development should be recognized and education, training and extension programmes should be designed in such a way so that these can reach them.
- Provision of infrastructural facilities like roads, water supply, hospital and other services.

2. Task Force for the Study of Eco-development in the Himalayan Region (1982)

The Task Force, under the Chairmanship of Dr. M.S. Swaminathan, in its report on Eco-development in the IHR recommends the following:

- Identified faulty use of principal resources of the region i.e. soil, forests and water as the primary factor for widespread degradation and framed its core strategy for the socio-economic development of the region through determination of correct land use, intensification of agriculture, recharging of water sources, afforestation and adoption of cash crops.
- The report also laid emphasis on the need for co-ordinated research on action oriented basis, post harvest technology and transport planning.

3. Working Group on Hill Area Development Programme for VII Five Year Plan (1985)

The approach and strategy evolved for the development of hill areas in 1981 has since not been followed uniformly in different hill states, the Working Group therefore recommended that a suitable mechanism had to be devised to ensure that uniform development opportunities are provided in all the categories of hill areas. The group recommended the following criteria for defining the hill areas of the country:

- area with average slopes of 30% and above may be treated as hill areas;
- all developmental blocks/talukas with 40% of their geographical area with an average slope of 30% or more may be designated as hill blocks/talukas;

- All compact regions with geographical area of 100 sq. kms. or more with an average slope of 30% or more within a block or located in more than one administrative unit may be designated as mini-tracts, and
- The hill areas of less than a 100 Km^2. should be within the technical, administrative and financial competence of micro-level planning in the respective states and should be adequately provided for in State Plans.

The group made elaborate recommendations for allocation of funds in two distinct categories of (i) Himalayan hill areas and (ii) sub-continental hill areas. It also re-emphasized that the focus of the planning process should be on the (i) complementarily of the hills and plains within the regional and the national frame work and the (ii) integrated view of ecological, economic and sociological aspects of hill area development with the common man as the central figure.

The suggested strategy centers round the active participation of the people, particularly of women, in the fulfillment of their basic needs viz. food, fuel, fodder and drinking water etc, whereas agro-forestry and pastoral economy were suggested as the corner-stone of hill area development. Need for scientific land-use pattern with adoption of appropriate technology was also suggested to be followed keeping socio-economic and ecological conditions in view. Problems of shifting cultivation, plantation policy in horticulture, animal husbandry programmes, fuel policy, need to be reviewed. The growth of towns in the hill areas should be strictly regulated keeping in view the ecological considerations. The recommendations for utilization and development of natural resources were also made.

4. Action Plan for Himalaya (1992)

The above action plan suggests mechanisms for ecologically sound economic development of the Himalayan region, and enumerates sector wise priority actions, covering both research based and development activities, in addition to management aspects required for increasing the pace of environmentally sound development in the region.

5. Expert Group on National Policy on Integrated Development of Himalaya (1993)

The report of the Expert Group Chaired by Dr. S.Z. Qasim emphasized the need to provide an insight into the major problems of the IHR as a whole and recognized the need for participatory approaches for sound socio-economic development of the region. The recommendations of the expert group include: constitution of a Himalayan development authority, creation of national Himalayan environment and development fund, enlarged role of the Ministry of Environment and Forests, linkage and co-operation of scientific institution, interaction of natural sciences with social sciences, preparation of guidelines for development projects in states, conservation of biodiversity and genetic resources, maintenance of forest cover and its sustainable management, development of agriculture and allied activities, marketing of horticultural products to neighbouring countries, improving Jhum cultivation, irrigation, energy, promote non-farm economic activities, promote health, nutrition and family welfare, preparedness for coping with natural hazards in earthquake-prone areas, strengthening road network and other modes of communication, promote environment friendly and ethical tourism, development of tribal populations, institutional arrangements in states for facilitating involvement of NGOs and voluntary organization, and explore / generate source of funding.

6. High Level Commission Report on Transforming the North-Eastern Region (1997)

The Prime Minister's economic package and offer of unconditional talks announced on the occasion of his visit to the north-eastern region in 1995 had aroused great expectations among the local people of the region. Consequently a commission was appointed under the chairmanship of Shri S. P. Shukla

to recommend measures to create good infrastructural facilities and bridge Basic Minimum Service Gap to bring the North-East at par with the rest of the country within the next five to ten years in a process of poverty alleviation and infrastructural upgradation. The major recommendations were related to strengthening sectors like farm, horticulture and plantations, animal husbandry and fisheries, irrigation, forests, environment, transport and inland water transport, civil aviation, communication and broadcasting, hydrocarbon, power, industry including cottage industries and handicrafts, urban and, trade and transit, tourism, and banking and finance. The commission also recommended additional resource mobilization for the region, creation of north eastern development council and strengthening political infrastructure.

7. Task Force on the Mountain Ecosystems for the 11th Five Year Plan (2006)

- The Task Force report under the Chairmanship of Dr. R. S. Tolia presents an analysis of current knowledge and status of sustainable use of mountain ecosystems and a number of gaps have been identified in natural resource management.
- Recommendations for better resource management include: (i) subsidy for fossil fuel to the hill communities (ii) modernize forest and wildlife management (iii) strengthen agro-forestry in the region (iv) improve Protected Area - People relationships (v) participatory resource management and (vii) more research on the ecosystems functioning and services in the mountain areas.
- It subsequently deals with an analysis of available information on potential impacts of climate change on the mountain ecosystems and the main recommendations for the IHR (besides recommendation for strict adherence of Kyoto Protocol at the country level) include: establishing a network of meteorological stations and adequate infra-structure for integrated climatological research across the IHR; revamping Clean Development Mechanism across IHR; monitoring glacial recession and extending glaciological programmes to Eastern Himalayas; disease surveillance and developing forecasting system for vector borne diseases; bio-prospecting for future crops, and long term ecological research on climate – endangered species – ecosystem relationships.
- Based on thorough review of institutional and individual capacities available to address issues related to conservation and sustainable use of mountain ecosystems the report concludes that very little efforts have been made to harness growing expertise for the conservation and development of IHR. Certain priority areas have been identified for capacity building viz., Training on EIA Procedures, Green Roads Engineering, Technology for management of hazardous waste, Mountain Hydrology, Water Harvesting Technology, and Rangeland Management. New Institutes visualized are Mountain Farming System Research and Centre for Mountain Studies. It is also emphasized that all organizations working in the IHR are required to be brought together to address vital environmental issues. This could be possible through (i) giving new role to local traditional institutions based in rural areas (ii) creating a synergy amongst different organizations, mountain scholars, and social workers, and (iii) recognizing social institutions, social sanctions, local culture and traditional knowledge systems.
- The task force also felt that the sectoral approach which has been taken so far would not be of much use to integrated mountain environment and development, therefore the scope of Ministry for the Development of the North – Eastern Region be broadened by incorporating the three states of Western Himalayas viz., Uttarakhand, Himachal Pradesh and Jammu & Kashmir. This would be the most logical step for an integrated planning of the Himalayan region at the national level.
- The report also provides review of the new EIA guidelines issued by MoEF in 2006 and suggests certain measures to strengthen the State Environment Impact Assessment Authorities (SEIAAs) including strict compliance of EMPs and CAT Plans.

8. Himalayan Mission under National Action Plan on Climate Change (2008)

Under the direct guidance of the Prime Minister's Council on Climate Change, India's National Action

Plan on climate change has been recently developed, which was released on 30 June, 2008. Of the eight core national missions of the plan, the Mission for sustaining the Himalayan Ecosystem aims to conserve biodiversity, forest cover and other ecological values in the IHR and to evolve management measures for sustaining and safeguarding the Himalayan glaciers.

9. The NE Region Development Vision 2020 (2008)

Ministry for the Development of the IHR Region has prepared a vision document for the eight states of North-Eastern region of the IHR. The vision document, which was adopted by North East council on 13 May 2008, emphasizes the following:

- To return the NE region to the position of national economic eminence that the region had held few decades ago.
- To create infrastructure for focusing agriculture, industrialization, connectivity and human resource development.
- Earmarking of 10% allocation of a non-lapsable pool of funds received through central assistance for NE Region.

10. Research and Development (R&D) projects funding in the Indian Himalayan Region

About 5.3% projects (out of the total R&D projects) had a focus on the IHR (1985-86 to 1998-99) with only 4.5% fund allocation out of the total R&D expenditure in the country.

11. Governance for Sustaining Himalayan Ecosystem (G-SHE) – Guidelines & Best Practices (2009)

In view of the need for clear guidelines for sustainable management and governance of the Himalayan Ecosystem, a recent initiative of Ministry of Environment & Forests (Govt. of India) in the form of "Working Document" puts together key guidelines along with case studies from various regions. The guidelines in this document cover a wide variety of issues- including urbanization, tourism, water security, energy, forest management and infrastructure- all of which are highly pertinent as the Himalayan region faces new and increased challenges and pressures.

12. Shimla Declaration on Sustainable Himalayan Development (2009)

In the first Himalayan Chief Ministers' Conclave, held at Shimla, it was resolved that challenges of climate change and sustainable development will be faced jointly and following actions were identified –

- Establishment of a Himalayan Sustainable Development Forum
- Setting up State Councils for Climate Change
- Catalyzing Research for Policy Action
- Payment for Ecosystem Services
- Managing Water Resources for Sustainable Development
- Challenges of Urbanisation
- Green Transport
- Dealing with impacts of climate change on livelihoods
- Decentralized energy security
- Managing growth of eco-friendly tourism and pilgrimage
- Green Industry
- Green Job Creation

Annexure – III

List of Some of the Scientific Institutions in the Himalayan region

S.N	Institution
1	Forest Research Institute (FRI), Dehradun
2	Himalayan Forest Research Institute(HFRI), Shimla
3	Rain Forest Research Institute (RFRI), Jorhat
4	Central Soil & Water Conservation Research & Training Institute(CSWCRTI), Dehradun
5	Botanical Survey Of India,(BSI), Regional Centres
6	Forest Survey Of India (FSI), Dehradun
7	GB Pant Institute Of Himalayan Environment & Development (GBPHIED), HOs at Almora and units in HP, Uttarakhand, Sikkim and Itanagar
8	Wildlife Institute Of India (WII), Dehradun
9	Zoological Survey Of India (ZSI), Regional Centres
10	State Forest Research Institute, Itanagar
11	Central Institute of Temperate Horticulture (CITH), Srinagar
12	Centeal Potato Research Institute (CPRI), Shimla
13	Vivekanand Parvatiya Krishi Anusandhan Shala (VPKAS), Almora
14	National Research Centre for Mithun (NRCM), Nagaland
15	National Research Centre for Yak (NRCY), Arunachal Pradesh
16	National Research Centre For Orchids (NRCO), Sikkim
17	National Research Centre For Mushroom (NRCM), Solan
18	National Research Centre On Coldwater Fisheries (NRCCWF) Bhimtal
19	National Bureau Of Plant& Genetic Resources (NBPGR), Regional Centres
20	Regional Research Laboratories at Jammu & Jorhat
21	Institute Of Bioresources & Sustainable Development, Imphal
22	Institute of Himalayan Bioresources And Technology (IHBT), Palampur
23	Wadia Institute of Himalayan Geology (WIHG), Dehradun
24	Indian Institute of Remote Sensing (IIRS), Dehradun
25	Centre for Space Sicence and Technology Education in Asia & Pacific (affiliated to United Nations; CSSTEAP), Dehradun
26	Regional Remote Sensing Service Centre (RRSSC), Dehradun
27	North-eastern Space Application Centre (NESAC), Shillong
28	Geological Survey of India (GSI), Regional Centres
29	High Altitude Plant Physiology Research Centre (HAPPRC), Srinagar (Garhwal)
30	Indian Institute Of Technology, Roorkee
31	Defence Institute of High Altitude Research (DIHAR), Leh
32	Laboratories of Defence Research Development Organisation (DRDO)
33	Snow And Avalanche Study Establishment (SASE), Manali
34	North East Region Institute For Water & Land Management (NERIWALM),Tezpur
35	The Energy Research Institute(TERI), Mukteshwar

Universities in IHR

North-Eastern Hill University, Shillong

Nagaland University, Kohima

Mizoram University, Aizawal

Arunachal University, Itanagar

Tripura University, Agartala

Assam University. Silchar

Tezpur University, Tezpur

Gauhati University, Guwahati

Assam Agriculture University, Jorhat

Dibrugarh University, Dibrugarh

Sikkim University, Gangtok

Sikkim Manipal University, Sikkim

GB Pant University Of Agriculture & Technology, Pantnagar

Doon University, Dehradun

University of Petroleum & Energy Studies, Dehradun

Uttarakhnad Technical University, Dehradun

H.N.B. Garhwal University, Srinagar (Garhwal)

Uttarkhand Open University, Haldwani

Kumaun University, Nanital

Y.S. Parmar University Of Horticulture, Solan

Himachal Pradesh University, Shimla

Sher – E- Kashmir Agriculture University, Srinagar

Kashmir University, Srinagar

Jammu University, Jammu

Annexure – IV

Hill Areas-Relaxation of Norms under Centrally Sponsored and other Central Schemes

1. Pradhan Mantri Gram Sadak Yojana

   While in the plain areas the norm for coverage is habitations with population of 500 persons and above, for hill areas habitations with population 250 and above are to be covered. As per the guidelines for the scheme, the population, as recorded in the Census 2001, is the basis for determining the population size of the Habitation, "The population of all Habitations within a radius of 500 metres (1.5 km. of path distance in case of Hills) may be clubbed together for the purpose of determining the population size. This cluster approach would enable provision of connectivity to a larger number of Habitations, particularly in the Hill / mountainous areas". In addition districts sharing borders with Pakistan, China, Myanmar, Bangladesh and Nepal get additional allocations from the rural roads share of diesel cess. Further, these States have been allowed to submit the estimates in two parts, if required, so that black topping can be carried out after two rainy seasons to ensure adequate stabilization of the side slopes.

2. Sarva Shiksha Abhiyan

   Construction of one residential hostel, for both boys and girls has been allowed, in blocks which have a population density of less than 20 persons per square Kilometre.

3. National Rural Drinking Water Programme

   In the criteria for allocation of funds, 40% weightage is given to Special Category Hill States and States with Desert Development Programme (DDP), Drought Prone Area Programm (DPAP) and Hill Areas Development Programme.

Organic manure in traditional agriculture of Uttarakhand

Women Drudgery & traditional Fuel