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MOUNTAIN ENVIRONMENT AND NATURAL RESOURCES MANAGEMENT *

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Honourable Chief Minister of Himachal Pradesh, esteemed Vice-Chancellor, respected colleagues, fellow delegates and students I am grateful to the organizers of the 12th Annual Conference of Association of Punjab Geographers for giving me this opportunity to deliver the keynote address to the galaxy of scholars driven from all over India. Since the conference was being hosted by Himachal Pradesh University, located in the midst of Himalayas, it was natural for the organisers to select Mountain Environment and Natural Resources Management as its focal theme for the deliberations. The Himalayas play a key role in the global atmospheric circulation and any alterations in the region's ecological balance has global ramifications. We all are aware that during the last few decades the climatic conditions in the Himalayas have undergone significant changes. Consequently, higher regions have also become suitable for horticulture, the tree-line has shifted altitudinally upward, snow beds and glaciers are melting rapidly. All these changes in the mountain environment cry for a comprehensive vulnerability mapping of the entire Himalayan belt so as to set the regional priorities and to prepare a comprehensive regional plan for management of mountain environment in accordance with this vulnerability index

mapping.

In the Himalayas, which are studded with unimaginable variety of natural landscape, one often encounters unique eco-systems that are immensely vulnerable to environmental degradation. Himalayas, in fact, offer a rich natural laboratory for intensive research on the management of mountain environment. Also we all are aware that the Himalayas, the most beautiful gift of nature, face a serious threat of mismanagement due to ever increasing population pressure and rapidly increasing accessibility of the so far difficult terrain.

Environmental studies have been the first love of geography and the geographers. A geographer, by his training, is better equipped to visualise the comprehensiveness of the trinity of space (Place, Folk and Work) and the correlations thereof. He is trained to visualise any phenomenon, say natural resources, not in isolation but in integration with the regional space. Geographer of the day is now fortunately equipped with more sophisticated tools of analysis such as remote sensing and geographic information system (GIS). Geography is truly a spatial science interested not only in understanding but also rationalising the spatial organisation through spatial planning. The spatial planning, in its theory and practice, all through its history of about 100 years, has

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oscillated between natural resource orientation, regional science orientation, cultural regionalism orientation, regional economic development orientation, urban metropolitan orientation, and spatial systems reorganisation orientation, often overlapping with each other. The growing concern for environmental issues in the recent past tends to give practical orientation to geographic thinking. It is my strong belief that with his better understanding of the totality of environment of a given regional space, geographer can help avoiding the derailment of all our policies in the field of natural resource management.

Management of key natural resources of soil, water and vegetation had been practiced by the farmers ever since the pre-Vedic times when they occupied a prestigious place in the social hierarchy and hence emerged as the key managers of natural resources at micro-level. Although people's participation in environment management practices is critical in case of all areas, it is more true of the mountainous belt. Also the wisdom lies in making the best use of local mountainous people's knowledge in this regard as the same has stood the test of time. Wisdom of local farmers with respect to watershed development, agricultural management, conservation of soils, water etc. is of immense significance for formulating strategies for sustainable development of such areas. No strategy for management of natural resources can be successful if it does not match with rationality matrix of the locals. Needless to stress that the natural resources of the mountainous belts in India have suffered greater exploitation that found its expression in an unmindful forest depletion, land degradation, landslides, floods etc. all associated with growing population pressure in the hills. The over-exploited mountainous regions have since long been crying for appropriate strategies for natural resources

management. However, it would be unwise to expect a ubiquitous management formulation. Instead management strategies have to be region specific as each region shall require a specific technical knowhow. For instance, management strategies for mountainous region cannot be the same as that of the Indo-Gangetic Plain.

This address, being delivered at Shimla, would appear inconsistent if it does not focus on Himachal Pradesh. Although the state of Himachal Pradesh is endowed with rich wealth of a variety of natural resources, yet I am constrained to limit my exposition only to its water resources and their management. Water is very precious, each drop is to be accounted for. With water becoming increasingly scarce, water wars in future do not seem to be only a figment of imagination. It is in this context that an academician would wish that all inter-state water disputes are resolved and resolved quickly on the basis of need rather than right. This objective can be achieved only through a comprehensive regional water management policy covering all watersheds and micro-watersheds on regional scale. By virtue of its location in the Himalayas, which is South Asia's major fresh water source, the state of Himachal Pradesh fortunately has abundant water resources in the form of glaciers, snow and fresh water. Not only that, the state is traversed by two major river systems of the country, namely the Indus and the Ganga systems, which hold great significance for most of the northern states of the country. It would, therefore, be advisable to create a common database for all these states with respect to topography, climate, hydrology, soils, land use etc. By using GIS such data could be standardised for each drainage basin, its subdivisions into watersheds and micro watersheds. Thus, a GIS based first level integrated water resource framework could be

created which in turn could be used by different departments like irrigation, forest, horticulture, industry, hydro-electricity, rural development etc. Such a framework, if created, would ensure (i) easy availability of upto-date reliable information, (ii) better intra- and inter-department dissemination of information, (iii) more effective integrated watershed management, and (iv) effective implementation of policies pertaining to sustainable development of water resources potential.

I understand that the state of Himachal Pradesh has already developed the first level GIS based integrated water resources framework. The state has also carried out case studies of micro-watersheds in Hamirpur in 2006 which were expected to be emulated by rest of the state. Similarly, irrigation and public health (IPH) related schemes have been standardised in case studies in Kangra while river basin modelling has been standardised in Giri basin. With high literacy rate, low poverty rate, high participation of women in its economy, high level of per capita government expenditure and a well spread strong network of local institutions, the state of Himachal Pradesh is well set to emerge as a mountain area development model to be replicated elsewhere. Three cheers for the state's enlightened governance.

The *in situ* rainwater harvesting in a hill state along *nallahs*, streams and catchment areas of watersheds offers the most potent area of further action. Although Himachal Pradesh has abundance of rainfall, its mountainous terrain allows quick run-off of this precious resource apart from causing soil erosion and landslides. The multi-faceted utility profile of *in situ* harvesting of rainwater is obvious from such facts as (i) rainwater harvesting from a roof top of just 1000 sq. ft. Is capable of adding 1 lac litres of water to the groundwater reservoir

in just one rainy season; (ii) just one hour of rainwater harvesting, if diverted to a drying up borewell/tubewell, is capable of rejuvenating it; (iii) the increasing fluoride content in water due to depleting water table can easily be neutralised through rainwater harvesting; (iv) harvested rainwater has a pH value of 6.95 which makes the water qualitatively ideal for human use. To initiate the *in situ* harvesting, detailed surveys may have to be conducted for identification of micro watersheds in each basin so as to facilitate estimation of water potential of each basin with a view to preparing watershed development plans for such basins. Services of NGOs engaged in spatial and environment planning could be utilized to overcome the red tapism of government departments. One such NGO is located close by at Panchkula – Institute for Spatial Planning and Environment Research (ISPER) – which in a short span of less than a decade of its existence has established its credentials in the field of planning and research not only in India but also beyond the country's borders.

While thinking about this address the question that often exercised my mind was as to what strategies need to be formulated to attain the best management of the state's water resources. These may include: (i) creating awareness for water conservation; (ii) upgrading the skills of employees with respect to planning design and management; (iii) debating the issues to ensure public feedback; (iv) involving the end users in participatory management; (v) creating a GIS based water resource information system; (vi) taking up pilot projects in select locations endowed with great water resources potential; (vii) involving NGOs for evaluation of different projects undertaken (ISPER), (viii) vulnerability index mapping of entire Himalayan region so as to set priorities as per vulnerability index; and (ix) monitoring of the policies of the government by

an independent NGO to measure the effectiveness of the impact of such policies.

In the end, it would not be out of place to enlist here some basic questions for deliberation by the scholars gathered here so that the organisers of the conference are able to make some concrete recommendations for the government's specific action *vis a vis* policy formulation. Such questions may include:

- (i) Which key policies relating to soil, forest and water resource management have significantly influenced the livelihood of the people?
- (ii) What role do the local and national institutions play in the formulation of these policies?
- (iii) How far has it been possible to overrule the skewed influence of different stakeholders in policy formulation?
- (iv) How to make policy formulation process participatory so as to ensure active involvement of local communities?
- (v) How far at the state level have we

succeeded in synchronising the state's rationality with national rationality?

- (vi) How far the livelihood of the poor been improved in specific regions where some projects especially for this segment of population were taken up?

In the end, I once again thank the organisers of this meet for giving me this opportunity to share my views with this august gathering of intellectuals driven from different parts of the country.

Thank you.

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