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Harnessing Applied Geomorphology for Sustainable Environmental Management

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Honourable Chief Patron of the Conference and Vice Chancellor of University of Allahabad, Prof. A.K. Singh, Patrons and Deans, Prof. M.P. Dubey and Prof. S.D. Dixit, Secretary of IGI, Prof. Savindra Singh, Convener of 25th IGI Conference, Prof. Alok Dubey, Chief Organising Secretary, Prof. Manorama Sinha, respected past Presidents and stalwarts, members of IGI, friends, ladies and gentlemen, a very good morning to you all and warm welcome at this momentous occasion of Silver Jubilee of Indian Institute of Geomorphologists.

It is indeed my great honour and privilege to share a few thoughts with this erudite gathering of geomorphologists of India at this Silver Jubilee celebration of IGI. It also gives me immense pleasure to be at my Alma Mater University after 50 years, from where I graduated in 1961.

Prof. Savindra Singh, myself and a few of our colleagues had attended the first International Conference of Geomorphologists in the year 1985 at the University of Manchester, UK. Subsequently, with the initiative of Prof. Savindra Singh, our team formed the much needed Indian Institute of Geomorphologist (IGI) in 1987, which also happened to be the Centenary Year of this

university. The first president of IGI was Professor K.R. Dixit. Today, the IGI has graduated from its vast experience and is traversing towards maturity from adolescence and has never looked back since then. Today IGI has become the largest gathering of geomorphologists in India.

During these 25 years, our learned friends have covered almost the entire India from Himalayas to Kanyakumari and Rajasthan to Arunachal Pradesh as well as the farthest outpost of India at Antarctica and expanded the horizon of geomorphological research.

Upgrading technologies and degrading earth's environment: Reality or myth

The indiscrete developmental impacts of technological advances, mining and other resource exploitation, emission of dangerous gases, generation of waste materials, deforestation, urbanisation, have created conditions of unprecedented environmental catastrophe, which resulted in pollution of air, water and soil which is causing irreversible damage to the earth's environment.

As in the case of other sciences, geomorphology also has become multi-disciplinary. Applied geomorphology is the order of the day. It is my opinion that much

has been done but more has to be achieved in this technologically fast growing field of geomorphology.

In India, development of geomorphology is a post-independence phenomenon. In the last decades or so it has emerged as a true interdisciplinary subject with relations to geology, geography, hydrology, climatology, environmental science, geotechnical engineering and other fields of science. Apart from applied geomorphology, aeolian, glacial, periglacial, coastal, fluvial, engineering geomorphology, pedogeomorphology, planetary geomorphology etc. also have emerged as distinct areas of study, emphasising the role of geomorphologists in environmental management.

India is really fortunate to have almost every facet of landforms with its varied background and biotic-anthropogenic interaction. Thus, the Indian geomorphologists are really blessed with an intricate mosaic of variety of landforms. It is for us now to explore the available inputs and develop an appropriate technological database for further research.

Some major challenging themes of study are morphoclimatic and palaeoclimatic conditions which have to be taken more vigorously by us. Mountain meteorology as well as erratic monsoons is to be especially addressed which bring havoc to the population in the form of floods and droughts. Some of the latest technological fields that should also be taken care of and researched for obtaining better results in geomorphology are:

- Application of geospatial technology
- Remote sensing and GIS techniques
- Computer-based software
- Integrated terrain evaluation for greening of earth and thematic mapping of natural resources
- Terrain evaluation and high resolution terrain mapping
- Preparation of 'going maps' for frontier

areas for defence purposes, internal and external

- Avalanche hazard mapping using numerical simulation techniques
- Avalanche forecasting and control techniques/structures
- Landslide study, assessment and mitigation measures
- Land use mapping for societal cause
- Mapping of land, degraded due to mining industry
- Study of desertification
- Study of glacial and periglacial landforms
- Estimation of glacial retreat and advance.

A word about Antarctic geomorphology

Extensive geomorphological study has been done at the two Antarctic stations established by India—Dakshin Gangotri (which is now converted into a supply base) and Maitri. The third station, named as Bharati, has been commissioned this year at Larsemann Hills. It is situated on a relatively flat landform close to freshwater lakes. Since the inception in 1981, today the 31st Indian Expedition is wintering over there. Some noteworthy Indian geomorphologists and Antarcticans are Dr. S.Z. Qasim, Dr. Harsh Gupta, V. K. Raina, M K Kaul, Arun Chaturvedi, Ajay Dhar and Rasik Ravindra. The lead organisations taking part in Indian Antarctic expeditions include Snow & Avalanche Study Establishment, Wadia Institute of Himalayan Geology, National Geophysical Research Institute, Geological Survey of India, India Meteorological Department, Defence Research & Development Organisation and various national universities.

For societal causes like controlling landslides, avalanche prediction, opening lines of communication and integrated mountain research, geomorphologists can make immense contributions. This, however, requires a close interaction with Border Road

Organisation (BRO), Snow & Avalanche Study Establishment, Department of Science & Technology etc. The BRO has operational commitment to keep open the lines of communication to frontier areas for military and civil population by working on roads like Jammu–Leh, Manali–Leh and Tezpur–Tawang routes and other northeastern strategic arteries.

Proper land utilisation for rural and urban regions can improve the quality of life of common man by meeting the basic human needs. Terrain evaluation studies and its interpretation will provide answers to ‘going maps’, for defence purpose. Some of our leading geomorphologists are presently working at Defence Terrain Research Laboratory, Delhi, for this purpose.

Along with environmental degradation the other dominant issues like global warming, ozone depletion, improved techniques of agriculture, harnessing of the depleting water resources etc. should be addressed adequately for overall development of the society. A unified approach by all of us will provide a definite

solution to complex societal problems.

It is the need of the hour that political system should be more stable. The economic and societal development policies of the nation should also be framed in a healthy fashion. Unless the problem is addressed to the ‘bottom of the pyramid’ of the society, as conceptualised by C.K. Prahalad, the real progress may not take place. The common man should enjoy the fruits of developed and security aspects of India.

I am strongly convinced that the Indian geomorphologists will join hands and translate the above strategies into action plan by unleashing their brain power as well as igniting their minds to achieve the dream of Dr. Abdul Kalam for seeing India as a developed nation by 2020.

Finally, I thank this scholarly gathering of geomorphologists and learned educationists for providing me an opportunity to share few of my thoughts. I heartily wish everyone a very happy Christmas and prosperous New Year 2013.