Sustainable mountain development in Indian Himalayan region is under the shadow of regional instability

Indian Himalayan Region (IHR) is characterized by a complex socio-ecological system, rich cultural and biological diversity. Himalaya forms a continuous chain of mountains from the West to East. However, the diversity in topography, latitudinal variations and rainfall factors in different parts of the Himalaya is incredible. The Himalayan mountains, located in Northern India play a significant role in deriving ecological benefits for mountains and adjacent plains of the country. Snow covered mountains, high altitude lakes and perennial rivers originating from the region are vital sources of drinking water, irrigation and hydroelectric power for nearly 1.5 billion people of eight countries located in IHR. Approximately 207,937 sq km of forest cover spreading in IHR is pivotal to the ecosystem. The value of Himalayan forests in terms of carbon sequestration has been estimated to be around Rs 943 billion/year. IHR is also bestowed with a variety of medicinal plants. There are nearly 99 wildlife sanctuaries, 28 national parks, 5 biosphere reserves, 4 tiger reserves, 11 elephant reserves and 2 world heritage sites. Owing to the scenic topography, natural resources and sacred mountains (Figure 1), IHR is a leading destination for tourism, pilgrimage, generation of hydroelectric power, medicinal plants and establishment of natural resources-based enterprises. 

But several factors are affecting the mountain ecosystem. The mountains are susceptible to frequent earthquakes, melting of glaciers, flash floods, forest fires, land slides and other natural hazards that have led to geophysical instability. Further, developmental activities like (i) quarrying, (ii) deforestation, (iii) road widening and construction of dams, (iv) frequent vehicular movement, (v) construction of multi-storey buildings along riverbanks and in subalpine–alpine–moraine habitats, (vi) unregulated tourism and pilgrimage, and (vii) non-biodegradable waste deposits are degrading the mountain ecosystem. Migration is yet another factor that is hampering traditional conservation agricultural and agro-pastoral practices.

There is need to restore the lost glory of the mountain ecosystem. The government should (a) promote low-cost erosion control measures that are simple and easy to use, (b) create protected areas to save wild genetic material, (c) develop spatial scales; (f) in fulfilling the ‘communication gap’ between scientists and the public and (g) in networking individuals with similar interest across different regions, thus increasing the size of the dataset and participation.

Despite the advantages of the SIM, there are several potential caveats as well. Some of these arise not as much due to the technology but due to the amateur nature of the contributors. Thus in many instances, the exact location of the sightings may not be provided or imprecisely provided. Information could carry inaccurate/mis-identification of species. Since the data collection is not planned, information may tend to be non-uniformly spread across the region or country and biased to urban and semi-urban areas. Finally in most of the cases, the less charismatic and common species may be grossly under represented which have a peripheral effect. The idea proposed here is the first ever initiative in India to map the bio-resources using social network, Internet media and e-mail discussion groups. This is cost effective, efficient and has a far-reaching effect on mapping and conservation of bio-resources of India. SIM allows not only rapid remote taxonomic identification, bio-resources mapping but can also fill the gap in our knowledge on ‘Wallacean Shortfall’ and conservation education and awareness and also reconnect back to our natural world.

1. Loarie, 2011; http://calendar.tamu.edu/?y=2011&m=10&d=06&eventdatetime_id=8234
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Conservation through cultivation: a promising opportunity for the critically endangered tree Gymnocladus assamicus

Extinction of species is considered as one of the greatest threats to human kind. Unfortunately, 99% of the species are threatened due to human activities such as habitat fragmentation, resource exploitation and global climate change. With the alarming increase of species extinction, scientists estimated the rate as high as 1,000–10,000 times higher than the natural extinction rate. If the process continues, we will be loosing as many as 30–50% of all species by mid-century. Therefore, effective conservation and management of the biological diversity is urgently needed to face the challenges of climate change, sustainable development and food security.

Plants are often being extinct due to over harvesting for foods, medicines, timber and similar uses to make other resources. Different approaches have been developed to conserve ‘species at risk’ in both in-situ and ex-situ conditions. Conservation through cultivation (CTC) is one of the successful approaches for conservation of endangered plant species which gained more popularity for several species. The CTC programme was developed by Limbe Botanic Garden in Mount Cameroon to conserve the rich and fragile biodiversity through reducing harvesting pressures and providing cultivated material. The story of Prunus africana in Limbe Botanic Garden showed the pathway for conservation to similar species at risk. American ginseng, Mahogany and many orchid species have also been recovered from the verge of extinction through cultivation for their economic and aesthetic values.

Another successful and perhaps the most popular CTC is the story of the oldest tree on Earth (Ginkgo biloba), popularly known as ‘living fossil’. Unchanged for more than 200 million years, the species have been extinct in the wild for centuries. The Ginkgo tree is adored in many parts of the world as a street tree and ornamental tree for its beauty and longevity, other than the medicinal values. In a recent interview, Peter Cran, Yale School of Forestry and Environmental Studies Professor and the author of Ginkgo agreed that humans have aided to ensure Ginkgo’s survival and CTC is an important toolkit for conserving plant diversity.

Gymnocladus assamicus is a critically endangered tree species endemic in Northeast India. Over-harvesting of mature pods for traditional uses and habitat degradation posed serious threat to the remnant populations in West Kameng and Tawang districts of Arunachal Pradesh, India. The CTC could be the most suitable approach for G. assamicus for two reasons. First, highly saponaceous pods are used for multiple purposes; for example religious activities, day-to-day cleansing, shampooing and expelling leeches from domestic animals. Mature pods are preserved by the local people and offered as a precious gift. Therefore, cultivation in homegardens is an ideal approach to increase the population locally. Secondly, G. assamicus leaves turn into elegant, bright yellow colour during autumn (September to...