MEETING REPORT

Mainstreaming mountain biodiversity conservation*

Mountain ecosystems are bio-geographically unique, with high species diversity supported by their ecological, phyto-geographical and evolutionary factors and high degree of endemism. The 7th CMS Vatavaran: International Environment and Wildlife Film Festival and Forum held recently provided a platform to discuss various issues related to mountain biodiversity conservation. It was aimed at 'mainstreaming biodiversity conservation at different levels to promote living in harmony with nature', with one of the sub-themes being 'Mountain biodiversity'. Pragya (www.pragya.org) was the knowledge partner for the 'mountain biodiversity' sessions, and the programme advisory group also included Ruchi Pant (Energy and Environment Programme, UNDP).

Seven thematic discussion sessions were held on diverse issues related to the mountain biodiversity sub-theme. The interactive sessions provided insights into issues regarding conservation of mountain biodiversity and helped explore potential solutions proffered by stakeholders and experts. Facilitated by Pragya, community leaders from various Himalayan districts participated in these discussions and shared their views.

The inaugural session on 'Uniqueness and richness of mountain biodiversity of the Himalaya' highlighted that the mountains, apart from being repositories of biological and cultural diversity, also provide vital services with tangible economic value to mountain communities as well as to the heavily populated plains at their base. L. M. S. Palni, Saroj Barik (Department of Botany, North Eastern Hill University), Ganesan Balachander (ATREE) and Umrao Singh (community representative from Uttarakhand), discussed the significance of mountain biodiversity. Dependence of indigenous mountain communities on natural resources was noted.

A session on 'Unique mountain ecosystems' focused on specific ecologies and landscapes in mountain regions. The session gave due recognition to: cold deserts, a distinct habitat in the rain-shadow zones of the Himalayas, which harbour a unique collection of flora and fauna; mountain lakes and marshes which have several ecological benefits in terms of managing local water resources, and providing flourishing ground for a range of plants, animals, birds, reptiles and amphibians; and pastures and sacred natural sites which play significant roles in the mountain way of life. The session discussions, which had specific inputs from Archana Chatterjee (IUCN-India), C. S. Negi (Govt PG College, Pithoragarh), Koustubh Sharma (Snow Leopard Trust) and Saroj Barik, centred around the need for special focus on these unique habitats and examined the relevance of traditional practices such as sacred groves as well as the importance of international cooperation for species with trans-boundary habitats.

Along with the ecological conservation issues, the deliberations focused on the socio-economic and cultural relevance of biodiversity as well. The session on 'Mountain biodiversity and sustainable livelihood opportunities' explored how a balance could be struck between conservation and economic prosperity and what incentives are required for sustainable livelihood practices. Inputs came from L. M. S. Palni, Seema Bhatt, Vijayalakshmi Viswanathan (Safer World Communications), and Tsewang Spalbar (community representative from Ladakh), who urged action against the silent disaster of eco-degradation. In a session that also engaged a number of young people, Rita Banerji (Dusty Foot), Ruchi Pant (UNDP India), Suman Sahai (Gene Campaign) discussed the 'role of traditional knowledge in the conservation of mountain biodiversity'.

During the session on 'Climate change and Himalayan biodiversity', Chandi Prasad Bhatt and women's self-help group leader Sukri Devi from Lata village, Central Himalayas, discussed the importance of community initiatives for biodiversity protection, as exemplified by the landmark 'Chipko Movement'. Mustafa Ali Khan (Swiss Agency for Development and Cooperation) and Jagdish Kishwan (Wildlife Trust of India) explored how the changing climate has been affecting mountain biodiversity, highlighting the challenges of increasing fragility, depleting biodiversity, physical isolation, political marginalization and poverty, enhanced frequency and severity of natural disasters against decreased coping capacity, and emphasized the importance of managing carrying capacity for mitigation of the impacts.

Examining the anthropogenic impacts on mountain biodiversity, the session on 'Conservation development dilemma: threat to Himalayas?' dealt with exploitation of the mountains by humans. From poaching to mining, tourism and mega development projects (i.e. hydro-power generation, road-building), have endangered mountain biodiversity. Anil Joshi (HESCO), Yash Veer Bhatnagar (Nature Conservation Foundation) and Ajay Rastogi (Foundation for Contemplation of Nature) discussed the changing developmental scenario for the mountains, and also explored complex issues concerning species introduction, migrant populations and ecopreneurship as action options.

The concluding session focused on the importance of 'Local environmental governance for biodiversity conservation'. Rastogi, Amba Jamir (The Missing Link) and Sukri Devi discussed the role of local communities as the custodians of the mountains, and stressed on the fact that governing the rich and diverse natural resources of the mountain region is an increasingly complex challenge and calls for constructive cooperation among stakeholders for effective governance.

The event uncovered certain concern areas for policy directions and further deliberations. While significant development activities are taking place to address security concerns, natural landscapes and habitats at locations of strategic importance (e.g. Siachen glacier,

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Pangong-Tso) require specific focus to help maintain the sensitive ecological balance. Mountain communities are dependent on natural resources for their sustenance and livelihood and hence positive support is required for eco-preneurs (entrepreneurs focusing on niche sector natural resource-based livelihood). Traditional knowledge and cultural beliefs have long been protecting the mountain biodiversity. The speakers urged the National Mission for Sustaining the Himalayan Ecosystem task force on the cross-cutting theme of traditional knowledge to help capture and integrate the local knowledge and practices for sustainable eco-development. Population expansion and increasing inflow of tourists are threatening the sensitive mountain ecosystems, and suitable measures are required to help stay within the carrying capacity. Development projects in the sensitive eco-zones call for approval processes to be linked with comprehensive research for long-term and downstream impacts with stringent monitoring for compliance of norms. It is critical to create common responsibility of all stakeholders (local communities as protectors of these resources, downstream beneficiaries, high per capita resource users in urban centres) for safeguarding mountain biodiversity. Rigid and non-inclusive regulations often curb the rights of indigenous communities. Hence the legal framework must be more conducive to address the primary needs of communities while protecting the sensitive ecozones.

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MEETING REPORT

Design and manufacturing technologies for orthopaedic biomaterials*

Among the human health problems, cases of patients suffering from musculoskeletal disorders are rapidly increasing, even in the middle-aged populations. Under such diseased conditions, an appropriately designed and fabricated biomaterial with bone-mimicking properties and architecture is necessary for the restoration of hard tissue structure and function. Rapid prototyping (RP) techniques like stereolithography, selective laser sintering, 3D plotting and 3D printing of metal, ceramic and polymer powders or biopolymer-based pastes are being applied extensively for the fabrication of porous, three-dimensional scaffolds. These techniques are based on layer-by-layer construction of 3D structures with pre-defined geometry and porosity as determined from the CAD/CAM datasets of the defect region generated from computed tomography (CT) or magnetic resonance tomography (MRT) of the patient. Such a scaffold-based tissue engineering strategy for healing large bone defects has been necessitated by the inherent clinical limitations of autografts and allografts in orthopaedic surgery. The combination of geometrically fabricated synthetic scaffolds representing the supporting extracellular matrix and cells (autologous stem cells isolated from the patient) guided by growth factors and signalling molecules in a 3D-bioreactor system forms the crux of tissue engineering-based approach for treating osteochondral defects, for cartilage repair and other diseased conditions of the bone.

The Indo-German symposium held in Dresden, Germany recently provided a unique platform for the exchange of scientific ideas among a select group of active researchers from the biomaterials, tissue engineering and medical field. The objective of the symposium was to bring to light, some on the state-of-the-art manufacturing technologies based on rapid prototyping for the design and fabrication of advanced biomaterials and implants. The symposium also provided an impetus for Indo-German joint research venture and collaboration, aimed at scaling up the production and commercialization of such healthcare products in the future. In line with the objective of the symposium, the proceedings were distributed over two days and categorized under eight technical sessions, each of which consisted of 4–6 speakers. Among the 33 presentations, 15 were made by participants from the Indian delegation while the rest were from the German contingent apart from a couple of representatives from Latvia and Lithuania. The Indian delegation had representatives majorly from IISc (Bangalore), NIT Rourkela, Jadhavpur University (Kolkata), SCTIMST (Thiruvananthapuram), DST Laboratory, two orthopaedic surgeons from Bangalore and Kolkata and a dyad of private enterprises – Excel Matrix Pvt Ltd, Hyderabad and Data Metallurgical Company, Kolkata. The German contingent consisted of speakers from universities spread across the country – Würzburg, Erlangen, Bremen, Rostock, TU Dresden and Fraunhofer-IWU (Dresden and Chemnitz).

The symposium began with the welcome address by A. Chakraborty (Indo-German Science and Technology Centre (IGSTC), Gurgaon) which funded the workshop. This was followed by brief welcome notes by Stefan R. Bornstein (Medical Faculty of TU Dresden); K. Venkatarama Sharma (Indian Embassy, Berlin); Christian Hannemann (Fraunhofer Institute for Machine Tools and Forming Technology, Chemnitz) and Martin Goller (International Bureau of the German Federal Ministry of Education and Research (BMBF), Bonn, Germany). The technical sessions were categorized based on the different related areas of orthopaedic research such as the design of biomaterials with bone-mimicking properties, rapid prototyping technologies, drug delivery, commercialization, metallic implants, ceramics and external field application for achieving the desired biological response. The inaugural technical session began with a talk by B. Basu (IISc, Bangalore),

*A report on the Indo-German workshop, 'Strategies for improved bone replacement materials and orthopaedic implants: design – manufacturing – technologies' held during 19–21 February 2014 at the Medical Theoretical Centre of TU Dresden, Dresden, Germany.