

Eve McDonald-Madden (University of Queensland) in his talk on 'Searching for black swans among the shrinking ice', addressed uncertainties of outcomes of climate change popularized as 'unknown unknowns' or 'black swans'. She gave an overview of the current state of research on climate change adaptation for conservation from a decision analytical perspective. She proposed adaptive management for explicitly thinking about the value of information and argued that 'black swans' are vital diagnostic opportunities to learn and improve our predictions of climate change effects.

Chris Filardi (American Museum of Natural History, USA) gave a talk on 'Throwing away the keys to paradise: unlocking conservation lessons among Pacific islands'. Communication, partnership, humility and human resilience

which are critical to conservation at any scale were discussed.

Bob Pressey (James Cook University, Australia) in his lecture discussed 'making protected areas makes a difference: impact evaluation as a tractable scientific challenge and an essential policy tool'. He talked about the protected areas and their failings because of remoteness and commercial uses. He addressed impact evaluation of both terrestrial and marine areas which use increasingly robust methods to estimate the difference between no intervention or an alternative intervention. Another key requirement for progress in biodiversity conservation for scientists is to 'step outside' the political constraints which have hindered progress. He said apparently naive approaches are needed to take conservation forward.

In his closing remarks, Richard Kingsford (University of NSW, Australia)

informed about 'SCB (Oceania) – plans, opportunities and publishing'. He talked about the approach of going beyond the science and communicating more broadly the implications of science to the public and involving more members. Finally, he pointed out that a key function of local and global importance, is the pursuit of quality science through the publications.

ACKNOWLEDGEMENTS. I thank Dr Manchi Shirish S., Sálím Ali Centre for Ornithology and Natural History, Coimbatore for encouragement and support. SCB training scholarship is gratefully acknowledged.

Akshaya M. Mane, Sálím Ali Centre for Ornithology and Natural History, Coimbatore 641 108, India.
e-mail: akshayamane@gmail.com

MEETING REPORT

Climate change vulnerability and hazards in mountainous regions*

The impacts of climate change (CC) are complex and varied and threaten human life through increased intensity and frequency of extreme events and natural hazards. Implications of CC-enhanced events could be more devastating in mountainous regions, which are susceptible to topographical hazards. The Indian Himalayan Region (IHR), which is also structurally weak and fragile, becomes vulnerable to these events. Kedar-nath tragedy of June 2013, which was the outcome of long spells of heavy rains, and consequent melting of glacier, lake outburst and flooding in the Mandakini river and the death and destruction that followed bear testimony to this. The magnitude and scale of such events can further enlarge under the advanced CC

scenarios. The CC preparedness in the IHR has now become the agenda of international developmental agencies and government departments, which have begun to collate and gear up efforts to address the issue through promulgation of Himalaya/climate-specific programmes, experience sharing, and framework development.

A scientific workshop on the vulnerability and hazards of IHR was recently organized. Nearly 50 delegates representing various national and international organizations/institutions participated in the workshop. This collaborative endeavour under the Indian Himalayan Climate Adaptation Programme (IHCAP) envisaged to achieve development of common framework for vulnerability, risk and hazard assessment for IHR for adaptation prioritization and its implementation modalities and mainstreaming in developmental planning of the Himalayan states. The workshop was structured in three sessions aimed at gaining insights into vulnerability, risk and hazard issues, adaptation planning, and opportunities for collaborative activities and group inputs for common framework. The inaugural session was devoted

to detailing of the programmes, missions and mandates by organizers and their climate change link. Jean-Bernard Dubois (Global Programme Climate Change of the Swiss Agency for Development and Cooperation (SDC)), highlighted linking of science with policy as a salient feature of IHCAP. The need was also reiterated by B. M. S. Rathore (Ministry of Environment, Forests and Climate Change, Government of India), who mentioned that the variance in vulnerabilities across IHR also accrues due to differences in eco-cultural diversity, sociological variables and actuation of adaptive responses. He emphasized on the need for adaptive capacity management plan. Deficiency of data for vulnerability assessments, and lack of high-resolution datasets for scenario projections was the general view of the speakers. The role of Himalayan ecosystem for climate regulation and trans-regional ecosystem service effects for 51 million agriculture practising people of the North Indian plains, and the National Mission for Sustaining Himalayan Ecosystem (NMSHE) as a Himalayan region-specific programme was highlighted. Low and weak adaptive capacity of the

*A report on the Scientific Exchange Workshop on Climate Change Vulnerability, Risks and Hazards, and Adaptation in the Indian Himalayan Region, held during 19 and 20 June 2014 at New Delhi; and jointly organized by the Swiss Agency for Development and Cooperation, Department of Science and Technology (New Delhi), and G. B. Pant Institute of Himalayan Environment and Development.

Himalayas, strong traditional knowledge base of Himalayan communities, and weak S&T capacity of NMSHE were the important points that came up during the workshop. Alluding to mapping of complex events that triggered Uttarakhand disaster, a point for collaboration for S&T capacity building was raised, also use of community knowledge for designing adaptation strategies was recommended.

The first session on 'Climate change risks and hazards and vulnerability' dwelt upon orientation for achieving the objective of common framework, where applications of two frameworks, one developed by IHCAP and the other by the Hindukush India Climate Adaptation Programme (HICAP), ICIMOD, Nepal were presented. The IHCAP framework whose application was demonstrated for GLOF and flood hazards in Kullu and Kedarnath tragedy, comprises of state-of-the-art concepts based on IPCC AR4 and IPCC SREX/AR5 and also incorporates key features of traditional frameworks, and flexibility to use existing subject knowledge and replication in other areas. Also, the vulnerability assessment uses exposure, sensitivity and the adaptive capacity as major input fields, and provides for integration of information on climate change and hydro-metrological events, etc. for integrated vulnerability, hazard and risk assessments. The HICAP Frameworks applications focused on vulnerability assessments that were derived from climatic predictions, changes in production systems and the impact on people. It had greater community/people focus and mainly relied upon mountain-specific multidimensional livelihood vulnerability index-based poverty-vulnerability assessments. It also provides choices for gender-specific adaptations. In the deliberations, need for science-based flexible dynamic framework, and linking of vulnerability assessment to policy through integration in State Action Plan on Climate Change (SAPCC) was accepted and scale of vulnerability assessments discussed.

The next session focused on 'Science based adaptation planning in mountains' in which an orientation on NMSHE's mission objectives, partner knowledge network institutions, research resources and its efforts for S&T capacity building and creation of CC adaptation database, that can be useful in adaptation planning was provided. The Governance for Sustaining Himalayan Ecosystems (GSHE), a programme of NMSHE, for potential roles of DST in governance part of adaptation was also briefed about. A deliberation on 'Climate change adaptation in Switzerland' by Nadine Salzmann (University of Fribourg, Switzerland) involving an economic decision model-based appraisal of scenarios relating to dam building and relocation vis-à-vis excavation of rivers, further corroborated grounds for integration of scientific results for decision making and CC-related policy adaptations. Another presentation on 'Grassroots initiative for science based adaptation planning' provided a description of adaptations that are being tried in India, Nepal and Bhutan. During discussions, fallacies related to policy formulation with regard to mountains, and better understanding of community requirements and perceptions for adaptation planning were highlighted. The issue of strengthening of capacity of institutions and searching out ways for development of adaptation capacity was also raised.

At the end of the workshop, the participants were split into three groups to know the aggregated view of the group on general considerations related to vulnerability, risk and hazard assessment framework. The spatial and temporal scale of assessment, data requirements, broad fields of analysis, output type, knowledge integration and the methodological and implementation challenges were the main points discussed. The opinions of the group were presented and lead persons gave their remarks on group outcomes. The workshop ended with many useful recommendations. The acceptance of the need of science-based

common framework which is flexible, dynamic, and compliant to accommodate inputs from existing knowledge and other studies was unanimously agreed upon. Linking of vulnerability assessment to policy and State Action Plans, use of community perceptions and traditional knowledge base for adaptation planning, and use of scientific evidence/analysis based adaptation planning were the other major recommendations. In the recommendations of the groups, spatial scale and some elements for assessment of exposure, sensitivity and adaptive capacity were suggested. A common baseline of 1980–2010 was proposed for current assessments. With regard to temporal scale, it was argued that politicians do not care about future scenarios. Hence more emphasis was laid on current and short-term assessments; 5–10 years time was the common consensus for short-term scenarios. For spatial assessments a block was identified as the lowest unit. The information/statistics on socio-economic status, climate, water, extreme weather events, infrastructure, energy, health, etc., was the major data field identified for incorporation in vulnerability assessments. Vulnerability measurement in index form was recommended for its universal acceptance and easy comparability. Bringing objectivity in the framework, translating inter/trans-disciplines, lack of availability and access to data, weak institutions and governance, diversity of Himalayan ecosystem, inter-state linkages and weak capacity were identified as the major challenges to the framework.

Ranjan Joshi*, **Subrat Sharma**, **R. C. Sundriyal** and **P. P. Dhyani**, G. B. Pant Institute of Himalayan Environment and Development, Kosi-Katarmal, Almora 263 643, India; **Jagdish Chandra Kuniyal**, Himachal Unit, G. B. Pant Institute of Himalayan Environment and Development, Mohal-Kullu 175 126, India.
*e-mail: joshi.ranjank@gmail.com