MEETING REPORT

Learning from the Nepal's earthquake for preparedness through transboundary collaboration among experts of Himalayan countries*

As a water source for over a billion people and a region of exceptional cultural richness and biodiversity, the Himalayan terrain is a global asset. The young and rising Himalayan Mountains are highly vulnerable to natural disasters, including earthquakes, landslides, avalanches and floods. The risk is compounded by low capacities of most Himalayan countries to deal with disasters, remoteness and difficult terrain, and in several cases, political instability. These factors also make scientific research in the region difficult. Further, casualties from natural hazards are increasing at a rate of roughly 6% per year along the Himalayan arc due to an increase in the number of people occupying lands prone to hazards. Hence, there is an urgent need for further research and development in preparedness, and pooling of resources between the countries involved, to deal with earthquakes and other disasters. As a step towards meeting these requirements, a seminar was organized which was attended by representatives from the Indian parliament, ministers, research institutions, development organizations and journalists. The aim was to create a forum where experts could pool lessons in preparedness and response, and discuss how such lessons could be applied to the 'seismic gap' of the Indian Himalayas in order to reduce losses from a possible great earthquake in the future. Special efforts were made to get inputs from experts and practioners of Nepal. The seminar focused on the relationship between science and society, and discussed the various causes of inertia in addressing earthquake risk in public policy. In the welcome address, P. P. Dhyani (GBPIHED, Almora, and Central Himalayan Environment Association (CHEA)) described the Himalaya as the water tower of the country. The rationale and main features of the event were elaborated by S. P. Singh (INSA, New Delhi). The Chief Guest, B. S. Koshiyari (Committee on Petitions and Member of Parliament, Lok Sabha) spoke about the need to develop the science of earthquake prediction and early warning systems for the seismically volatile areas of Hindu-Kush Himalaya. Scientists from various research institutes and universities highlighted the seismic vulnerability of the Indian Himalaya and the Gangetic Plains. A. K. Gupta (Wadia Institute of Himalayan Geology (WIHG), Dehradun) spoke about how shifts in disaster reduction should include social components, mainstreaming disaster reduction into planning and a move to a multi-headed, comprehensive approach. D. S. Ramesh (Indian Institute of Geomagnetism) explained that the Indian and Eurasian plates are converging at a rate of 18 mm/yr in the Himalaya, but that the total seismic movement along the Himalayan Arc is just 8 mm/yr. This leaves a slip deficit equivalent to the energy released in four 8.6 magnitude earthquakes, a major cause for concern. David J. Molden (International Centre for Integrated Mountain Development (ICIMOD), Nepal) stated that an 8.6 magnitude quake in Uttarakhand has a potential death toll of over 400,000, the highest anywhere along the Himalayan arc, in view of the state's high population density and its vulnerability to secondary hazards such as landslides. C. C. Pant (Kumaun University) gave an insight on seismicity, stating that Uttarakhand is identical to Nepal in rock type and seismic conditions, and is crossed by seismic faults which transfer energy southwards, putting the flat Gangetic Plains also under earthquake risk. His network of seismometers has recorded over 6000 earthquakes of low magnitude in eastern Uttarakhand during the last 15 years, mostly at a shallow depth of 15–20 km. This indicates that the crust is incapable of storing large amounts of energy, limiting the magnitude of the earthquakes. However, some segments of the crust are locked and are accumulating unreleased tension. Furthermore, the Nepal earthquake of 25 April 2016 added additional stress to one of the seismic blocks in the Western Himalaya, making a future great earthquake in the region more likely. Populous towns in Uttarakhand are also highly vulnerable to secondary hazards, particularly landslides. Ranjan K. Dahal (Tribhuvan University, Kathmandu) explained that Nainital is built on a landslide mass from a historic great earthquake, making the land inherently unstable. Ridge towns such as Almora and Ranikhet are also at risk. Dharani Ratno (Tata Trusts) spoke about relief work undertaken in Nepal. Tata Trusts had set up a centralized kitchen catering to 17 relief camps, in collaboration with the Akshaya Patra Foundation and Sipradian Sansthan, a Nepalese NGO. Prachanda Man Shrestha (formerly with Nepal Tourism Board) spoke about the impact of earthquake on tourism in Nepal. In a presentation entitled 'Earthquake's impact on mountain ecology', Madan Koirala (Tribhuvan University) highlighted the fate of the Langtang National Park, where tremors induced landslides and avalanches which impacted eight villages. Forest were destroyed and tourist areas were lost. Sushil Kumar (WIHG) spoke about the need to improve earthquake sensing and monitoring equipment. The seismic vulnerability of the Indian Himalaya, and the fact that it is still not possible to predict earthquakes, warrants an increased preparedness in the region. After all, earthquakes do not kill people directly; people are killed because of damage and collapse of buildings and infrastructure. As the example of Chile indicates, human mortality can be kept below 1000 even for an earthquake of magnitude greater than 8, through adequate preparedness. The seminar hoped to capitalize on the learning outcomes from impacts and response in Nepal in order to apply them to this region. The seminar covered a wide range of topics with focus on three key

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themes: (i) the role of information and its dissemination, (ii) mainstreaming disaster management into long-term mountain development, and (iii) the need for a coordinated system and understanding the reasons why this is difficult to achieve. A recurring theme throughout the seminar was the role of information, and how best it can be collected and used to enhance the effectiveness of relief operations and long-term disaster management. Molden spoke in detail about this during his keynote address. He described how ICIMOD used its expertise in geoinformation, surveillance and mapping to direct rescue efforts. He said that the vast amount of information from different sources, ranging from government sources to loudspeakers on the streets was overwhelming. This not only induces panic among people, but also slows down relief work since information has to be constantly verified. Eklabya Sharma (ICIMOD) highlighted the need for both a broad overview of the areas affected and detailed information at the local level in order to improve coordination and save time and lives. Both speakers stressed upon the importance of hazard mapping and information on helicopter landing sites, atmospheric conditions and the capacity of local actors to distribute relief as preparation activities with regard to earthquakes. Jagdish Lal Baidya (B&B Hospital, Nepal) showed how realities during a tremor are so different from what is generally perceived. For example, constructing a safe hospital building is emphasized as a part of preparation for an earthquake. But no doctor or nurse would agree to work inside a building when the threat of shocks is high. So medical treatment, including surgery would need to be carried out in the open. In fact, creating an open space for taking shelter is the most critical and challenging task in urban management with regard to earthquakes. An open space is useful also to fulfil other human environmental needs. Vandana Chauhan (AIDMI) made an important point that a centralized institutional structure for disaster management should be established to coordinate concerned information. This would collect and channelize information, thus avoiding the chaos induced by an information overload. Kamal Kishore (National Disaster Management Authority, New Delhi) said that information about vulnerability is being put to use in India, with 548 out of 675 districts having a complete disaster management plan. However, further work is required to ensure that these plans are capable of being put to use when a disaster occurs. Another important theme which is highly applicable to the Indian Himalayas, is the requirement for short-term relief and recovery to support a long-term vision in order to boost development in vulnerable areas, thus improving the safety and standard of living at the same time. The seminar covered several possibilities, with construction being an obvious focal point. Molden suggested that bamboo could strengthen buildings against lateral forces in a cost-effective manner. He called for strict codes for new buildings and training of engineers. Dahal elaborated that the construction of an earthquake-resistant building varies by soil type and depth, and hence future construction and re-building should take note of these factors. Kishore was positive about the potential benefits of retrofitting, saying that in ten years time 70% of buildings in Nepal will be earthquake-safe. Mainstreaming disaster reduction into urban planning also offers a joint opportunity for safety and development. The creation of open spaces in towns and cities, both to reduce earthquake risk and fulfil other human and environmental needs would result in a win–win situation. Gender inequality is another important area to be considered. Bimala Rai Paudyal (National Planning Commission, Nepal) stated that relief packages were gender-blind and ignored specific needs of women and girls, including clothes, sanitary products, care for pregnant women and security from the increased risk of trafficking. This is due to the lack of women representatives in the central decision-making process. Paudyal recognized that reconstruction could be an opportunity to reduce gender inequalities. It was realized that both Nepal and India lack a coordinated system required for effective disaster management. The discussion identified some reasons for this. One is uncertainty, which as Ajaya Dixit (Institute for Social and Environmental Transition, Nepal) explained, stems from both natural events, and vulnerable human and ecological systems. Uncertainty reduces the effectiveness and increases the cost of planning and preparedness. Another factor is the lack of social demand for earthquake-safe buildings and risk education in areas where earthquakes occur infrequently. However, perhaps the key reason is the number of involved players. Dixit mentioned that government agencies, NGOs and local communities all have vested interests in relation to earthquake risk calculations. It is important to understand the power relationships between them and the uneven distribution of benefits and shock exposure. He indicated that coordination demands a substantial shift in governance and increased accountability for decision-makers in Nepal and India. Anil K. Gupta (National Institute of Disaster Management, New Delhi) moderated the technical session and threw light on the importance of preparedness to face disasters. Despite these challenges, the seminar identified some positive actions to be taken. Singh suggested a cross-boundary system of information exchange, perhaps headed by ICIMOD, with regular assessment to monitor progress in research and risk reduction. Sharma, recommended that governments, international experts and NGOs across the Himalayan arc should collaborate to aid preparedness. At a more immediately achievable level, many speakers stressed upon the opportunity to capitalize on local knowledge by mobilizing local self-help groups (SHGs) in both the preparedness and recovery stages. Bhishma Subedi (Asia Network for Sustainable and Agriculture Bioresources, Nepal) recommended a combination of external aid and local knowledge to increase the effectiveness of relief efforts. He suggested that hazard mapping be carried out with community participation, and that a network of local volunteers should be established to communicate and direct relief efforts. This would address inequality in relief efforts and the issue of unsuitable aid from foreign donors. Dikshya Devkota (Gorkha Foundation, Nepal), mentioned that some of the most severe and long-lasting effects of an earthquake are actually psychological, and called for local teachers, social workers and army officers to be trained in providing counselling. Molden mentioned that this would increase the effectiveness of relief as more people could offer their support, and would reduce long-term economic impacts as fewer work days would be lost. SHGs must be equipped with appropriate skills for preparation and disaster management in order to achieve this.

In the concluding panel discussion Hem Pande (Ministry of Environment, Forest and Climate Change, Government of India) and Molden referred to the significance of the 2015 Sendai Framework for Disaster Risk Reduction and emphasized its concept of 'build back better'. Despite the existing challenges and inertia in social and political systems, they hoped that the Nepal earthquake will be treated as an opportunity for the whole Himalayan region to 'build back better', in preparation for the inevitable future earthquakes. The seminar was a useful step in drawing together various stakeholders and diverse ideas to discuss how effective earthquake preparedness could be achieved. It has made a major beginning in the direction of collaboration between the experts and practioners of neighbouring countries for improving the knowledge of earthquake science and the management of the disasters it triggers.

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MEETING REPORT

Sustainable tea production*

Tea is one of the most popular and inexpensive beverages of the world. India is the largest producer of black tea and the largest consumer of this beverage. Tea crop in India is infested by various insect and mite species that cause substantial damage to this foliage-crop. The use of pesticides has often been considered as the only way to manage pest infestation on tea. Indiscriminate application of pesticides poses various risks to environment, human health and also the plant itself in the long run. There is a need to relook into the usage pattern of synthetic pesticides on this crop and development of non-chemical-based strategies for pest management. Various research groups work on or practice non-chemical pesticide approach for pest management in tea. A need was felt to have a forum to share the different initiatives and findings with the scientific community, industry and planters. This will enable development of a roadmap for non-chemical pest management. Hence a workshop on sustainable tea production was organized, that was attended by more than 200 planters along with members of Tea Research Association (TRA), Tea Board, Unilever and other MNCs, and the relevant experts from CABI and Tocklai Tea Research Institute (TTRI), Jorhat and other institutes.

The workshop clearly highlighted the efforts being made by the tea industry to reduce use of chemicals. CABI and TTRI are conducting a scientific study to evaluate the environmental and economic feasibility of applying non-chemical pest management methods for plant protection on three commercial tea estates in Assam. The ultimate aim of this project is to develop a toolkit of best practices for the ecological production of tea, which will lay down a template for industry-wide application.

The workshop started with the welcoming of the delegates by N. Muraleedharan (TRA). Ravi Khetarpal (CABI South Asia) described the purpose of the workshop. The message on behalf of Chairman, Tea Board was read by Joydeep Phukan (TRA). The workshop was structured into two technical sessions followed by a panel discussion.

The first session was on 'Non-chemical pest management – strategies and challenges' chaired by Muraleedharan and S. K. Pathak. B. V. David (Chennai) gave an introduction to sustainable pest management and an overview of pest management strategies in different crop ecosystems. Kavya Dashora (CABI) and Somnath Roy (TTRI) presented the activities under the pilot field studies in Assam for non-chemical pest management of tea, funded by Unilever. They emphasized the systems approach for enhancing soil health, pest–predator ratio, and increasing the biodiversity and systems health to manage pest attack. Radhakrishnan (UPASI-TRF) presented a success story on non-chemical pest management of tea in South India with special reference to the use of sex pheromone traps in the management of tea mosquito bug. It was noted that the sex pheromone traps for *Helopeltis* should be field-tested in the experimental gardens, where tea mosquito is a major problem under this project. Pravir Murari (Phoolbari Tea Estate, McLeod Russell) a partner garden in the project, gave an overview of the challenges faced by the tea gardens, the experiments being performed and the deliverables so far in the project. He laid special emphasis on field and drainage sanitation to avoid the building of inoculum in the field. He described the various strategies being adopted in the garden under the project. There was active involvement from the participants during the presentations; a large number of questions were posed to the presenters and satisfactory clarifications were provided by the speakers.

The second session was on 'Strategic approaches in translation of research to practice' chaired by Ravi Khetarpal (CABI) and A. Babu (Tocklai Tea Research Institute). Abid Rahman (Goodricke Group Ltd.) on behalf of Kapil Sinha presented the experiences related to integrated pest management practices for tea at Sessa tea estate, a partner garden in the project. B Rajkhowa (Hooloongure T.E.), Andrew Yule and Co. Tea Estate and partner in the project, presented the field experiences related to the Integrated Crop Management (ICM) and Ecological Pest Management (EPM) strategies being implemented and the challenges to it. He talked about practitioner's skill building for integrated and ecological pest management. Raj Barooah (Aideobari T.E. Pvt Ltd)

*A report on the workshop on 'Sustainable tea production – A non-chemical approach to pest management' organized by CABI South Asia (India) and Tocklai Tea Research Institute (TTRI), Jorhat and held at TTRI on 18 February 2016.