

Disaster Resilient Infrastructure in the Himalayas: Opportunities and Challenges

Recommendations of the workshop organized by Uttarakhand State Disaster Management Authority in Dehradun on 21-22 November, 2017

- 1. Improve understanding of various hazards, particularly earthquake hazard and apply the same for DRR and record signatures of climate change impact, if any.**
 - Dense network of seismographs and meteorological instrumentation
 - Central repository of all seismological and meteorological records (including satellite based data) for the region
 - Real time data sharing protocols
 - Detailed GIS based record of landslide, flood and other disaster events together with losses incurred by these
 - Hill slope response together with impact of earthquake triggered landslides be assessed
 - Regular monitoring of land-use / land-cover changes using GIS and RS tools with sound ground-truthing
 - Seismic microzonation of major cities
 - Mapping of active faults and preparation of paleo-earthquake catalog for the region

- 2. The building codes be translated to the ground realities in the hills where surface slope renders standard codes non-usable.**
 - Standard designs for main housing typologies in the hills be prepared and circulated
 - Systems put in place for compliance of bye laws
 - Special attention be given to the stability and design of foundations
 - Particular attention be given to slope stability and retaining walls
 - Identification of lifeline buildings and ensuring their functionality after an anticipated natural disaster

3. Earthquake early warning (EEW) system be strengthened with clear categorization of level of warning and particular emphasis on warning dissemination through various modes and public awareness.

- More seismographs in the source region
- Arrangement for quickly propagating the warning amongst the masses
- Regular conduct of mock exercises
- Awareness as to what to be done
- Mechanism be devised for taking note of various earthquake precursors' studies and better utilizing their results

4. Infrastructure be looked more broadly and not restricted to departmental assets alone.

- Hill slope be included in road infrastructure
- River bank in waterways

5. Different modes of financing DRR related activities be explored.

- Flexi fund available under CSS be made available under Mitigation Fund
- CSR funds
- Local area development funds of MPs and MLAs
- Individuals, organisations and cooperates motivated to adopt villages for disaster resilience
- Losses incurred by previous disasters be documented together with the cost of response, recovery and reconstruction and the source of funding, time in mobilisation and disbursement of funds and completion of various activities. This would help understand gaps in the system and problems caused by design, implementation, lack of liquidity, or otherwise. Based on this better design of financial strategy for DRR could be framed

6. Risk transfer tools be explored for effective DRR.

- Popularisation of infrastructure insurance
- Incentives for compliance
- Analysis of past losses and funding be an input for a proactive or "ex-ante" disaster-risk financing strategy of the government, which should be an optimal mix of relief fund utilization and risk transfer

7. Building community resilience through the use of science and technology and capacity building.

- Bulk sms
- Multimedia for awareness
- Satellite technology for monitoring and assessment
- Use of drones
- Capacity building and training for different stakeholders
- DRR awareness through schools
- In view of efficient and better performance of the traditional houses promote living in traditional houses. Important / influential individuals be encouraged to adopt living in traditional houses