

Seismic Safety Agenda in North-Eastern Region of India: A NICEE Initiative

ABSTRACT

There was a long-felt need of getting a collective feedback from all stakeholders on the impact of various earthquake awareness programs launched by Government and non-Government organizations in Northeastern region of India. National Information Centre of Earthquake Engineering (NICEE) took an initiative and organized a one-day brainstorming workshop at Indian Institute of Technology Guwahati on Saturday, March 22, 2014. The primary objective of the workshop was to understand the problems faced by various stakeholders in the region while implementing the earthquake safety agenda in day-to-day life of local people. Interesting discussion took place between twenty-eight participants from several organizations on how to move forward and what should be the further role of NICEE and other agencies in improving the seismic safety of the region. This article highlights the urgent need for additional actions required to be undertaken by various stakeholders and agencies to reduce the earthquake risk in the Northeastern region of India.

INTRODUCTION

India has a very real earthquake problem, which has been highlighted several times in different forums (Jain 2005). The past two decades have seen devastating earthquakes striking India with frightening regularity. India's seismic zone map emphasizes that over 60% of land area in India is under moderate to severe earthquake hazard (IS1893 2002).

The Northeastern region of the country falls in the most severe seismic zones of IV and V. Recent earthquakes in Sikkim (2006 & 2011) highlighted the seismic vulnerability of the infrastructure and growing seismic risk in the region with the construction of seismically deficient structures (Kaushik et al. 2006; Rai et al. 2012; Kaushik and Dasgupta 2013). The Northeastern region has a huge potential for generation of hydropower, and a large number of big and small projects are already in pipeline. Hence, it is of utmost importance that the populace of the region is made aware of the techniques available to minimize the damage to life and property in case an earthquake strikes.

Some steps in this direction were initiated by National Information Centre of Earthquake Engineering (NICEE) in the past. These include conduction of short courses and lectures on seismic safety and earthquake resistant design with the help of faculty members at IIT Guwahati and distribution of reading material on various topics published by NICEE. It was felt that these have not had desired effect in the local region, and therefore, the advisory committee of NICEE during the 9th meeting held on August 06, 2013 had laid emphasis on conducting a workshop at IIT Guwahati so as to outline the way ahead. In order to evaluate the efficacy of the steps taken till date and mark the strategy for bridging the gaps still existing, one day brain-storming workshop was held at IIT Guwahati on Saturday, March 22, 2014.

The workshop was attended by 28 participants representing organizations which were considered to be major stakeholders in the seismic safety of the region. Prof. A.K. Sarma, Head, Department of Civil Engineering, IIT Guwahati, was in chair. Prof. Hemant B.

Kaushik welcomed the participants and apprised them that this was the first of its kind workshop by NICEE outside Kanpur. Prof. Sarma appreciated the efforts of NICEE and felt strongly that this workshop would go a long way in firming up the action agenda for the seismic safety of the region. He apprised the participants about the research work being undertaken at IIT Guwahati in earthquake engineering and dissemination of earthquake related information.

Prof. Durgesh C. Rai, Coordinator NICEE, briefly educated the participants about the formation and functioning of NICEE. As on date the membership of NICEE stands at around 11,500 of which only about 400 members are from the North-Eastern region of the country. The quarterly periodical of NICEE - *Earthquake Engineering Practice* - which is distributed to about 3,400 members from 69 countries has only about 130 members subscribing from the region. This clearly indicates a very small penetration in the region and NICEE is firmly committed to empower all the stakeholders of the region, viz., engineers, architects and builders.

PRESENT SCENARIO

During the course of discussions, the following emerged with regard to the present scenario on the seismic safety awareness and practices in the region.

Physical Factor

- Soil movement was a common phenomenon observed in the region.
- The terrains in the area necessitated construction of structures on slopes and with dearth of knowledge, local methods that cannot be considered to be safe, were being mostly used.
- Joints are imperfect and sagging of beams is a common phenomenon.
- Multi-storey buildings are being constructed with least concern for proper designing or building codes.
- Buildings in rural areas are close to confined masonry construction but not following its exact methodology.
- Usage of poor quality material and poor workmanship is rampant in the region.
- House owners, builders and designers are hesitant to spend on safety related issues, not only in this region, but in the entire country.
- Seismic micro zonation of Guwahati city is available with Assam State Disaster Management Authority (ASDMA).
- Transportation of gas through pipelines was being done on a large scale throughout the region, but seismic safety in this area was a major concern.
- ASDMA was actively involved with several institutions in the region for projects related to seismic safety, rehabilitation of structures, etc.

Awareness Status

- The local populace is generally aware about the seismic risk in the region but lacked knowledge and practices about its mitigation. This has resulted in construction of huge number of vulnerable construction throughout the Northeastern region. The problem is more in urban areas because of rapid expansion and urbanization without due regards to the earthquake safety.
- Poor detailing and monitoring during construction is rampant.
- Poorly engineered or non-engineered buildings are a common norm in the entire region.
- Seismic safety consciousness of architects is generally low throughout the country.

Academic Issues

- About 20 engineering colleges exist in the region with Civil Engineering discipline. However, shortage of faculty is a major hindrance.
- There are only two colleges that offer Architecture Courses in the region.

ROAD AHEAD

There was a consensus amongst the members present that immediate action on the following issues was necessary.

Topography

- Action towards slope protection, for example, soil nailing on hill slopes, and prevention of liquefaction.
- Considering vulnerable soil conditions at most locations, more geotechnical engineers to be involved in seismic safety issues.
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Training Issues

- Training of engineers and artisans is conducted by several organizations. However, it was felt that the programs did not have desired effects. The training programs are required to be developed keeping in mind the necessity of the local people, the construction practices in the region, and the cultural aspects.
- In countries like Japan, Italy, etc. the aspects of seismic safety are instilled from childhood itself. Similar action is essential in the entire country and especially in the Northeastern region.
- ASDMA could conduct awareness programmes in the region.
- Design and construction of Confined masonry to be included in syllabi of architecture and civil engineering.
- Designers need to be trained to design safe structures for main earthquake and subsequent aftershocks. Detailed research work is required to be undertaken in this area.

Concerted Efforts

- Specific study related to seismic safety of gas pipelines is required to be undertaken.
- Micro zonation of Guwahati city could be made easily accessible for use by designers, architects and builders
- Schedule for health monitoring of structures especially schools, hospitals, fire stations, etc. must be drawn up and rigidly followed
- Awareness must for keeping a separate budget for safety issues of the structures being built
- Material testing methods and standards need to be emphasized for improving the construction quality.
- Construction of buildings on slopes more than 30 degrees should be banned by the district authorities.
- Enforcement and governance should be of high order.
- Seismic safety awareness needs to be instilled in the faculty of architecture by providing a platform where a discussion should take place between architects and designers.

- Council of Architecture to be approached to make PCM must for entry to architecture courses.
- Some basic courses on Structural Engineering (for example, Structure Analysis) to be included in syllabi of architecture.
- For practicing engineers Masters in Structures should be made mandatory.
- Confined masonry could be effectively and safely used for schools, PHC, fire stations, etc. in the region
- ASDMA and other state authorities be approached for spreading awareness at school level through inter school quiz. Painting competition can also be included to further spread awareness.
- Draft code for buildings on slopes is required to be developed. (IRC hill road manual could be helpful)
- Draft code for seismic architecture is required to be developed on lines of American Institute Architecture Manual.
- Document on evaluation and retrofitting of structures with specific reference to high value structures.
- Translation of select NICEE publications into Assamese, Bengali and Hindi.
- Earthquake resistant structures workshop for practicing engineers. International experts may also be called upon to express their opinion.

CONCLUDING REMARKS

The participants generally opined that the daylong workshop was a wonderful experience. Several key aspects on possible ways to improve the earthquake safety of the region were discussed. It was stressed that the earthquake safety issues must be included in school syllabus to instill the earthquake awareness in children. Similarly, the basic structural engineering courses are required to be included in the Architecture program. More number of training programs and short courses targeted and tuned for Northeastern populace are required to be undertaken for improving the overall earthquake safety of the region by reducing construction of seismically deficient structures. Some popular NICEE publications are required to be translated in local languages so that people can take advantage and improve the construction practice. However, the absence of several stakeholders was felt, whose presence would have made the workshop more meaningful. It was also felt that possibility of sponsored fellowships for research in this area be investigated. Backward and forward integration of research work is essential for the betterment of the society.

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