Prof. (Dr.) Chandan Ghosh
Professor & Head
Resilient Infrastructure Division
National Institute of Disaster Management (NIDM)
Ministry of Home Affairs
Govt. of India

A sense of urgency and compliance can be created through repeated trainings and capacity building of practicing engineers at all levels.

Seismic Academy: Share your vision for the Indian and Global Seismic Infrastructure.

Prof. (Dr.) Chandan Ghosh: Earthquake engineering is in today's context a very pertinent topic in Indian infrastructure and requires lot of attention. There has been significant progress in terms the standard development, keeping in conjunction with the changing scenario. The global safety standards in terms of earthquake stability have been very streamlined and can inspire us to adopt similar approach, tailored to meet the Indian framework.

We should also put adequate emphasis on the site-specific measures while dealing with earthquake resistant construction. It is important that we have to go an extra mile in bringing experts' contribution in the field evaluation of the existing as well as upcoming infrastructure in the country.

Seismic Academy: Highlight the need of periodic seismic upgrades?

Prof. (Dr.) Chandan Ghosh: It is extremely important that the seismic standards are getting upgraded on a regular basis, in line with the changing demands. It is to be noted that BIS has been very up-to-date in revising many standards. These details also need to be implemented and maintained during actual execution. A sense of urgency and compliance can be created through repeated trainings and capacity building of practicing engineers at all levels. The continuous changes also need to be communicated effectively to the students through competence enhancement sessions and regular update in the curriculum.

Seismic Academy: One of your areas of expertise is seismic microzonation. Kindly elaborate and share your thoughts.

Prof. (Dr.) Chandan Ghosh: Seismic microzonations are routinely in practice since 1990's and many cities have tick marks in these exercises. Delhi-NCT has been completed in 2015, Sikkim in 2005, Guwahati in 2005 and many more have completed the process. However, it is to be noted that these are the study reports based on ground characteristics, which is to be looked after by the municipalities while sanctioning plans and more so by the construction fraternities for due changes or modification in the design procedure as well as corrective measures, e.g. adoption of liquefaction mitigation measures.

Issues lie in the interpretation of Microzonation findings with building performance, where complexities of structural geometry, architectural hegemonies and extra sense of safety factor based on judgmental-superstitions among the experts are excessively out-powered by even by an M5 earthquake event.

Seismic Academy: To aid in earthquake management, what ground improvement techniques will you lay stress upon for the industry to ponder over diligently?

Prof. (Dr.) Chandan Ghosh: Ground improvement measures are very much enriched in the construction fraternity yet majority of the decisions on the seismic performance of a built up facility lies on the factual situation of foundation.

Appropriate measures for the ground improvement must be done and in many cases, e.g. instead of avoiding liquefaction potential areas as per Microzonation report, simple densification of the ground or micropiling of the shallow ground with proper evaluation of the ground improvement by SPT, CPT would be a good demonstration of the best practice.

Seismic Academy: What will be your recommendations to make built-infrastructures disaster resilient?

Prof. (Dr.) Chandan Ghosh: In order to make built-infrastructures disaster resilient it is recommended that:

- All state governments and all local bodies (urban & rural), development authorities, special and new town development agencies, etc. need to modify, revise and revamp the existing building byelaws; development control rules; planning standards; town planning rules; special regulations for fire, structural, health, construction, electric and life safety, in line with the NBC 2005, 2016 by suitably adopting fully or adapting it with such local variation as may be needed.
- NBC 2005, 2016 to be adopted as the basis for all structural design, fire protection, building and plumbing services, building materials & practices (and construction safety) and for proper protection, upkeep & maintenance of water bodies by modifying the departmental construction codes/specifications/ manuals of government construction departments.
- The strengthening of all building development and regulating agencies with the right level of professional human resources to deal with proactive responses needed with the building professionals and builders. The professional human resource pooling for contiguously situated human settlements and the related regulating agencies should be attempted, considering the socio-economic and budgetary constraints of smaller level local bodies dealing with building regulation work.

Seismic Academy: What in your opinion is required to unleash India's full potential in the infrastructural sector?

Prof. (Dr.) Chandan Ghosh: India's software part of physical infrastructure (like telecom, air and port services) performed well, thus not only helped the country to maintain a faster growth but also integrated the economy with the world market at a faster pace.

At the same time the hardware component of the country's physical infrastructure (e.g. road, rail, power) comparatively grew slowly, thus, negated the country's development process. Therefore, in order to unleash India's full potentials, development of the hardware component of the country's physical infrastructure (e.g. road, rail, power) perhaps deserves utmost attention. This also indirectly indicates high investment potentials in roadways, railways, power and the associated components in India.

Seismic Academy: Your recommendation for ensuring the need to address the areas of seismic safety to be taken up for future establishments.

Prof. (Dr.) Chandan Ghosh: There is a need for a more systematic, holistic and integrated effort to address the critical areas of concern responsible for fragile seismic safety in India. These can be achieved by:

- Sensitizing stakeholder groups on prevalent seismic hazard and potential loss due to lack of earthquake resistance in buildings and structures;
- Implementing structural mitigation measures through formal education and research in earthquake-resistant design and construction, beginning with faculty members of colleges of civil engineering and architecture made competent in associated subjects, and then modifying the undergraduate curriculum to include mandatory elements of earthquake-resistant design and construction;
- Improving enforcement of building codes and town planning regulations related to earthquake-resistant design and construction;
- Encouraging earthquake-resistant features in non-engineered construction in suburban and rural areas;
- Organizing formal technical training of architects and engineers on earthquake-resistant construction best practices.

“There is a need for a more systematic, holistic and integrated effort to address the critical areas of concern responsible for fragile seismic safety in India.”