

## **2<sup>nd</sup> INDIA DISASTER MANAGEMENT CONGRESS**

4-6 NOVEMBER 2009

VENUE-VIGYAN BHAVAN, NEW DELHI

### **Geological Disasters Thematic Cluster - A [1. Earthquakes]**

#### **Introduction**

Earthquakes represent a risk in many parts of the world, particularly Western South and North America, China, Japan, Philipines, Iran, Turkey and northern part of India, to name a few of the higher seismic risk regions. Assessing the seismic risk, determining mitigation alternatives and making a decision about what to do and doing it adequately with the utilization of knowledge, methods and data from disparate fields, including the geosciences, engineering, emergency planning, business continuity, insurance and economics, form the gamut of earthquake risk management process.

Effective disaster reduction depends upon a multi-sectoral and interdisciplinary collaboration among all concerned stakeholders. While there have been notable achievements in the mitigation of natural hazards in recent times and while awareness of risk from natural and environmental disasters has considerably increased in global scale, there remain areas where loss of life and impoverishment of large communities continue to increase at an alarming rate. The severity and frequency of disasters and their impact on the society will intensify in near future, thus requiring the urgency for sustained strategies to reduce disaster risk. In the 2<sup>nd</sup> India Disaster Management Congress (IDMC-2009) all level decision makers (from ministers to local authorities), scientists, technocrats, leaders of the executive and legislative powers, doctors, social activists, NGOs & INGOs, relief organizations, business corporate, representatives from private sectors and media are invited to take part and help devising strategy for the reduction of disaster impacts on the population, vital infrastructure and property.

About 59% of India's geographical area is under the threat of moderate to severe earthquakes. The increase in demographic pressure, unplanned and ill-planned development practices and poor quality construction techniques have contributed immensely to the proliferation of seismic risk. Almost the entire northeast region, northern Bihar, Himachal Pradesh, Jammu & Kashmir and some parts of Kutch are in seismic zone V (IS 1893 – 2002), while the entire Gangetic plain and some parts of Rajasthan are in seismic zone IV. In the last 19 years the country has experienced eight major earthquakes that took more than 25000 lives and thereby affecting the local or regional economy. The effect would be colossal if such earthquakes hit metro cities where developmental activities are alarmingly high. In India, where 90% of the

population lives in buildings built without proper guidance from qualified engineers and architects, occurrence of an earthquake of even a medium scale spells disaster.

The country has been classified into four macro-seismic zones indicating the intensity of damage or frequency of earthquake occurrences. These zoning maps indicate broadly the seismic coefficient that could generally be adopted for design of buildings in different parts of the country. These maps are based on subjective estimates of intensity from available information on earthquake occurrence, geology and tectonics of the country. The Indian seismic zoning is a continuous process, which keeps undergoing changes as more, and more data on occurrence of earthquakes becomes available.

### **Context**

National policies on earthquake risk mitigation, preparedness, emergency response, and recovery and reconstruction, individually and collectively shall be addressed to:

- Reduce increasing the risk to people, building stock, and lifeline infrastructure that future construction and urban development will lead to increased earthquakes.
- Start decreasing the risk to community, businesses, organizations, buildings, and infrastructure already placed at risk to future earthquakes by the vulnerabilities of past urban developments.
- Devise planning and implementing ways to respond to and recover from the inevitable earthquake, including the unthinkable extreme event---a catastrophic earthquake in the Himalayan belt or Tsunami effect due to oceanic subduction plate movement--- that will severely disrupt the production, distribution, and financial systems of habitat, industries, vital establishment and the nation as a whole.
- Ensure implementation of bye laws relating to earthquake resistant design and constructions
- To spread awareness amongst vulnerable communities to develop seismic hazard and risk microzonation map in order to examine and evaluate seismic safety of their own dwellings and to take measures for the retrofitting of the buildings.

### **Where India stands?**

Seismic risk reduction demands a systematic evaluation of the hazards, vulnerability and risk mapping of the entire region. Town and Country Planning Acts, Master Plan, Development Control Rules and Building Regulations of some of the metro cities in the country have mentioned adequately on the importance of safety requirements against natural hazards. Moreover, roles and responsibilities of different stake holders namely, owner, builder, developer, architect, engineer and the personnel in the regulatory bodies/authorities have been defined but they are not adequately put to practice due to lacking in performance oriented testing, mockdrill and accountability of disaster safety measures in the form of pilot projects.

As per guideline issued by National Disaster Management Authority (NDMA) many states have already formulated broad Disaster Management Plan, keeping in view the nature of natural and man-made disasters likely in the State with appropriate response mechanism for action at various levels, starting from State level headquarters through the district headquarters, towns down to the local village units. Appropriate preparations keeping in view the State level disaster mitigation plan in respect of preparedness, prevention, capacity building, training, mockdrills, the nature of equipments and machinery needed to be provided for has been underway.

### **Broad scope of the Congress**

- To motivate all stake holders with the importance of microzonation studies that includes suitable instrumentation network in the disaster prone area of the states for monitoring and study of earthquake occurrences, strong ground motions, cyclonic wind speeds, ground water resource & watershed mapping, and flood flows.
- To undertake micro-zonation surveys in fast expanding urban agglomerations falling in the disaster prone regions for preparing land use and development plans based on local site effects. Based on the recent events priority may be given to the settlements where ground subsidence has been observed.
- To ensure proper performance of the existing buildings and housing stock to withstand the forces of natural hazards in future, it is necessary to create mechanism for carrying out safety audit and facilitate adequate financial support for retrofitting and strengthening wherever necessary.
- To ensure empowerment and accountability of the various actors involved in building construction, namely, the owner, the builder/developer/promoter, the architect, the structural engineer, supervisors, the local body personnel involved in approval of plans, inspection of constructions and issuing of building use permits.
- To ensure that all new building constructions have mandatory provisions of safety elements against earthquakes, cyclones and floods.
- To assess the hazard safety of existing buildings and to demonstrate and encourage owners for retrofitting of unsafe buildings, particularly those which are critical to the safety of large number of people.
- To initiate a pilot project with various building service agencies where all multi-hazard resistant measures shall be demonstrated and checked its performance with an aim to device a template for screening existing buildings so that risk mapping standards can be established.

### **Common Gaps**

The most common gaps in the understanding of earthquake risk management in India are:

- Mass scale awareness campaign, education, sensitization programs are not enough to cater country's need
- The built-environment in the country is seismically vulnerable and there is urgent need for assessing their risk potentiality to expected earthquakes

- Adequate techno-legal and techno-financial regimes while approving constructions are yet to be devised
- Earthquake resistant features are not routinely enforced in construction of houses situated in seismically active zones III, IV and V.

### **Earthquake Risk Management Policy of the country**

The earthquake risk management policies of the country shall look into upgrading seismic network and integrate this information into a comprehensive and predictive understanding of earthquake phenomena; and communicate this understanding to end-users and the general public in order to increase earthquake awareness, reduce economic losses, and save lives.

The ministries and financial institutions shall motivate leading research institutes to develop a comprehensive, physics-based understanding of earthquake phenomena in Indian context through integrative, multidisciplinary studies of plate-boundary tectonics, active fault systems, fault-zone processes, dynamics of fault ruptures, ground motions, and seismic hazard analysis.

Earthquake risk management policy makers of the country shall motivate earthquake-prone community by devising social, technical, administrative, political, techno-legal, techno-financial forces for a concerted, long-term effort to change, improve, and accelerate the enactment and implementation of cost-effective public policies for mitigation, preparedness, emergency response, and recovery and reconstruction.

### **The Congress shall elaborate on the following areas:**

- Earthquake resistant design and construction of infrastructures
- Policy, standards and guidelines on earthquake risk management
- Evaluation, repair, rehabilitation and retrofitting of structures
- Disaster safe construction practices and issues
- Techno-legal and techno-financial framework for earthquake protection compliance
- Nonstructural earthquake risk mitigations
- Training and Capacity building of stake holders
- Computer aided earthquake risk management tools
- Engineering seismology and seismotectonics
- Liquefaction and Ground failures
- Earthquake forecasting and early warning systems
- Seismic Microzonation, vulnerability assessment and urban planning
- Lessons learned from past earthquakes and post-earthquake reconstructions

**Session Plan: A1: Earthquake**  
Day & Date: Wednesday, Nov 4 2009  
Venue: Vigyan Bhavan, Hall -1 (Plenary hall)

**Chairman:** Dr D K Paul, Professor, Department of Earthquake Engineering, IIT-Roorkee  
**Session Officials:** Dr Chandan Ghosh and Shri Amir Ali Khan, NIDM, Delhi

**Keynote session: 12:00 – 13:00 hrs**

Lecture 1:

**Application of earthquake resistance guidelines and enforcement mechanism - Indian context – Prof. A.S. Arya, Padmashee**, Professor Emeritus, Deptt. of Earthquake Engg., I.I.T Roorkee, Former National Seismic Advisor GoI-UNDP New Delhi

Lecture 2:

**Earthquake Risk Mitigation Programs for Public and Private Sectors: Post Earthquake Damage Assessment & Loss Estimation – Mr H. Kit Miyamoto**, President & CEO, M/s Miyamoto International Inc., California, USA

Lecture 3:

**Earthquake testing facility at SERC, Chennai – Dr K. Muthumani**, Scientist G & Head, Adv. Seismic Testing and Research Laboratory, SERC, Chennai

**Technical session - I : Earthquake resistant construction & Retrofitting**  
Venue: Hall 1 (Plenary Hall), Date: Nov 4, 2009, Time: 16:00-18:00

Chair: Dr D K Paul

Rapporteur:

1	Earthquake resistant design & construction practices in India	<b>Yogendra Singh<sup>O</sup></b> , Ratnesh Kumar Putul Haldar IIT-Roorkee <a href="mailto:yogenfeq@iitr.ernet.in">yogenfeq@iitr.ernet.in</a>
2	Requirements of Building Materials for Earthquake Resistant Building	<b>Shailesh Kr. Agrawal<sup>O</sup></b> J.K. Prasad, BMTPC, Delhi <a href="mailto:ska@bmtpc.org">ska@bmtpc.org</a> , <a href="mailto:jkprasad56@gmail.com">jkprasad56@gmail.com</a>
3	Proposed Rapid Visual Screening Procedure for Seismic Evaluation of RC Frame Buildings in India	<b>Keya Mitra<sup>O</sup></b> , BESU, West Bengal Sudhir K Jain, IIT-Gandhinagar Mehul R Shah, <a href="mailto:keyamitra@gmail.com">keyamitra@gmail.com</a> , <a href="mailto:director@iitgn.ac.in">director@iitgn.ac.in</a> ,

		<a href="mailto:mrscept@yahoo.co.in">mrscept@yahoo.co.in</a>
4	Earthquake Safety Elements in Traditional Koti Banal Architecture of Uttarakhand, India	Piyooosh Rautela, DMMC, DDN <b>Girish Chandra Joshi<sup>0</sup></b> , DMMC, DDN <a href="mailto:algirish@yahoo.co.in">algirish@yahoo.co.in</a>
5	Constructional Practices, Climate Change and Disasters – Some instances from Kashmir	<b>G. M. Dar<sup>0</sup></b> , ATI, IMPA, Srinagar <a href="mailto:gmdar@yahoo.com">gmdar@yahoo.com</a>
6	Managing with Vulnerable Built-infrastructures in India	Chandan Ghosh, NIDM, New Delhi Amir Ali Khan, NIDM, New Delhi S. Yousuf, PHE, Srinagar <a href="mailto:cghosh24@gmail.com">cghosh24@gmail.com</a> , <a href="mailto:alikhnamir@gmail.com">alikhnamir@gmail.com</a>
7	Traditional Earthquake Safe Housing Practices of North East India	Amir Ali Khan, NIDM, New Delhi Chandan Ghosh, NIDM, New Delhi <a href="mailto:alikhnamir@gmail.com">alikhnamir@gmail.com</a> , <a href="mailto:cghosh24@gmail.com">cghosh24@gmail.com</a>
8	Retrofitting of structures – principles and applications	<b>Amlan Sengupta</b> , IIT-Madras <a href="mailto:amlan@iitm.ac.in">amlan@iitm.ac.in</a>
9	Seismic control of structures using Friction dampers	<b>S C Mehrotra</b> , Mehrotra Consultants/Unitech Ltd.
10	Concrete Jacketing with Supplemental Damping for Seismic Retrofit of a Non-Ductile Concrete Building	<b>Sandeep Donald Shah</b> <a href="mailto:donaldshah@yahoo.com">donaldshah@yahoo.com</a>
11	Building capacity in Delhi to seismically retrofit existing lifeline building	JE Rodgers, <b>H Kumar<sup>0</sup></b> & LT Tobin <a href="mailto:Hari@geohaz.org">Hari@geohaz.org</a>
12	Post Kashmir earthquake reconstruction & resettlement experience	<b>Najmi Kanji</b> Tinni Sawhney, Agakhan Foundation, Delhi <a href="mailto:tinni.sawhney@akdn.org">tinni.sawhney@akdn.org</a>
<b>Technical session - II : Seismic Microzonation &amp; Earthquake forecasting</b> <b>Venue: Hall 6, Date: Nov 5, 2009, Time: 9:30 -12:00</b>		
<b>Chair:</b>		
<b>Rapporteur:</b>		
1	Seismic microzonation principles and techniques	<b>T.G. Sitharam<sup>0</sup></b> , IISc, Bangalore <a href="mailto:profsgs@gmail.com">profsgs@gmail.com</a>
2	Importance of seismic microzonation in urban safety – a case study	<b>Aftab Alam Khan</b> , SDMC, Delhi

		<a href="mailto:aftab@univdhaka.edu">aftab@univdhaka.edu</a>
3	Current Seismic hazard scenario in Garhwal-Kumaun Himalayas	<b>Ajay Paul</b> , Wadia Institute of Himalayan Geology, Dehradun <a href="mailto:ajaypaul@wihg.res.in">ajaypaul@wihg.res.in</a>
4	Seismic hazard Microzonation of Guwahati city	<b>T. Rahman</b> Department of Civil Engineering National Institute of Technology, Assam Email: <a href="mailto:tauhid_srm@yahoo.com">tauhid_srm@yahoo.com</a>
5	Seismic Vulnerability Assessment of Mussoorie and Josimath, Uttarakhand (India)	<b>Girish Chandra Joshi<sup>0</sup></b> , Piyoosh Rautela & Bhupendra Bhaisora <a href="mailto:algirish@yahoo.co.in">algirish@yahoo.co.in</a> <a href="mailto:piyooshrautela@gmail.com">piyooshrautela@gmail.com</a>
6	Observation of earth's free oscillations in Gujarat Superconducting Gravimeter at MPMGO site Badargadh in Kachchh	Arun Gupta, Rashmi Pradhan, Srichand Prajapati, Mukesh Chauhan B.K. Rastogi Institute of Seismological Research, Raisan, Gandhinagar
7	Seismic risk in hilly regions	D.S. Narsimha, Yogendra Singh & M. L. Sharma <a href="mailto:narasimhadhongdi@gmail.com">narasimhadhongdi@gmail.com</a>
8	Tectonic geomorphology as a tool for Paleoseismic studies: A Case Study of Alaknanda valley, Uttarakhand Himalaya, India	S. P. Sati, Naresh Rana, Devender Kumar D. V. Reddy HNB Garhwal University, Uttarakhand <a href="mailto:spsatihnbgu@gmail.com">spsatihnbgu@gmail.com</a>
9	Microzonation and Disaster Risk Mitigation Studies of Istanbul Metropolitan Municipality	Mahmut BAS, Hikmet KARAÖGLU,  Ahmet Emre BASMACI Istanbul Metropolitan Municipality, Directorate of Earthquake and Ground Analysis, Sarachane, Istanbul TURKEY <a href="mailto:mahnmt.bas@ibb.gov.tr">mahnmt.bas@ibb.gov.tr</a>
10	Evaluation of Liquefaction Potential of Chandigarh City	R. Dharmaraju, S. Karthikeyan, VVGST Ramakrishna, C. Ghosh <a href="mailto:rdraju@yahoo.co.in">rdraju@yahoo.co.in</a>

11	Seismic hazard assessment based on attenuation relationship for Tamil Nadu State, India	S. Rajarathnam, G. P. Ganapathy R. Muthukumar Anna University, Chennai <a href="mailto:cdmmindia@yahoo.co.in">cdmmindia@yahoo.co.in</a>
12	Recent developments in earthquake forecasting	<b>Devesh Walia</b> , NEHU, Shillong <a href="mailto:deveshwa@gmail.com">deveshwa@gmail.com</a>
13	Static coseismic ground movement of the 26 <sup>th</sup> December 2004 earthquakes-observation in Andaman area and inferences on seismic hazard on active fault traces	Sumit Kumar Ray, Anshuman Acharyya (GSI, Kolkata) <a href="mailto:skray45@yahoo.co.in">skray45@yahoo.co.in</a>
14	Possibilities of Earthquake Prediction using Ground and Satellite Techniques	<b>Shourabh Bhattacharya</b> <sup>O</sup> and A. K. Gwal, Bhopal <a href="mailto:shourabhattacharya@gmail.com">shourabhattacharya@gmail.com</a>
15	Seismic Vulnerability of National Capital Region Delhi from a Large Magnitude Earthquake in NW Himalayas	<b>Arun Bapat</b> <sup>O</sup> , Pune <a href="mailto:arun_bapat@vsnl.com">arun_bapat@vsnl.com</a>
16	The Potential of an Earthquake Early Warning System of Delhi Region	H. R. Wason IIT, Roorkee <a href="mailto:wasonfeq@iitr.ernet.in">wasonfeq@iitr.ernet.in</a>
17	Foreshock clustering and precursory changes in source parameters for the Kachchh Earthquakes Gujarat, India	Sandeep Kumar Aggarwal, BK Rastogi B. Sairam <a href="mailto:sandeep12480@gmail.com">sandeep12480@gmail.com</a>
18	Analysis of temporal heterogeneity in the magnitude of completeness & its uncertainty for a North East India region	Ranjit Das, Earthquake Dept., IIT Roorkee <a href="mailto:ranjit244614@gmail.com">ranjit244614@gmail.com</a>
19	Seismic Hazard Assessment of Kumaon Himalayan Region using Fractal dimension of the part earthquake sequence	P. N. S. Roy, <b>S. K. Mondal</b> <sup>O</sup> <a href="mailto:Pns_may1@yahoo.com">Pns_may1@yahoo.com</a>
20	Perception of Earthquake Hazard and Risk in Garhwal Himalaya Uttarakhand, India	M. M. Semwal, S. P. Sati <a href="mailto:spsatihnbgu@gmail.com">spsatihnbgu@gmail.com</a>
21	Unnatural earthquake prediction and animal behaviour	Bivas Bhattacharya, Kolkata <a href="mailto:bivastrans@gmail.com">bivastrans@gmail.com</a>
22	Pseudo-seismic tunneling vis-à-vis earthquake precursor	Aftab Alam Khan SDMC, Delhi <a href="mailto:aftab@univdhaka.edu">aftab@univdhaka.edu</a>
23	Seismic-hydrological studies for limitation of negative earthquake consequences and for	Margarita Matova, Georgi Frangov, Plamen Ivanov

	wider use of positive ones	Geological Institute, Bulgarian Academy of Sciences, Sofia, Bulgaria margarita.matova@gmail.com
24	Radon Variation in Soil Environment as Earthquake Precursor in and around Shillong Plateau	Devesh Walia D. Maibam Y. Sharma A. Saxena deveshwa@gmail.com atulnehu@yahoo.co.in
25	Response time for earthquake preparedness from seismic alert system in Shillong and Guwahati	A.C. Lyngdoh, Devesh Walia M. Taid
<b>Technical session - III : Post earthquake reconstruction</b> <b>Venue: Hall 6, Date: Nov 5, 2009, Time: 12:00 -13:00</b> <b>Chair:</b> <b>Rapporteur:</b>		
1	Tsunami Reconstruction and CBDRR	<b>KM. Parivelan</b> , Chennai <a href="mailto:Parivelan@yahoo.co.uk">Parivelan@yahoo.co.uk</a>
2	The Significance of Networking in Tsunami Recovery	Suresh Mariaselvam DRR consultant, Chennai <a href="mailto:suresh.masel@gmail.com">suresh.masel@gmail.com</a>
3	Tsunami – A Malady – Remedy Analysis in Agriculture	B. Shanmugasundaram, K. A. Ponnusamy <a href="mailto:IDMC-09@ekgaon.com">IDMC-09@ekgaon.com</a>
4	Post-Disaster Reconstruction Challenges: Lessons from Gujarat	<b>Sudhir Kumar</b> , Relief & Rehabilitation Deptt., Mumbai, <a href="mailto:skumar_sw@rediffmail.com">skumar_sw@rediffmail.com</a>
5	Earthquake recovery In context of Uttarkashi	Joshi, S. Joshi, P.C. Department of Anthropology Delhi University
6	Whether Disaster management due to earthquake is appropriate in India as per present practice?	T. Rahman U. Kumar Department of Civil Engineering, Silchar Email: <a href="mailto:tauhid_srm@yahoo.com">tauhid_srm@yahoo.com</a>
7	Post-Tsunami Effect and Children	S. JERALD CHILD SECRETARIAT, No-5, Mettu Bungalow, New Beach Road, Kadambadi, Nagapattinam – 611 001 <a href="mailto:Jerald.cst@gmail.com">Jerald.cst@gmail.com</a>

8	Disaster Management Status in J & K, India	<b>Mir Ghulam Hassan</b> District Disaster Management Authority, Srinagar, J & K and Divisional Town Planner, Srinagar Development Authority, Srinagar Email: <a href="mailto:chinar5884@yahoo.com">chinar5884@yahoo.com</a>
9	Challenges in Tsunami Response: Shelter, Gender & HIV AIDS	Harikrishna Nibanupudi Humanitarian Country Team Representative for India and Disaster Risk Reduction Specialist Email: <a href="mailto:hkrishna@oxfamamerica.org">hkrishna@oxfamamerica.org</a>
10	Approaches to integrate gender in the Tsunami Disaster Response: Experiences from Tamil Nadu	Chaman Pincha <a href="mailto:pincha.chaman@gmail.com">pincha.chaman@gmail.com</a>
11	Post-tsunami Agriculture Livelihood Restoration – A district-level coordination effort	Chandra Mohan <a href="mailto:cmohan.ncrc@gmail.com">cmohan.ncrc@gmail.com</a>
12	Negotiating Rehabilitation in a Tsunami Affected Village	Kanchan Gandhi Department of Geography, National University of Singapore <a href="mailto:kanchanisthere@yahoo.com">kanchanisthere@yahoo.com</a>
13	Public Participation on Emerging Earthquake Risk by the Development of Hydropower Projects: A Case Study of the Tribal Areas of Himachal Pradesh	V. B. Negi IGNOU, Shimla <a href="mailto:negivbhagat@rediffmail.com">negivbhagat@rediffmail.com</a>
14	Building Community Organisations for effective Disaster Recovery Post Tsunami Experiences of DHAN Foundation	J. Saravanan DHAN Foundation, 23 West Park Road, Shenoy Nagar, Chennai – 600 030. Email : <a href="mailto:dhancpp@gmail.com">dhancpp@gmail.com</a>
15	Involving Youth in Documenting Tsunami Reconstruction	Gopal Kumar Jain, Youth Programmes, CEE <a href="mailto:gopal.jain@ceeindia.org">gopal.jain@ceeindia.org</a>
16	Development of a Himalayan region for earthquake risk reduction	Ila Gupta R Shankar Email: <a href="mailto:ila_jo@yahoo.com">ila_jo@yahoo.com</a>