



KOBE REPORT draft
Report of Session 3.5, Thematic Cluster 3

Seismic disaster mitigation assurance in the 21st century
- how should our societies encounter major earthquakes?

1. Summary of the session's presentations and discussions

The focus of this Session 3-5 has been to present technologies developed for earthquake disaster mitigation, to provide critical evaluation of the technologies, and finally to propose practical methods of upgrading and practical mechanisms of knowledge transfer that can be shared by all earthquake-prone countries throughout the world. This topic is most appropriately addressed by international or national lateral organizations in the field of earthquake engineering, such as International Association for Earthquake Engineering (IAEE) and Japan Association for Earthquake Engineering (JAEE), primary organizers of this session.

In the first part of the session chaired by Dr. Hirokazu Iemura, General Secretary of IAEE, five speakers made keynote presentations representing the following organizations:

Dr. Luis Esteva, President of IAEE, reviewed past major earthquake damages and technical lessons learnt from these as well as past activities of IAEE in the 20th century, and showed a perspective on the positive roles of IAEE for earthquake disaster mitigation in the 21st century.

Dr. Polat Gulkan, Executive Vice President of IAEE, reported on new initiatives of IAEE for earthquake disaster mitigation in developing countries and made proposal by IAEE for achieving global seismic resilience through enhanced cooperation among countries facing earthquake and other perils. Whereas the global seismic risk is increasing because of the increase of assets exposed to potential earthquake, and whereas the implementation of measures that enable mitigation shows great variability between and even within individual countries. IAEE might propose the inclusion of the following statement in the Resolutions of WCDR: "The UN should select several densely populated cities with high disaster risk for the development of integrated multidisciplinary demonstration projects."

Dr. Tsuneo Katayama, President of World Seismic Safety Initiative, reported examples of the successful past activities of WSSI in support of UN's IDNDR (1990-2000), for earthquake preparedness in developing countries of Asia Pacific region, such as in Nepal and Myanmar. WSSI organized a unique reconnaissance team from developed and developing countries after the Bhuj earthquake, which brought a resounding success in terms of how we can raise awareness about earthquake disaster. Although WSSI is not rich in funds, its activity, especially on small but realistic and well-focused projects that bring people from developed and developing countries to work together, will continue to mitigate earthquake disaster worldwide.

Dr. Kojiro Irikura, President of JAEE, explained importance of hazard and risk assessment as well as future roles of JAEE for earthquake disaster mitigation. Significant progress has been achieved in academic field of ground motion simulation and seismic hazard assessment after the 1995 Kobe Earthquake, while it has not yet reflected to practices such as design code for new construction or seismic retrofit. JAEE will promote exchange of information and technology in various fields of earthquake engineering not only in Japan but also globally by unifying seismology, geotechnical,

structural and social engineering for disaster mitigation.

Dr. Masayoshi Nakashima, International Committee member, JAEE, reported on Summary of ISEE2005, International Symposium on Earthquake Engineering Commemorating the Tenth Anniversary of Kobe Earthquake Disaster, especially the resolutions derived from the panel discussion "From Research to Implementation: Making Retrofit a Reality." The resolutions are focused on addressing the construction problems of communities throughout the world with limited or non-engineered buildings in seismic areas. These problems have contributed to extensive loss of lives in the past and represent great threats for the future, especially in densely populated regions.

In the second part of the session, discussion was open to participants being chaired by Dr. Shunsuke Otani, President Elect of JAEE. Dr. Otani explained the objective of the discussion insisting the importance of seismic retrofit.

Dr. Mohsen Ghafory Ashtiany, President, International Institute of Earthquake Engineering and Seismology, Iran, insisted that the successful risk management in major cities require a comprehensive look at risk from its source to its effect and providing a socio-economically and culturally applicable and acceptable program by the people and authority along with an effective implementation with zero tolerance of its violation. The action plan should be more application oriented than pure research, and implement engineering know-how into development policies and programs with the full considerations of the regional social backgrounds.

Dr. Craig Comartin, Incoming President, EERI, USA, quoted a catchphrase "Natural hazards are inevitable. Natural disasters are not." (by John Filson, USGS scientist). To mitigate natural disasters, it is important to be intend be clear and direct in disclosing well-documented risks, to assemble practical advice for mitigative action in a form that is easy to understand and implement, to recording the results of mitigation and recovery programs. Examples of activities in EERI are reported, such as a web-based World Housing Encyclopedia (WHE), which soon will be expanded to include schools, hospitals, and other community facilities, developing tutorials on adobe and concrete frame structures, providing an unprecedented opportunity to learn from the practical experience of others. IAEE and EERI propose that the UN strongly support the enhancement and expansion of the WHE into a global repository and communication network for seismic safety.

Dr. Zifa Wang, representing CAEE, China, as the host country of 14th World Conference on Earthquake Engineering in Beijing, 2008, introduced that special emphasis will be focused on 1) Tsunami and its early warning system, 2) Raising the public awareness, and 3) International collaboration on education and training at the conference. He introduced Chinese efforts in mitigation of natural hazards. Further close collaboration with Japan and US will raise awareness of both general public and professionals for natural hazards mitigation and will make the network open and shared worldwide.

Dr. Toshimi Kabeyasawa, JAEE, pointed out the importance of more efforts in sharing technology and data for retrofit practice worldwide. Not only guidelines and research papers but also bare observation or experimental data could be useful in developing regions. Authoritative promotion by UN with limited support will urge preliminary action of translation in voluntary base. An example was introduced in translating the Standard for Seismic Evaluation and the Guidelines for Seismic Retrofit into English, which was supported by JICA but mostly done voluntarily by the authors of Japanese edition.

Dr. Susumi Iai, Convener, Subcommittee 3, ISO-TC98, insisted that adoption and implementation of ISO are considered most beneficial for improving the engineering practice and awareness of seismic hazard in the developing countries.

Dr. Takaji Kokusho, Board Member, JAEE, reported about geotechnical natural hazards in Asia, which can be measured to be significant from recent statistical data. Raising people's risk awareness on these hazards and disasters, development of low cost instrumentation networks, design guidelines, hazard maps, soil investigation techniques, and application of GIS, GPS are needed.

Dr. Kenji Ishihara, Past President, JAEE, proposed that the risk assessment be made with reference to a risk zonation map indicating various levels of risk exposure potential relevant to locality or region, which is for hazards and vulnerability. Chain-interaction on disasters resulting from multiple hazards such as heavy rainfall and earthquake also needs to be identified.

In the last part, Dr. Masayoshi Nakashima chaired and presented the draft resolution, which was based on the panel discussion at JAEE Kobe Tenth Anniversary Symposium, January 13 to 15, Awaji Island. Some modification was made with active discussion in the session and was finally adopted as the resolution of this session, which is attached in the appendix of this report.

2. Primary issues

From Research to Implementation: Making Retrofit a Reality depends on a few critical issues:

- 1) Raising the awareness of the international community about the extent of the technical construction problems and the socio-economical realities in seismically vulnerable regions
- 2) Developing feasible solutions to the construction problems and the necessary educational and training programs
- 3) Establishing collaboration mechanisms between local and international parties, including practitioners, researchers, social scientists, economists, and local authorities

3. Suggested targets and indicators to measure accomplishments

Global target(1): Several projects should be selected at several densely populated mega-cities with high disaster risk for the development of integrated multidisciplinary risk mitigation demonstration by 2008. Global target(2): Enhance and expand the IAEE/EERI World Housing Encyclopedia into a global repository and communication network for practical seismic safety starting immediately and continuously to be recognized as central source of information by 2008.

Regional target: (1) Full-scale collapse tests should be planned and conducted with international collaboration to verify seismic performance of two types each for widely used non-engineered buildings by 2010. For example, unreinforced masonry construction could be enhanced with confining members. Two types could be tested on shaking table to directly demonstrate improved performance. (2) Develop practical simple guidelines for improved construction practice in developing areas. These will include basic graphics and illustrations to explain the problem and effective mitigative actions by 2008.

National target: Statistical data on the progress of seismic retrofit shall be compiled for all the school buildings by 2008, such as ratios of school buildings retrofitted, evaluated, reconstructed and others.

Local target: Seismic evaluation should be made for all school buildings constructed before implementation of modern seismic design and construction practices by 2008; Seismic retrofit should be completed for a nationally determined part of seismically deficient school buildings by 2010.

4. a) Name, affiliation and contacts of presenters and titles of presentations

- (1) Dr. Luis Esteva (President, International Association for Earthquake Engineering):
<LEstevaM@iingen.unam.mx>
Earthquake Engineering for Seismic Disaster Mitigation in the 21st century
- (2) Dr. Polat Gulkan (Executive Vice President, International Association for Earthquake Engineering):
<pgulkan@ce.metu.edu.tr>
New IAEE Initiatives for Improvement of Earthquake Engineering Practice World with Particular Reference to Developing Countries
- (3) Dr. Tsuneo Katayama (President, World Seismic Safety Initiative):
<katayama@bosai.go.jp>
Past and Future Activities of WSSI for Earthquake Disaster Mitigation
- (4) Dr. Kojiro Irikura (President, Japan Association for Earthquake Engineering):
<irikura@egmdpri01.dpri.kyoto-u.ac.jp>

Importance of Hazard and Risk Assessment

(5) Dr. Masayoshi Nakashima (International Committee, Japan Association for Earthquake Engineering):

< nakashima@archi.kyoto-u.ac.jp>

From Research to Implementation: Making Retrofit a Reality

b) Name, affiliation and contact of person filling in the form

Dr. Hirokazu Iemura (Secretary General of IAEE, Prof., Kyoto University, Japan)

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Dr. Toshimi Kabeyasawa (International Committee, Japan Association for Earthquake Engineering)

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APPENDIX: Resolutions of the session 3-5 based on Panel discussion at JAEE Kobe Tenth Anniversary Symposium, January 13 to 15, Awaji Island, Kobe
“From Research to Implementation: Making Retrofit a Reality”

- 1) Raising the awareness of the international community about the extent of the technical construction problems and the socio-economical realities in seismically vulnerable regions**
 - a. Select one or more densely populated mega-cities with high seismic risk for the development of integrated multidisciplinary demonstration projects.
 - b. Create a major campaign to inform owners of the underlying seismic vulnerability of their buildings with the direct involvement of advertising and marketing specialists.
 - c. Create an international entity like the World Health Organization for buildings (perhaps within existing UN entities.)

- 2) Developing feasible solutions to the construction problems and the necessary educational and training programs**
 - a. Convert comprehensive documents of retrofit techniques into simple and low-cost guidelines for the end-users considering local conditions in terms of materials and construction techniques dictated by socio-economical realities.
 - b. Establish an international initiative on the retrofitting of school buildings which have common features all over the world to effectively introduce communities to mitigating seismic risk.
 - c. Establish proper mechanisms for financing both the development and the implementation of the solutions. Initiate and encourage efforts to invest and act before earthquakes as preemptive action rather than just post-disaster relief.
 - d. Establish the proper measures to assure the implementation of code provisions in regions of pre-disaster investments.
 - e. Develop educational and training programs targeting the local communities, including professionals, contractors, construction workers, government officials, and the public with the objectives of encouraging end-users to appreciate and implement seismic mitigation actions.

- 3) Establishing collaboration mechanisms between local and international parties, including practitioners, researchers, social scientists, economists, and local authorities**
 - a. Encourage the international exchange of information, including to organize and support specialty and multidisciplinary conferences on all aspects of the problem regularly.
 - b. Support existing international organizations such as “Engineers without Borders” for implementations of sample demonstration projects.
 - c. Support the international collaboration for full-scale experiments using E-Defense, NEES, and other international facilities to validate the proposed solutions and to create effective audio-visual demonstrations for educating and convincing the end-users of the importance seismically resistant construction.
 - d. Expand and enhance the EERI/IAEE “World Housing Encyclopedia” into an accessible global repository for information on practical seismic safety measures including all recommendations presented in these resolutions.