



Earthquake Hazard and Risk and Strong Ground Motion Commission
Report to the
IASPEI 2011 General Assembly

I. Report on the implementation of past decisions of the SHR commission:

1. Preparation for publication of the book on “Earthquake Hazard and Risk Assessment Methods”

The SHR 2009 report explained the objective of the book which was supposed to be delivered by 2011. Due to the heavy involvement of most of authors in the GEM project, the delivery of book in agreement with the Springer has been delayed one year. The content of the book and the authors are given in the Appendix I. The expected time of publication is early 2012 and it is envisaged that the book will be endorsed by both IASPEI and IAEE.

2. Establishment of Joint Working Group on “Dialogue Among Seismologist and Earthquake Engineers” (WG-DSEE)

The Group has not been active, but we expect that in the 15th World Conference on Earthquake Engineering in 2012, the Working Group on “Dialogue Among Seismologist and Earthquake Engineers” will be re-activated. This is a great need in the world of integrated activities for the earthquake risk reduction. The WG activities would be on the:

- Develop a mechanism for starting the critical and in-depth discussion among the earthquake related scientist
- Hazard and Risk workshops with basic applications to simple and non-engineered structures (proposal: start with Schools safety program)
- Hazard and risk assessment for highly hazardous (NPP) structures – need for strong co-operation (specialised workshop needed)
- Support and cooperate with the GEM project
- Joint effort for outreaching the public and government

3. Integrated Disaster Risk Management (IDRiM) Journal

The IDRiM Journal has been established and its First issue was published online in May 2011. Also the IDRiM society was established in 2010 and its First conference will be held from 14 to 16 July 2011 at USC in USA.

Considering that the objective of the IDRiM Society and Journal is compatible with the SHR commission objective, it is recommended that IASPEI-SHR commission endorse the Journal and co-sponsor it as well. Please visit the www.idrim.org for the society Charter and mission; as well as about the Journal objective and peer review process.

4. Report on Earthquake Risk Session (S07):

Based on the Call for the session S07 (Appendix II), 22 abstracts were received. 20 were accepted for the oral and 2 were accepted for poster presentation. Finally 14 papers were presented on 3 sessions on 4th of July 2011.

5. Report on Earthquake Risk Session (S08):

Based on the Call for the session S08 (Appendix III), 34 abstracts were received. 23 were accepted for the oral and 8 were accepted for poster presentation. Finally 13 papers were presented on 4 sessions on 2th of July 2011.

II. Program of Future Activities

The SHR commission at its 2nd of July 2011 meeting during the IUGG-IASPEI General Assembly in Melbourne, Australia has proposed the following activities and meetings for the year of 2011 to 2013:

1. IASPEI would write a request to the IAEE President and 15WCEE President to propose the joint organization of the some or all of the following sessions or workshops during 15WCEE in 2012:
 - ✓ Organization of Working Group meeting on “Dialogue Among Seismologist and Earthquake Engineers” (WG-DSEE)
 - ✓ IAEE-IASPEI Joint Session on: Rotational Strong Ground Motion and its Effect on Structural Response
 - ✓ Strong Ground Motion Databases and SGM Record Selection
 - ✓ IASPEI-IAEE-GEM Seismic Hazard Forum: Performance on existing SHA methods in assessment of Extreme Events and Disaster with the view on the Future Direction of SHA methodology.
 - ✓ Joint IAEE-IASPEI meeting SGM Site Effect
2. The SHR activities during the IASPEI/IASPO/IAHS Joint Assembly 2013 will be as follows:
 - ✓ Organization of Working Group meeting on “Dialogue Among Seismologist and Earthquake Engineers” (WG-DSEE)
 - ✓ IASPEI-IAEE Joint Session on: Rotational Strong Ground Motion Seismology
 - ✓ IASPEI-GEM-IAEE Seismic Hazard Forum or Debate: Performance on existing SHA methods in assessment of Extreme Events and Disaster with the view on the Future Direction of SHA methodology
 - ✓ Strong Ground Motion Data processing and databases
 - ✓ SGM Site Effect
 - ✓ IASPEI Forum/Debate on Earthquake Prediction and Forecasting and Public
3. ASC Assembly 2012 in Mongolia
During a joint meeting with the ASC, it was decided that SHR cooperate with the ASC and some of above mentioned topics will be covered during the ASC Conference in Mongolia.

4. SHR Commission decided to recruit young members to fulfill its objective duties. For this reason an announcement will be posted on the IASPEI website. The announcement was also made during the S07 Session on 4th of July; and it was welcomed by the participants.
5. It was decided that Mohsen Ghafory-Ashtiany will continue as the Chair of SHR for another term.

Appendix I:
Earthquake Hazard and Risk Assessment Methods
 Table of Content and Contributing Authors

	Section / Chapter	Author(s)
	Preface	tbd
	Foreword	Editors
	I. General	
1	Global Earthquake Risk: An Overview	Ashtiany/Scawthorn
2	Why Earthquake Risk Management? - Concepts and Definition	Scawthorn
3	Elements of Earthquake Risk Assessment Process and their importance or contribution in the Risk Mitigation Process	Ashtiany/Scawthorn
	II. Earthquake Hazard Analysis (Step by Step Procedure with theoretical background)	
4	Identification and characterization of Seismic Sources	Peter Suhaldoc
5	Seismicity and seismic parameters modelling	Zhongliang Wu
6	Strong Ground Motion Properties, Characteristics and Attenuation	Yoshi Fukushima
7	Seismic Hazard Analysis: Theory and Step by Step Procedure	Luis Esteva
8	Development of Response Spectra	Luis Esteva
9	Hazard Mapping: Seismic Hazard Zonation	Petersen
10	Geotechnical Hazard Analysis and Geotechnical Microzonation	P.Y. Bard (Grenoble)
	III. Vulnerability Analysis (Step by Step Procedure with theoretical background)	
11	Development of Fragility Curves: Theory and Methodologies	Elashai
12	Vulnerability Analysis of Buildings: Simplified and Detail Analysis\	Porter
13	Vulnerability Analysis of Lifelines Systems	T.D. O'Rourke / Scawthorn
14	Vulnerability Analysis of Nonstructural elements	Ashtiany and Hosseini
15	Vulnerability Analysis of Industrial, Petro-Chemical and Power Facilities	Porter and Bachman
16	Damage Analysis of an Urban Area: Classical Approach	Omar Cardona
17	Urban Area Quick Loss Assessment Using Geospatial Technologies	Babak Mansouri
	IV. Socio-Economic Impact Analysis and Estimation	
18	Social Impacts of Disasters	Tierney ?
19	Human Loss Estimation	Spence/So
20	Risk Modelling and Benefit Cost Analysis: The Economic Perspective	Mario G. Ordaz and Omar D. Cardona
	V. Risk Analysis (Assessments)	
21	Indicators of Risk and Risk Management: The Holistic Approach	Omar D. Cardona and Martha-Liliana Carreño
22	Earthquake Risk Analysis (Assessments)	Scawthorn
23	Risk Mapping of Casualties, building damage, economic loss, etc.	David Wald and K. Jaiswal
24	Treatment of Uncertainty in Risk Analysis	Rui Pinho
	VI. Case Studies	
25	Earthquake Hazard and Risk Assessment of a City (Bogota)	Cardona / Mario Ordaz (UNAM)
26	Risk Analysis of Petro-Chemical Facility	Ashtiany and Bachman
27	Risk Map of an Urban Area (Istanbul)	Mustafa Erdik and Dr. Karin Şeşetyan
	VII. Risk Management and Reduction	
28	Integrated Risk Reduction and Management: Planning and Implementation.	Norio Okada + Tatano
29	Risk Analysis Tools: Status, Needs and the Future	Crowley, Pinho et al
	Appendices and Backmatter	
	APPENDIX A: Glossary	Scawthorn/Ashtiany
	APPENDIX B: Probability Theories and Concepts required for Earthquake Hazard and Risk Analysis:	Ashtiany/Scawthorn

Appendix II: IASPEI Symposia S07

Strong Ground Motions; their source, path, and site effects

Lead Conveners: Mohsen Ghafory-Ashtiany (Iran), Hiroshi Kawase (Japan)

Scope: To predict strong ground motions for future scenario earthquakes, we need to characterize factors such as: source spectra, GM characteristics, path attenuation, local site amplification, etc. For theoretical synthesis of strong motions we would like to have detailed physical process of rupture on the surface of a hypothesized fault, which is not an easy task since observed data and information of the shallow crust are not sufficient to delineate such a detailed source process yet. Even though up-to-date networks for strong motion observation throughout the world are continuously expanding, near-source records for larger-size events are still rare and precious. As for the path effects, we can invert quite stable values of Q thorough the so-called spectral inversion, however, we have not successfully mapped these observed "whole-path Q values" to the Q values as material parameters. As for the local site amplification we would like to have relative amplification characteristics at a target site with respect to a reference (bedrock) site from observed strong motions and then delineate a physical model of ground structure that can reproduce such characteristics. It sounds simple, however, in reality this is the most complex and important part of the strong motion prediction procedure. That is primarily because a high impedance contrast of ground structure creates strong interactions and interferences among different types of seismic waves and so a lot of information or a-priori constraints are necessary to resolve the source of complexity in observed waveforms.

Based on the above mentioned introduction, the session will be focused on the following topics:

1. Strong Ground Motion seismology: observation, interpretation and modeling
2. Need for measurement and identification of rotational components of SGM.
3. Description and modeling of source, path and site effects
4. Effect of source to site path on the characteristics of SGM and its attenuation
5. Scenario based SGM data base for reliable structural analysis
6. SGM data processing for linear and nonlinear dynamic analysis
7. Near-field characteristics of SGM
8. SGM Intensity Measures. How to include all effecting parameters for more quantitative prediction/reproduction of strong motions for hazard mitigation
9. Soil and site characterization effect on SGM characteristics and SGM data processing
10. Surface topography effects on SGM
11. Non-linear response of soils: observations, characterization (lab and in-situ tests), modeling

Appendix III: IASPEI Symposia S08

Seismic Hazard and Risk: The Global Earthquake Model

Lead Conveners: Mohsen Ghafory-Ashtiany (Iran), Domenico Giardini (Switzerland), Andrzej Kijko (South Africa)

Scope: Earthquake risk reduction and control as a crucial criterion for sustainable development, minimizing social and economic loss and disruption due to earthquakes, requires reliable assessment of seismic hazard, vulnerability of the built environment and risk. All of these provide the critical basis for improved building codes and construction, emergency response plans, protection of critical infrastructures, land use planning for sustainable development, and insurance strategies. The seismic hazard assessment (probability of exceeding a specific ground motion) as one of the main component of seismic risk requires good understanding and identification of earthquake source and its activity or seismicity (probability of occurrence of earthquakes in time and space) and strong ground motion attenuation from source to the site. Despite the great achievement in the development of the SHA methodologies, we are still unable to predict the expected ground motion due to the lack of reliable models and data, as it was discussed in IASPEI 2009 GA. It is expected that through the global scientific efforts of GEM projects, we will be able to better identify the seismic sources and their activity (instrumental, historical and pre-historical periods) with geologic evidence; and develop a global set of attenuation models following the Next Generation Attenuation (NGA) approach to take into account local site conditions.

With this introduction, this session is intended to provide a forum for scientific overview and exchange on what has been developed under GEM projects and others, on the following topics:

1. Importance of reliable Seismic Source modeling and identification in SHA
2. Earthquake Catalogues (Present and Historical).
3. Ground Motion Predictions.
4. Probabilistic and Deterministic (scenario-based) Seismic Hazard Modeling and Models.
5. Seismic hazard, Vulnerability and Risk Analysis relations and process
6. Socio-economic consequences, modeling and analysis
7. Loss estimations