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17th Annual Conference**

***Global Emergency Response to Disasters for
a Harmonious World***

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National Earthquake Response Support Service (NERSS), CEA

Beijing Zhong Ji Kexin Research Institute of Economic and Information Technology

第 17 届国际应急管理大会论文集

“全球灾害应对 共建和谐社会”

2010 年 6 月 8-11 日
中国 北京

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Foreword from TIEMS President

Almost every day of 2010, a natural disaster has happened somewhere in the world. The consequences are hundred thousands of casualties and millions of people have fled their homes and are in need of help. On this background, I like to put up the following questions:



- ***How can we as TIEMS contribute to improve the alertness for such disastrous events and improve the ability of the emergency organizations to quickly move in and help?***
- ***How can we as TIEMS contribute to that the communities can be better prepared through risk assessments of potential hazards for their community and by improvement of building structures and other facilities to reduce the consequences of disasters?***

TIEMS annual conference in Beijing 8th – 11th June 2010 is focusing on all these issues, and gives the attending international experts in emergency and disaster management the opportunity to meet and exchange experiences and hopefully find better solutions that can improve the international preparedness for disastrous events.

TIEMS is a Global Forum for Education, Certification and Policy in Emergency and Disaster Management and is dedicated to developing and bringing the benefits of modern emergency management tools and techniques and best practice to society for a safer world, through exchanging information of the use of innovative methods, technologies and operations to improve society's ability to avoid mitigate, respond and recover from natural and technological disasters. TIEMS provides a platform for all stakeholders within the global emergency and disaster management community to meet and network, learn about technologies and operational methods, and exchange experience on best practice, and influence policy makers worldwide to improve global cooperation and establish global standards within emergency and disaster management.

The importance of TIEMS global events only grows and grows, and the Chinese TIEMS Chapter, with particularly Qu Guosheng, Zhang Ji, under the leadership of the President of TIEMS China Chapter, Shan Chunchang, as the hosts for TIEMS annual conference in Beijing 2010, without forgetting all the other Chinese helpers, have made impressive preparations for this event, which is expected to be visited by more than 500 participants from all over the world. The participants will be having a comprehensive program of more than 100 important presentations. Simultaneous translations English – Chinese, and with two co-chairs for each

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session, one international and one Chinese, will see to it that there will be a good exchange of experience between Chinese experts and international experts, which again may hopefully lead to even more global cooperation in emergency and disaster management. The participants will also one day visit the newly opened China National Training Base for Urban Search and Rescue. This base is the largest facility of this type in Asia and the delegates will experience an earthquake simulation, as well as watch a seismic emergency rescue drill. All above integrated with relaxing social events showing the ancient Chinese culture, will certainly make the TIEMS annual conference 2010 in Beijing a memorable event.

The papers presented in the conference proceedings should give a broad international view of emergency and disaster management in an international perspective, and with these proceedings TIEMS like to stimulate to a continuous ongoing global dialogue on emergency and disaster management. Many thanks go to Nils Rosmuller, Chair of the Paper Review Committee, together with his co-chair Snjezana Knezic and Lan Xue, Jing Li, Guosheng Qu and Ji Zhang as well as their review team for doing an excellent job with reviewing the papers and preparing the proceedings. I trust that the authors at TIEMS 2010 appreciate this quality improvement of the event and the feed-back on their papers from the review team.

TIEMS is an international non political and not for profit NGO and has limited financial resources. TIEMS 2010 in Beijing had not been possible without the large financial support and help from the Chinese Government, sponsors, and enterprises. TIEMS is very thankful to them.

I welcome all participants to TIEMS Annual Conference 2010 in Beijing 8th – 11th June 2010.

Oslo 22nd April 2010



TIEMS President

国际应急管理学会 (TIEMS) 主席欢迎致辞

在筹备 TIEMS 2010 北京年会期间，年初海地和智利发生了毁灭性的地震灾难，而此时我们仍然对 2008 年 5 月 12 日的“汶川大地震”以及近年来世界上发生的其它地震记忆犹新。地震造成超过数百亿美元的损失，数百万人离开家园急需帮助。此外，世界上还连续发生了其它的灾难性事件。

国际社会对受灾群众提供帮助并且已经为此做好了准备，这彰显出我们生活在同一个地球上，在发生这样的毁灭性灾难后，我们将会互相帮助。

- **然而，我们如何能够提高对类似灾难的预警并且增强应急组织迅速的采取行动并提供帮助的能力？**
- **进而，我们如何更好地做好潜在危险的风险评估，并且改善建筑结构和设施以减轻灾害损失？**

即将于 2010 年 6 月 8 日至 11 日在北京召开的 TIEMS 年会将极其关注上述问题，给与会应急和灾害管理方面的国际专家提供一个讨论和经验交流的机会，并期望找到更好的解决办法以增强国际社会应对灾害事件的能力。

TIEMS 是一个致力于与应急和灾害管理方面的教育、认证以及政策制定的全球组织，致力于发展现代应急管理工具和技术并使其产生社会效益，通过实践使我们的世界更安全。通过创新方法的应用和技术运行的信息交流，增强社会对自然和技术灾害的避免、响应和恢复能力。TIEMS 向所有在全球应急和灾害管理组织中的相关者提供一个交流和网络平台，相互学习技术和使用方法，交流好的实际经验，对全球政策制定者产生影响，进而增进全球合作，并建立应急和灾害管理全球标准。

TIEMS 全球活动的重要性日益增强，TIEMS 中国委员会，特别是曲国胜、张骥，在闪淳昌为主席的领导集体领导下，承办了北京 2010TIEMS 年会，以及其它所有中国同仁的努力下，其准备工作令人印象深刻，大会期望有来自全世界的超过 500 人的代表出席。代表们可以聆听有关世界不同国家和地区应急和灾害管理活动的主题演讲，也可对国际专家提交的论文和墙报进行讨论，还可以参加涉及关键应急和灾害管理问题的专题讨论。在内容广泛的议程中还包括超过 100 个重要讲演，每个分会都有分别来自国际和中国的两个联合主席，会议还配备中英一英中同声传译，尽力为中外专家提供一个良好的交流体验，进而希望能促进全球应急和灾害管理方面的合作。大会还安排与会者一天时间去参观新开放的国家地震紧急救援训练基地。该基地是亚洲最大的同类设施，代表们在那可以体验模拟的地震，并观摩地震紧急救援演习。此外，大会还组织了社会活动，展示古老的中国文化，这些肯定会使在北京举办的 TIEMS 年会留下令人难忘的记忆。

大会所提交的会议论文集，从国际视野提供一个广泛的有关应急和灾害管理交流，通过这些论文，TIEMS 将持续促进当前关于应急和灾害管理的全球对话。这里要感谢论文审查委员会主

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席 Nils Rosmuller, 先生，他和联合主席 Snjezana Knezic 以及薛澜、李京、曲国胜、张骥等审查小组一起，对论文审查以及论文集的准备做出了杰出工作。我深信，参加 TIEMS 2010 年会的论文作者也会对审查小组对论文的反馈以及其质量的改进表示感谢。

TIEMS 是一个国际的非政治、非营利的非政府组织并且商业资源有限。如果没有来自中国政府及应急行业相关单位、企业的大量财政支持和帮助，将不可能在北京举办 2010 年 TIEMS 年会，在此 TIEMS 表示衷心感谢！

最后，我对所有参加 2010 年 6 月 8 日至 11 日北京 TIEMS 年会的代表表示欢迎！



国际应急管理学会 (TIEMS) 主席
奥斯陆

2010 年 4 月 22 日

Foreword from TIEMS China Chapter President

From the fighting against SARS in 2003, China's pace of emergency management system accelerates forward in just six years, with a series of effective emergency response. China has made major success of rescue for series of emergencies of Snow Disaster and Wenchuan Earthquake in 2008. But we also clearly recognize that our emergency management system, capacity building and disaster prevention and mitigation, still have shortages. And there is a big gap between China and the developed countries.

In order to improve the theory of emergency management, to build an international exchange platform to absorb foreign advanced theoretical concepts of emergency management and to promote latest emergency management practice, many experts and scholars in the industry joined The International Emergency Management Society (TIEMS). Chinese experts set up the TIEMS China Chapter in June 2009 and successfully bid for "the 17th International Emergency Management Conference" to be held in Beijing in June 2010.

The International Emergency Management Annual Conference has been successfully held for sixteen times worldwide. The Conference is dedicated to promote global disaster response and emergency management, technology exchange, application analysis, policy discussions and international collaboration in the global scale. About 500 experts and government officials from UN, EU and more than 30 countries and regions will participate in The 17th International Emergency Management Conference in Beijing this year. This conference will be the largest in the history of TIEMS with the number of participants, officials, experts, technical seminars and exhibitors, and the most extensive session and workshop of the general assembly since the founding of The International Emergency Management Society (TIEMS).

The conference will be held on June 8-11 in 2010 in Beijing Loong Palace Hotel. The conference held by The International Emergency Management Society (TIEMS), and sponsored by China Earthquake Administration (CEA), Co-sponsored by about 30 ministries and institutes of China, as well as some associations of relevant emergency response organizations, and host by TIEMS China Chapter, and National Earthquake Response Support Service (NERSS). The conference will bring together high-level domestic and international emergency management managers, experts and business representatives to discuss upon emergency management, disaster risk assessment, ICT applications, medical and psychological assistance soothing, anti-terrorism and security, training and exercises, as well as global strong earthquake disasters, influenza and infectious diseases and global emergency relief and catastrophe worldwide, on-site coordination and management, emergency information platform, the social sustainability of the strategy in the global economic crisis and disaster situations. It aims to build a platform of exchange of emergency

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management and to promote the global exchange of disaster response and emergency management, application and cooperation, especially for China to exchange and cooperate with the international emergency rescue organizations to improve global disaster response capacity.

The conference held in Beijing is not only play a very important role for the development of China emergency management but also make a good impetus to expand our international perspective.

We sincerely welcome you to participate this grant conference to show your new achievements firstly, to exchange your good ideas in the international and domestic scales secondly, to discuss and set up a Experts Leading Group on Emergency Management under TIEMS China Chapter thirdly, and to learn each other from provincial and municipal emergency management experiences with visiting some emergency management sites and platform fourthly.

Best wishes to you for a lucky and happy stay in Beijing, China.



TIEMS China Chapter President

30, Apr. 2010

TIEMS 中国国家委员会主席欢迎致辞

从 2003 年抗击“非典”开始，中国应急管理体系建设的步伐在短短 6 年时间里，伴随着一系列重大突发事件的有效应对而加速迈进，我国取得了抗击特大冰雪灾害和汶川特大地震等系列突发事件的重大胜利。但我们也清醒地认识到，我国应急管理体系建设和防灾减灾能力还存在着许多薄弱环节，与世界发达国家还有不小差距。

为了深化应急理论研究，搭建应急管理领域的国际交流平台，吸收国外先进的应急管理理论和技术，广泛进行学术研究与交流，促进中国应急管理体系的建设与完善，行业内多名专家、学者共同加入了“国际应急管理学会（The International Emergency Management Society，以下简称 TIEMS）”，成立了“TIEMS 中国委员会(China Chapter)”，并成功申办了 2010 年北京“第 17 届国际应急管理大会”。



国际应急管理大会每年召开一届，至今已在全球成功举办十六届。会议致力于推动全球灾害应对与应急管理的技术交流、应用分析、政策研讨及国际协作工作，在全球享有盛誉。2010 年“第 17 届国际应急管理大会”将有 30 多个国家、地区的约 500 名专家、学者和政府官员出席，联合国、欧盟等高层官员也将应邀出席。本届大会将成为国际应急管理学会成立以来参会人数最多、参会官员规格最高、技术研讨与展示内容最广的一届大会。

本次大会将于 2010 年 6 月 8 日—11 日在中国北京龙城丽宫国际酒店隆重举行。大会由国际应急管理学会（TIEMS）举办，中国地震局代表我国作为本届大会的申办方，近三十个部委及相关应急单位共同协办，国际应急管理学会中国国家委员会、中国地震应急搜救中心联合承办。大会将汇集国内外应急管理学界的高层管理者、专家和企业代表，对应急管理、灾害风险评估、信息通讯等高新技术应用、救援医学与心理抚慰、反恐与安全、培训与演练，以及全球地震等国内外巨灾应急救援处置、现场协调与管理、应急信息平台建设、全球经济危机与灾难情况下社会持续性应对方略等进行专题研讨，旨在搭建应急管理的交流平台，推动全球灾害应对与应急管理交流、应用与合作，特别是中国与国际应急救援领域的交流与合作，提高全球灾害应对能力。

本次大会在北京召开，不仅对我国应急管理事业具有重要意义，而且将对开拓国际化视野具有良好的推动作用。

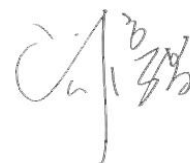
现诚恳地欢迎大家参与本次大会，一是展示你们近年来所取得的成果；二是与国际、国内同行开展业务交流；三是协商成立 TIEMS 中国国家委员会应急特邀专家组；四是学习兄弟省市的应急管理经验，实地考察参观应急管理场所、平台。

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衷心祝您在中国北京期间幸运、幸福！



TIEMS 中国国家委员会主席

2010 年 4 月 30 日

Preface

The proceeding of the 17th TIEMS Conference is realized under joint effort of TIEMS International and TIEMS China Chapter members. It is mostly bilingual, English and Chinese, and organized in two Parts. First part contains peer-reviewed papers written in English. The papers are reviewed by TIEMS International Scientific Committee. The second part contains peer-reviewed papers written in Chinese. Those papers are reviewed by TIEMS China Chapter Scientific Committee. We are very proud that using such organization of the proceedings more Chinese researchers in the field of emergency and disaster management could have been included. In such a way TIEMS stays firmly on its main mission to bring both scientific findings and practical experience from local to global level.

Like the year 2009, and as a part the quality improvement of TIEMS-contributions, we again distinguished TIEMS conference contributions among research papers, practice papers and posters. Research papers are papers that are embedded in state of the art literature and intend to develop new insights and knowledge. Practice papers describe a practical application of knowledge or technology. Posters are mainly visual presentations using graphs and tables.

The reason for this difference is that various types of papers require a different type of review. In the review process of the peer reviewed papers in English we accepted 15 practice papers (in 2009 this was 7) and 36 research papers (in 2009 this was 40). We conclude that the distinction between practice and research papers stimulates professionals as well as academics to publish their work. These papers are in this proceeding. The 2 accepted posters are shown at the conference and not in this proceeding.

A second item regarding the quality improvement was a pre-selection based upon the abstracts. Several submissions were rejected because of either their lack of quality or the poor relation to emergency management.

Quite a lot of contributions are dealing with earthquake disasters, geographic information systems, and monitoring technology. In addition quite some contributions address the issue of cooperation in emergency management: cooperation between countries, military defense and emergency response organizations, public and private partners.

We cover a broad variety of subjects and disciplines. TIEMS stands for the interchange between theory and practice on all kind of emergency management related subjects and disciplines as well. This interchange is absolutely necessary to learn from each other, from different countries, and different approaches. This year again, we succeeded in generating contributions from industry, policy makers, practitioners and researchers.

The 17th TIEMS Conference 2010 in Beijing is not only a largest scale conference in the history

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of TIEMS, but also is a pageant conference in the history of China in the field of emergency management. More than 100 papers involved in the proceedings show the new achievements, cases studies, and innovation of theory on emergency management which will be a great contribution for the management of emergency issues in international scale, and also will take a very important role for improving the development of emergency management of China. The papers in proceedings are very valuable for the scientific research of scientists on the theory, methods of emergency management, and also very practicable for the managers and officers in different level of governments of China that we have only 7 years experiences on this field. To learn the theory, methods and technology from the response and rescue of disasters will enrich our knowledge and experience, and improve our capability against disasters. We believe that the proceedings of 2010 Beijing TIEMS annual conference will supply plenty knowledge, methods and technology of dealing with disasters for emergency managers of international and domestic of China.

All these contributions were reviewed by the review committee of reviewers of international and domestic of China. Without them, the quality of the 17th TIEMS conference papers would not be as it is, as can be read in these proceedings. It was an honor to work with the men and women. The Editors of the proceedings would like to thank the members of the Scientific Committees, both international and Chinese for their assistance in reviewing the abstracts and full papers. Special thanks go to the authors without whom we could not have achieved the high quality of the proceedings.



Beijing, China

June 2010

序言

第十七届 TIEMS 大会是在 TIEMS 国际和 TIEMS 中国委员会共同努力下召开的。大会主要采用两种语言，英语和中文，会议由两部分组成。第一部分是经过审核的英语文章，这些文章是由 TIEMS 国际科学委员会审核的。第二部分是中文文章，由 TIEMS 中国科学委员会审核的。我们对于有更多的研究应急和灾难管理的中国学者加入这次大会感到由衷的高兴。通过这种方式，TIEMS 致力于中国研究成果和实践经验从本地推广到全球，反之亦然。

像 2009 年一样，作为 TIEMS 稿件质量改进的一部分，我们再次在如下方面重视 TIEMS 大会稿件：研究论文，实践论文和海报。研究论文注重技术发展水平以及新的认识和技术，实践论文描述技术的实际应用，海报主要是用图表进行可视化表达。

这样做的原因是因为不同类型的文章需要进行不同的审核。在英文稿件审核过程中我们录用了 15 篇实践论文（2009 年是 7 篇）和 36 篇研究论文（2009 年是 40 篇）。本论文集包含的实践论文和研究论文的区别在于提升业务水平和科学出版，2 个已录用的海报将在大会上展示而未录入在本论文集中。

第二个改进质量的办法就是基于摘要进行预审。几篇分会论文被退回是因为质量很差或者和应急管理没什么关系。

很多稿件是关于地震灾害，地理信息系统和监控技术。另一些稿件涉及应急管理的相关合作，包括国家间合作，军事防御和应急响应组织间的合作以及政府组织与民间组织之间的合作。

本论文集包含广泛的应急管理领域的科目和学科。TIEMS 架起理论研究和在所有应急管理相关的实践之间的沟通桥梁。这种沟通对于理论和实践之间，不同国家之间，不同方法之间很有必要。今年，我们又成功地录用了来自工业，决策机构、从业人员和研究者的不同的文章。

在北京举办的第 17 届国际应急管理学会年会不仅是国际应急管理历史上的一次规模最大的会议，也是中国历史上最大的一次国际性应急管理盛会，该论文集中 100 余篇论文充分展示了国际应急管理领域近年来的最新成果、案例分析和理论创新，不仅是对国际突发性事件应急管理领域的又一重要贡献，同时将对我国应急管理的深入和快速发展起到极大的推动作用。不仅对应急管理理论、处置方法研究的众多学者有重要的价值，也将对仅有 7 年应急管理快速发展的中国各级政府应急管理者具有重要的实用性，从灾难的处置中学习应对灾难的理论、方法和技术，将丰富我们应对灾难的知识和经验，提升我们共同应对灾难的能力，相信 TIEMS 本次年会论文集将给国际和中国应急管理的相关人员提供丰富的知识与处置方法和技术。

这些稿件由来自国际和中国的审核委员会进行审核，没有他们，17 届 TIEMS 大会论文集质量将很难保证出现在本论文集中。很荣幸和他们一起工作，论文集的所有编辑们衷心感谢由国际和中国共同组成的本次国际大会科学委员会的成员对论文摘要和全文的审阅，特别感谢所有的作者，是他们为本论文集提供了高质量的成果。



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