

# ICUS NEWSLETTER

*International Center for Urban Safety Engineering*



**Institute of Industrial Science  
The University of Tokyo**

**VOLUME 4 NUMBER 3  
OCTOBER -DECEMBER 2004**

## DISASTER PREPAREDNESS OF PERSONS WITH DISABILITIES

*By*

***Hiroshi KAWAMURA\****

The United Nations World Conference on Disaster Reduction (WCDR) held in Kobe in January 2005 gave me most important findings regarding disaster preparedness for persons with disabilities as follows:

a. Tsunami Disasters on 26th December 2004 could have been significantly reduced if an early warning system and Tsunami preparedness were well developed. As soon as the earthquake happened, experts knew the magnitude of the potential disaster caused by the

Tsunami but there was no system to disseminate the critical information in time and in an accessible and understandable form.

b. Although detailed statistics on victims is not yet available, children and foreign travelers are believed to be among vulnerable killed by the Tsunami incident in addition to old people and persons with disabilities.

c. There are best practices on Tsunami preparedness developed by many coastal local governments in Japan. However,

the Tsunami preparedness for persons with disabilities and those from foreign countries is still to be developed.

d. Japan Autism Society successfully held an international symposium on disaster preparedness of persons with Autism Spectrum Disorders (ASD) in association with the WCDR to identify the special needs of persons with ASD.

e. World Meteorological Organization (WMO) successfully held the Thematic Session on Disaster Reduction of the World Summit on the Information Society (WSIS) in the framework of WCDR to identify the key role of the Information and Communication Technologies (ICT) development.



*Lecture delivered by Dr. Kawamura (ICUS Open Lecture, Sep. 29, 2004)*

We recognize the critical importance of disaster preparedness of all levels including personal knowledge and training level. The outcome of WCDR was not just for immediate response or reconstruction but also for long term disaster reduction and preparedness. The lesson we

learned from the Tsunami incident must boost the development of international collaboration for early warning, response, disaster reduction and preparedness development.

The key lesson of the Tsunami incident was the development of understanding on disasters such as imagination of each disaster including evacuation routing.

Of course each individual has individual requirements. If we develop our imagination well, we will be able to identify some special needs such as;

- a. If you are challenged by visual impairments and/or hearing impairments, how do you know the early warning and evacuation route?
- b. If you are challenged by motor disability, how do you get assistance to evacuate?
- c. If you have cognitive/intellectual disability to understand the warning, how do you develop your capacity of understanding

- and respond?
- d. If you are on a beach in foreign country without knowledge of the local language, how do you cope with early warning?

The key role of ICT development is obvious when we identify special needs of individuals and try to meet those requirements. In this context, forthcoming WSIS Tunis Summit to be held in November 2005, in particular its 10 Years Plan of Action to be decided will be of critical importance to implement necessary accessibility built into the system for early warning and evacuation.

In conclusion, I believe that persons with disabilities and others so called vulnerable people in terms of disasters are potential active role models to identify individual requirement that needs to be met by disaster reduction activities including development of preparedness.



*Presentation in Global Forum on Disabilities in the Information Society(Mr.YAMANE)*

*\*Director,  
Department of Social  
Rehabilitation  
National Rehabilitation  
Center for Persons with  
Disabilities(NRCD)*

### Suggestions for Accessible Disaster Preparedness Information

<p><b>Delivery:</b></p> <ul style="list-style-type: none"> <li>a. Internet</li> <li>b. TV/Radio analog/digital broadcasting</li> <li>c. Mobile phone</li> <li>d. Public information displays such as Kiosk and ad-board</li> <li>e. Streaming mechanism with adaptable bit rates and formats</li> <li>f. Portal service with distance learning support</li> </ul>	<p><b>Tactile expression/Vibration:</b></p> <ul style="list-style-type: none"> <li>a. Vibration standards</li> <li>b. Tactile indicator for exit, entrance, etc.</li> </ul>	<p><b>Interactivity:</b></p> <ul style="list-style-type: none"> <li>a. Role playing game capability</li> <li>b. Simulations and training</li> </ul>
<p><b>Language:</b></p> <ul style="list-style-type: none"> <li>a. Multilingual capability</li> <li>b. Alternate text presentations in corresponding languages</li> <li>c. in simplified languages; such as "easy to read"</li> <li>d. in Braille/finger Braille</li> <li>e. in sign language/tactile sign language</li> <li>f. Pictograms</li> </ul>	<p><b>Audio expression:</b></p> <ul style="list-style-type: none"> <li>a. 3D audio has potential to identify the way for evacuation</li> <li>b. All textual presentation need to be associated with audio output</li> <li>c. Alternative audio description</li> <li>d. Ubiquitous system in association with audio guidance</li> <li>e. Alarm sound and message construction</li> </ul>	<p><b>Easy straight forward media capturing/editing process:</b></p> <ul style="list-style-type: none"> <li>a. Semi-automatic capturing support</li> <li>b. Capacity to start with one shot project</li> <li>c. Capacity to combine multiple projects</li> <li>d. Templates support</li> </ul>
<p><b>Visual expressions:</b></p> <ul style="list-style-type: none"> <li>a. Visual signs and landmarks</li> <li>b. Alternative visual expressions for text contents</li> <li>c. Geo-spatial awareness on way finding support</li> </ul>	<p><b>User interface for manipulation of devices:</b></p> <ul style="list-style-type: none"> <li>a. Single key/simple switch action support</li> <li>b. Voice command/recognition</li> <li>c. Refreshable Braille support</li> <li>d. Touch panel</li> <li>e. Automatic turn on when alarming comes</li> <li>f. Gesture recognition commands</li> <li>g. Automatic optimization for individuals/locations</li> </ul>	<p><b>Others:</b></p> <ul style="list-style-type: none"> <li>a. Olfactory</li> <li>b. Puppets</li> <li>c. Avatar</li> </ul>

# ICUS & IITK Organized Third International Symposium on Urban Safety in Agra, India

The International Center for Urban-Safety Engineering, Institute of Industrial Science, University of Tokyo and the Department of Civil Engineering, Indian Institute of Technology, Kanpur, India, organized the Third International Symposium on New Technologies for Urban Safety of Mega Cities in Asia at Agra on October 18-19, 2004. Several national and international professional and government organizations also supported the symposium financially and otherwise.

The symposium sought to bring together experts in areas of design, construction and maintenance of urban infrastructure and those engaged in development of new tools that could be used for better asset management. It also provided a forum for decision makers, practicing professionals and researchers to share their expertise in diverse areas such as infrastructure planning and development, application of new technology, nondestructive evaluation of structures and rehabilitation methods.

Professor SG Dhande, Director, IIT Kanpur chaired the inaugural session along with Professor Yoshifumi Yasuoka, former Deputy Director-General of the Institute of Industrial Science, University of Tokyo. Prof Mahesh Tandon, President of the Indian Concrete Institute, and leading structural consultant of Delhi was the Chief Guest and Professor R N Iyengar of Indian Institute of Sciences,



*Speech given by Prof. Dhanda, Director of IIT Kanpur*

Bangalore and formerly Director, CBRI, Roorkee, delivered Keynote address in the inaugural session.

About 150 delegates from India and 36 delegates from other countries participated in the symposium, where about 60 technical papers were presented in the oral and poster sessions. The papers have been printed in the Proceedings of the symposium both in the form of a book and a CD-ROM.

Based on the deliberations, a resolution calling for greater cooperation among the professionals and organizations in the region was adopted in the closing session. ICUS and IIT Kanpur also signed an Memorandum of Understanding for closer cooperation in research activities in areas of mutual interest.

*by Dr. Sudhir MISRA  
Associate Professor  
Department of Civil Engineering  
IIT Kanpur*



*Opening ceremony of the Symposium*

## CONTENTS

### Plenary sessions

- From Ground Shocks to Air Blasts-Multiple-Hazard Protections
- Optimal Improvement of Storm Sewer System for Inner Bangkok
- Recent Advances in Assessment Technology of Infrastructures in Korea
- Impact Resistance of FRP-Concrete Sandwich Panels
- Surface Climatic Impacts of Urbanization in the Ho Chi Minh City, Vietnam: An Integrated Study with Remote Sensing and Modeling
- Durability Design for Concrete Structures for Urban Safety in Thailand
- Vulnerability Assessment of Existing Engineered and Non Engineered Structures of Dhaka City using RVS and NDT Techniques

### Parallel sessions

- Damage to Masonry Buildings in Dien Bien Phu Earthquake
- New Concept for Retrofitting Concrete Structures with Unconventional Materials
- Hydraulics Computations to Study Flood Control for Hanoi City
- Urban Building Inventory from VHR Remote Sensing Imagery for Earthquake Risk Analysis in Bangkok

## SCHEDULE OF SESSIONS(\*)

Date	Time	Session
October 18	09:00 - 10:30	<b>Inaugural session</b>
	11:00 - 13:15	<b>Plenary session I</b>
	14:30 - 16:15	<b>Plenary session II</b>
	16:30 to 18:00	<b>Plenary session III</b>
October 19	09:00 to 10:45	<b>Parallel session A</b> Rehabilitation of Structures
	11:00 to 12:45	<b>Parallel session B</b> Remote Sensing and GIS
		<b>Parallel session C</b> Structural Engineering and Seismic Performance
	14:00 to 16:00	<b>Parallel session D</b> Planning and Monitoring of Infrastructure
		<b>Plenary session IV</b>
16:00 to 16:30	<b>Closing session</b>	

\* Papers in the poster session were on display throughout the duration of the symposium

## Central Part of Niigata Prefecture was Stricken by M 6.8 Earthquake on October 23, 2004

On October 23, 2004, at 17:56, a magnitude 6.8 earthquake, with a focal depth of 13 km, stroke the central part of Niigata Prefecture. This earthquake was the first event in which the derailment of a bullet train was observed since they entered service in 1964. Fortunately, this service line is not very congested and at the time of the earthquake only one of the lanes, the one bound for Niigata, was being used. As a result, no fatal victims were reported.

Due to this earthquake, strong ground motions with Japanese Meteorological Agency (JMA) Intensity 7, which corresponds to the highest intensity in this scale, were observed. This is the first time since the JMA changed its definition, from a human perception based definition to an instrumental observation based one. Peak ground accelerations up to 1.7 g and peak ground velocities up to 133 kins were observed. These values are much higher than those of the ground motion during the 1995 Kobe Earthquake. Based on earthquake response spectrum analysis, in the short period range from 0 to 1.0 sec, the response acceleration was over 6,000 Gals.

Because of this earthquake, 40 people were killed, 9 of them due to structural collapse. The other victims died for other reasons such as shock, exhaustion, stress, and the economy class syndrome. The latter was caused by the long periods that

the residents had to sleep in their cars, in uncomfortable positions, because of the insecurity of their houses and their fear due to the huge number of aftershocks. The number of people injured was 4,500, whereas the number of collapsed, moderately damaged, and slightly damage houses were 2,800, 10,600, and 88,500, respectively.

One of the most important characteristics of this earthquake is the huge number of large aftershocks. Another major characteristic is that it occurred in a mountainous area which was hit by heavy rainfalls and typhoons just prior to the earthquake occurrence. These previous events saturated and loosen the soil, and therefore when the earthquake stroke the mountain slopes where particularly vulnerable. For this reason, the geotechnical related damage was widespread and much more considerable than the structural damage.

Due to the severe winter and huge snow fall that is common in this area, houses are built with small openings, to keep them warm and robust foundations and

structural elements to resist the snow weight. These features increase the overall structural strength and thus it is not surprise to observe that most of the collapse houses were either old or presented soft stories in the 1st floor were open space, such as parking or shop is allocated.

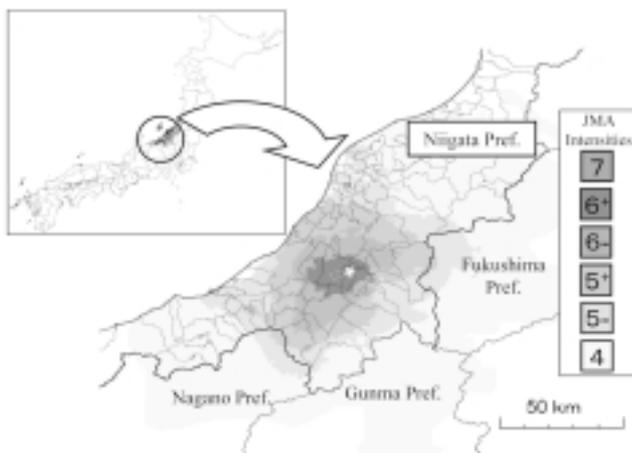
*(by K. Meguro)*



*Typical buildings in the affected area, an old damaged (upper) and a new intact (bottom)*



*The bullet train derailed for the first time since it started operations in 1964*



*Distribution of JMA Intensities at the earthquake hit area during the main shock on October 23, 2004, 5:56PM*



*Bullet train viaduct pillars exhibited concrete spalling at the sections where longitudinal rebars were cut*

## ICUS Members Joined Regular Maintenance of The Disaster Mitigation Facilities at Metropolitan Expressway Tunnels

Following the tragic fire accident of the Nihonzaka Tunnel in 1979, great efforts to improve road tunnel safety have been made in Japan. During November 2004, Mr. Takafumi Takahashi, the executive director of The Metropolitan Expressway Public Corporation (MEPC) and ICUS former visiting Professor arranged two field trips to observe the disaster mitigation facilities of MEPC tunnels and to attend their regular examination. The MEPC has a total length of approximately 283.3 km and carries around 28% of the arterial vehicular traffic in the Tokyo Metropolitan area.

Several ICUS members joined the visits to Asukayama and Kasumigaseki Tunnels. The field visit started at the tunnel disaster management office, where all the facilities inside the tunnels are remotely monitored. A brief expansion of the disaster mitigation and emergency facilities was presented. Inside the tunnels, these facilities were observed as well as maintenance operation of fire-hydrant and sprinkler systems.

(by S. Elkholy)



*Examination of performance of foam fire-hydrant by Prof. Meguro*



*Verification of water sprinkler system*

## Open Campus of IIS Chiba Experiment Station



*Children looking at exhibition*

*The Institute of Industrial Science (IIS) of the University of Tokyo organized an open house at its Chiba Experiment Station on November 12, 2004. ICUS participated in this event and presented its research activities to the visiting students from the Yayoi elementary school. At the Uomoto laboratory section of the ICUS presentation, Mr. Hoshino and Mr. Nishimura, the technical assistants of the Uomoto laboratory, guided*

*and explained the research works to the students. After the explanation, the students were given an opportunity to make models using their hands from cement paste cast in bread dough. Students were highly impressed by this experience and that were reflected in their letters written to the institute. We hope that the students gained good impressions and knowledge about concrete technology.*

## ICUS Signed MOU with IIT Kanpur

On October 22, 2004, ICUS signed a Memorandum of Understanding (MOU) with the Indian Institute of Technology, Kanpur (IITK) to collaborate in research and other academic activities, in the fields of Urban Safety Engineering. One of several categories of the academic exchange and cooperation is "Organizing academic meetings, symposia and workshops".

ICUS held the Third International Symposium on "New Technologies for Urban Safety of Mega Cities in Asia" jointly with IITK at Agra, India (Oct. 18-19) as a part of that.

A team from the ICUS visited IIT Kanpur, India on Oct.22 after the symposium at Agra, and discussed possibilities of closer understanding and joint research between the two institutes.



## ICUS Renewed Contract of RNUS with AIT

ICUS recently renewed its collaboration with the Asian Institute of Technology (AIT), Thailand on the operation of the Regional Network Office for Urban Safety (RNUS). RNUS was established at AIT in October 2002 towards strengthening its research collaboration in South and South-east Asia. With the successful progress of collaborative activities at RNUS in the last two years, ICUS signed an agreement with AIT in October 2004 to foster the collaboration for another three years. Signed on 22 October 2004 by Prof. Taketo Uomoto, ICUS Director and Prof. Jean-Louis

Armand, AIT President and, through RNUS, SCE and ICUS cooperate in promoting urban safety engineering utilizing advanced engineering technologies. The signing ceremony was witnessed by ICUS faculty members, Prof. Reiko Amano, Dr. Kimiro Meguro, and Dr. Junichi Susaki.

RNUS' activities revolve around urban disaster mitigation, infrastructure maintenance and environmental monitoring. Since its inception in October 2002, RNUS has initiated several collaborative research projects in the areas of health monitoring of urban infrastructure,

utilization of very high resolution remote sensing for urban inventory and catastrophic disaster risk management in Bangkok as well as the socio-economic impacts of coastal floods in South and South-east Asia under climate change conditions.



## ICUS Activity Records

- All ICUS members participated in the Third International Symposium on "New Technologies for Urban Safety of Mega Cities in Asia" at Agra, India (Oct15-20).
- Profs. Uomoto, Amano, and Meguro visited AIT, Thailand for collaborative research at RNUS, AIT (Oct.22-23).
- Prof. Uomoto attended the "First International Conference of Asian Concrete Federation" at Chiang Mai, Thailand (Oct.27-31) with Dr. Kato, and the "Event of International Activities, CICHE2004 (Selected for Joint-Seminar Speakers)" at Kaohsiung, Taiwan (Dec.1-3).
- Prof. Yasuoka attended the "SPIE

Fourth International Asia-Pacific Environmental Remote Sensing Symposium" at Honolulu, Hawaii (Nov.8-13) and the "25th Asian Conference on Remote Sensing" at Chiang Mai, Thailand (Nov21-26) with Dr. Endo.

- Prof. Meguro attended WSSI meeting at Nanyang University, Singapore (Dec.5-8).
- Prof. Ooka visited RNUS, AIT to give a seminar (Nov. 21) and attended the "Celebration of the 60th Anniversary of the Department of Architecture of the National Cheng Kung University", Taiwan. (Nov. 22-25).
- Prof. Dutta visited AIT, Thailand for collaborative research at RNUS (Sep.7-Dec.31). During this period,

he attended the "International Conference on Advances in Integrated Mekong River Management", Vientiane, Lao (Oct. 24-28) and the "International Conference on Sustainable Water Resources Management in Changing Environment of the Monsoon", Colombo, Sri Lanka (Nov. 17-19).

- Dr. Susaki participated in the "Meeting on Operation of MODIS Receiving Station and Research using MODIS data" at Bangkok, Thailand (Aug15-17), and the "25th Asian Conference on Remote Sensing" at Chiang Mai, Thailand (Nov.22-27).

## Visitors to ICUS

Some of the international visitors to ICUS during the period of October-December 2004 are listed below.

- Profs. Yuanxian Gu, Yang Haitian and Gengdong Cheng, Dalian University of Technology, China (Oct. 28).

- Prof. Chongrak Ploprasert, Asian Institute of Technology, Thailand (Nov. 5).

## - RNUS Activities -

### Workshop on urban safety lessons from Japan

Over half of the world's population is concentrated in urban areas covering just 4% of the world's surface. Mega cities in particular are characterized by a high population density and tremendous pressure on supporting infrastructure. It is estimated that by 2015, Asia will be host to more than 50% of the mega cities in the world. A phenomenal growth in the number of high-rise buildings and other infrastructure in these cities is clearly foreseen, though a balance is often not ensured with measures for their maintenance. Safety of infrastructure is foremost important for sustainable urbanization and economic development in Asia. RNUS organized a workshop on "Urban Safety for Sustainable Urbanization: From Experiences of Japan" at AIT on 22 October 2004 by inviting three prominent academicians; Prof. Taketo Uomoto, Prof. Reiko Amano and Prof. Kimiro Meguro of ICUS, the University of Tokyo, Japan to talk on how urban safety issues are addressed in highly urbanized Japanese cities. Various issues related to durability of urban infrastructure with proper safety measures including measures against disasters like earthquake and fires with the conventional and new technologies were addressed by the speakers. Prof. Taketo Uomoto talked on Maintenance and management of urban infrastructure in Japan to decrease risk of injury to public. Prof. Reiko Amano talked on "Water Screen Fire Disaster Prevention System in Underground Space". Prof. Prof. Kimiro Meguro presented about the Universal Disaster Simulator towards



*A snapshot from the workshop venue*

earthquake disaster mitigation in Japanese cities. The workshop, coordinated by Dr. Pennung Warnitchai of RNUS, was well attended by over 65 participants from AIT and various government institutions and private organizations from Bangkok.

### RNUS receives research grant from UNU

In July 2004, RNUS received a research grant from the United Nations University, Tokyo, Japan to conduct research on "Risk Analysis due to Catastrophic Urban Floods using GIS, Remote Sensing and Surface-River Model". The research project is funded by UNU from its Multi-hazard Risk Assessment Core Research Budget. The main scope of the project includes a case study in Bangkok city for risk analysis due to catastrophic urban flooding. The work will cover simulation of catastrophic floods due to extreme rainfall events and assessment of its socio-economic impacts using an existing urban flood risk assessment model in a part of the Bangkok city, which is most vulnerable to floods. The one-year long project is scheduled to complete in July 2005.

### Seminar Series on urban safety

The Regional Network Office for Urban Safety (RNUS) of ICUS/AIT initiated a seminar series on urban safety in 2003 by inviting experts from different countries to talk on various related issues. As a part of this series, two seminars were organized in November 2004. On 15 November 2004, RNUS invited Dr. Koji Dairaku, Researcher at the Disaster Prevention Research Group under the National Research Institute for Earth Science and Disaster Prevention in Tsukuba, Japan to give a seminar the "Role of Orography and Soil Moisture in Hydrological Transitions Associated with Monsoon Onset in Southeast Asia". In the seminar, Dr. Koji Dairaku presented his research on Asia monsoon region, particularly Thailand, to study the mechanism of atmospheric-landsurface interaction using regional climate models. Understanding of this mechanism is essential for accurate prediction of rainfall, which can be utilized for urban flood forecasting. On 22 November 2004, RNUS invited Dr. Ryoza Ooka, Associate Professor at the International Center for Urban Safety from the University of Tokyo, Japan to give a seminar on "Numerical Simulation of Atmospheric Environmental Problems", Dr. Ooka discussed turbulence modeling and explained its applications in understanding environmental problems such as wind environment around a building, pollutant dispersion in an urban street canyon, urban fire spreading and heat island phenomena.



*Dr. Dairaku and Dr. Ooka during their seminars at AIT*

**Editor's Note**

We theoretically understand that the earth is active and moving, however, we have never imagined that it would really move as much as on December 26, 2004. The images and movies on the earthquake and the tsunami were far more than we imagined.

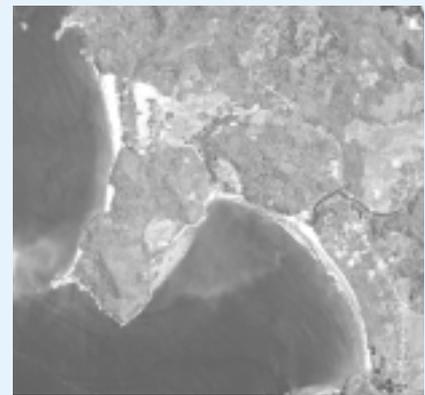
The disaster this time demonstrated the difficulties in observing and predicting it. Before the event we need to deploy wide and general observation system linked with prediction system, and when it would unfortunately happen it should be switched to the site-focused, pinpointed and very frequent observation system linked with the counter measures including evacuation.

At the Third Earth Observation Summit held in February, 2005 at Belgium the ten-year's Implementation Plan

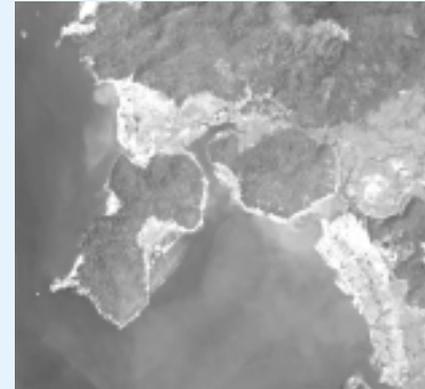
for building a comprehensive, coordinated, and sustained earth observation systems was adopted. "Reducing loss of life and property from natural and technological disasters" was raised as the top item of 10 specific areas of socio-economic benefit in observing the earth system. In a series of Erath Observation Summit Japanese Government declared that Japan would contribute to the earth observation in three fields including global warming/carbon cycling, climate change/water cycle and disaster mitigation over Asian and Oceanic regions.

The mission of the ICUS covers from observation, modeling to countermeasures for the disaster prevention. "It surely happens when we forget it", the very famous remark by Dr. Torahiko Terada. We, the ICUS, will do our best for the next event which of course we would not like to have.

(by Y. Yasuoka)



*Banda Aceh  
(before Tsunami)*



*Banda Aceh  
(After Tsunami)*

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