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TSUNAMI RISK IN THAILAND

By

Absornsuda SIRIPONG*

Tsunami disasters, such as the one that occurred on December 26, 2004 can cause tremendous lost of livelihood, properties and ecosystems in many countries around the Indian Ocean. Thailand was the fourth affected country with a death toll of 8,396. A tsunami disaster mitigation procedure is proposed for Thailand. Tsunamis, with return periods of 475 and 975 years, may reach more than 20 m-height along the entire subduction zone. Away from the subduction zone, the amplitudes are significantly lower, but there is strong variability along the coastline of Thailand. In particular, the highest recorded tsunami amplitudes are at Kao Lak, Cape Pakarang (15.7 meter), which were hardest hit during the 2004 event. The high waves along this stretch of shoreline are evidently caused by local bathymetry and topography. This illustrates the usefulness of a method to identify stretches of coastline that are particularly vulnerable to tsunami impact. The recent researches on real-time tsunami prediction are important to enable safe evacuation and coastal zone management. Without sophisticated system of instruments or tsunami modeling, local people should be given adequate information on actual tsunami disasters, characteristics of tsunami wave, evacuation route and refuge places. Knowing that a coastal area may be subjected to certain coastal hazards is important to create awareness. Risk knowledge will help to manage it and to mitigate damage as a result.

Resort villa buildings at Kao Lak damaged by the tsunami which occurred on December 26, 2004 (Photo courtesy of Prof. K. Meguro)

Three fundamental areas of effort to cope with tsunami disaster were proposed by Dr. Eddie N. Bernard, the Director of NOAA/PMEL (Pacific Marine Environmental Laboratory): 1. Tsunami Hazard Assessment, i.e. preparation of inundation maps; 2. Tsunami Warning, i.e. installation of sea level gauge and seismometer networks and deployment of tsunami detection buoys; 3. Mitigation Program, i.e., preparation and analysis of tsunami hazard and risk maps for emergency management.

Before planning any method to prevent tsunami disaster, we should first know where the tsunami risk areas are. The seismologist, geophysicist and geologist can map the risk and tsunami hazard zone from small scale (local area) to large scale (whole country coastline) for

further planning. This can be done from historical data and paleotsunami and past earthquake records in the area of interest. During the Workshop on Seismic Hazard in Thailand, January 16-19, 2007 at Chulalongkorn University, the Thai scientists with assistance from the experts from the US Geological Survey (USGS), worked on an earthquake hazard map of Thailand.

Not all submarine earthquakes generate tsunami. For the Indian Ocean, two potential sources have been identified, namely Mekran near Pakistan coast and the Andaman to Sumatra subduction zone. The frequency of historical tsunamis can be found in many old documents, paintings, and proxy data in geological time. The earthquake source and geophysical characteristics of the two tsunamigenic-earthquakes should be investigated by seismologists. These data can be used to infer the tsunami recurrent interval. Based on the plate tectonics theory and the history of past events in the area, Professors Kerry Sieh (California Institute of Technology) and Emile Okal (Northwestern University) roughly estimated that the recurrence interval for an ocean-wide tsunami generated by a magnitude 9.3 submarine earthquake, similar to the December 26, 2004 event, occurring at the same spot, is about 500-1000 years. The recurrence interval at any one spot for a local earthquake of magnitude 8 is roughly estimated at 120-400 years. The recurrence interval for a local tsunami of magnitude 8, that may occur anywhere along the 5,000 km long Indian-Burma trench is estimated to be about 30-100 years.

Given the range of numbers provided above, a conservative recurrence range for hazard mitigation planning purposes can be provided. Due to additional uncertainties inherent in attempting to predict future natural hazard events, 500 years is used as a conservative estimate for the magnitude 9 event and 100 to 120 years, for a local earthquake of magnitude 8. Over time, it is likely that these numbers will be refined as further studies in specific areas are conducted.

Consideration should be given to conducting studies that model the tsunami impact for each country, as different portions of the active subduction zones around the Indian Ocean rupture to relieve built up stress. Both Sieh and Okal recognize that the December 2004 event did not relieve all stresses along the southern portions of the Indian-Burma plates. This may be the cause of Java tsunami on July 17, 2006.

Norwegian experts such as F. Løvholt and C.B. Harbitz (Norwegian Geotechnical Institute) proposed a model for future tsunami risk for Thailand in both short and long term. The earthquake source is developed based on available seismological and geodetic inversions, and the simulation using the submarine earthquake source as initial condition agree well with sea level records and run-up observations. They concluded that another megathrust earthquake generating a tsunami affecting the coastline of Thailand is not likely to occur again for several hundred years. This is in part based on the assumption that the Southern Andaman Microplate Boundary near the Simeulue Islands constitutes a geologic barrier that will inhibit significant rupture across it, and in part on the decreasing subduction rates north of the Banda Ache region. It was also concluded that the largest credible earthquake along the part of the Sunda-Andaman arc that could affect Thailand, is within the next 50-100 years an earthquake of magnitude 8.5, which is expected to occur with more spatial and temporal irregularity than megathrust events.

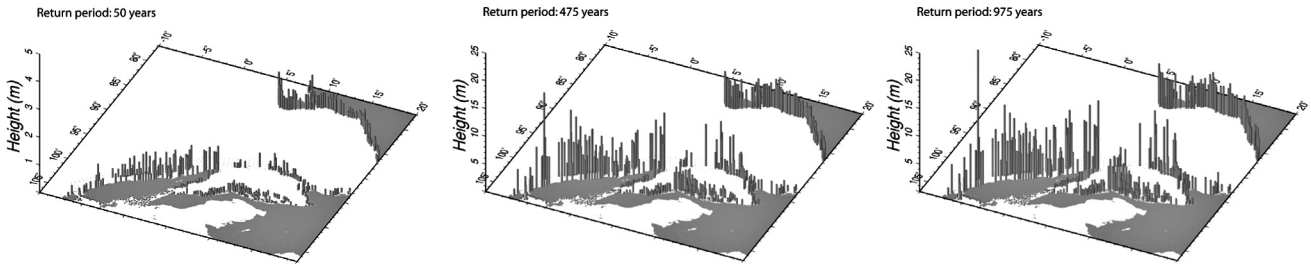
Numerical simulations have shown such earthquakes to cause tsunamis with maximum water levels up to 1.5-2.0 m along the west coast of Thailand, possibly 2.5-3.0 m on a high tide. However, in a longer time perspective (say more than 50-100 years), the potentials for earthquakes of similar magnitude and consequences as the 2004 event will become gradually larger and eventually pose an unacceptable societal risk. These conclusions apply only to Thailand, since the effects of an M 8.5 earthquake in the same region could be worse for north-western Sumatra, the Andaman and Nicobar Islands, maybe even for Sri Lanka and parts of the Indian coastline. Moreover, further south along the Sunda arc, the potentials for large ruptures are now much higher than for the region that ruptured on December 26, 2004.

Paul Somerville, Hong Kie Thio and Gene Ichinose from URS Corporation, Pasadena Office assessed the tsunami hazard over a long time scale using Probabilistic Tsunami Hazard Analysis (PTHA). Probabilistic Seismic Hazard Analysis (PSHA) has become a standard practice in the evaluation and mitigation of seismic hazards on structures, infrastructure, and lifelines. Its ability to condense the complexities and variability of seismic activity into a manageable set of parameters greatly facilitates the design of effective seismic resistant buildings and infrastructures.

Although PSHA usually considers the ground shaking hazard from earthquakes, the same approach can be used to estimate other seismic hazards, such as fault displacement, surface folding due to subsurface faulting, soil liquefaction, lateral spreading of soil, and landslides. They have extended the capability of PSHA to include tsunami wave height at the shoreline.

PTHA can be used to identify whether a significant tsunami hazard may exist at a particular coastal location or over a stretch of coastline. If the hazard is found to be

Meeting held at Bangben School, Ranong in March 14, 2007 to explain about tsunami disaster and evacuation plan



Probabilistic tsunami hazard for the northeastern Indian Ocean for three return periods (From P. Somerville, Hong Kie Thio & Gene Ichinose, 2005, Probabilistic Tsunami Hazard Analysis, a report by personnel communication)

significant, then further analyses can be performed, such as:

- Probabilistic tsunami run-up and inundation calculations at the site based on the probabilistic tsunami wave height at the shoreline
- Probabilistic tsunami loss calculations based on the probabilistic run-up and inundation

In probabilistic ground motion hazard analysis, the estimation of ground shaking level for a specified magnitude and distance from the source is based on ground motion attenuation relations. This kind of approach is not feasible for tsunamis, because fault orientation and ocean bathymetry cause a large variability in the height of the tsunami, which is not a simple function of the distance to the source. To estimate the tsunami height at a particular location along the coast for a given earthquake, they have adopted a waveform excitation and propagation approach instead of trying to develop tsunami attenuation relations. They computed the complete tsunami wave field for each earthquake scenario.

They have carried out preliminary tsunami hazard calculations for the Sumatra-Andaman subduction zone based on the earthquake recurrence model of Peterson et al. (2004), who performed a PSHA for the island of Sumatra and surrounding regions. The calculations use a set of 2,000 scenario earthquakes to provide a probabilistic description of tsunami wave height occurrences in the region. In the figure on top of this page, the probabilistic tsunami wave heights for return periods of 72, 475 and 975 years, corresponding to probabilities of exceedance of 50%, 10% and 5% in 50 years are shown.

At return periods of 475 and 975 years, tsunami heights reach more than 20 m along the entire subduction zone. Away from the subduction zone, the amplitudes are significantly lower, but there is strong variability along the coastline of Thailand. In particular, the highest calculated tsunami amplitudes are at Kao Lak and Phuket, which were hardest hit during the December 26, 2004 earthquake. The high waves along this stretch of shoreline are evidently caused by local bathymetry and topography. This illustrates the usefulness of this method in identifying stretches of coastline that are particularly vulnerable to tsunami damage

Historical tsunami and tsunami deposit data are also important for assessing the tsunami hazard. Past records provide clues to what might happen in the future, such as frequency of occurrence and maximum wave heights. Instrumental and written records do not often span over a long enough time to assess the full range of a region's tsunami hazards. Therefore V. Brocko (University of Colorado) and P. Dunbar (US National Geophysical Data Center) are developing a Tsunami Deposit Database. For paleotsunami studies in Thailand, Dr. Brian Atwater from USGS is developing regional cooperation and cross-learning with field exercise in Phang-nga to forecast the next tsunami in the Indian Ocean as well as to build capacity for tsunami hazard assessment. The taphonomy of sediments deposited by the Indian Ocean Tsunami along the west coast of the Malay-Thai Peninsula was studied by University of Pennsylvania group (B.P. Horton, A. Hawkes and S. Engelhart). J.R. Schmidt, M.E. Kirby and B.P. Rhodes from California State University studied the Holocene coastal lagoon for paleotsunami deposits at Kamala Beach, Phuket and Tap Lamu, Phang-nga Province, Thailand. At Ban Talae Nok, Ranong province, K. Monecke and A. Moore (Ken State University), J. Beitel and K. Moran (University of Rhode Island) studied the sedimentary characteristics of the 2004 Indian Ocean tsunami. These studies showed the historical tsunami records in the sediment deposits.

CONCLUSION

The tsunami disaster mitigation can be done by mapping tsunami hazard and risk on the vulnerable coasts. The researches on probabilistic tsunami hazard and tsunami recurrence are useful for developing an evacuation plan and coastal zone management. The practical applications of tsunami risk assessment, in both quantitative and qualitative terms, for implementation into mitigation strategies for the terrestrial and marine environments include:

1) Building Codes (potential damage due to wave action and flooding)
2) GIS Mapping
3) Land-use Planning (taking note of wave action & flooding)
4) Disaster Planning (in identified hazard zones)
5) Emergency Management
6) Emergency Personnel Training (necessary aspects relevant to marine situations)
7) Rescue and Response (cargo, tourist, inter-islands fishing community, marine situations related to shipping, recreational boating)
8) Insurance Needs
9) Community Education
10) Simulated Tsunami Drill and Exercises

** Professor,*
Marine Science Department,
Faculty of Science
Chulalongkorn University
Bangkok, Thailand

Drought Monitoring Using Remote Sensing and Memories of Stay at the Asian Institute of Technology, Thailand

I had been seconded to the Asian Institute of Technology (AIT), Thailand, from ICUS as a long-term Japan International Cooperation Agency (JICA) expert and Visiting Assistant Professor for two years since February 2005. Just after coming back to ICUS, I moved to Kyoto University in March 2007. In this article, I report my research activities in AIT and the history of collaboration between AIT and Japan.

DROUGHT MONITORING USING REMOTE SENSING

The northeastern part of Thailand has periodically experienced severe droughts. One definition of drought, agricultural drought, is said to occur when there is insufficient soil moisture to meet the needs of a particular crop at a particular time. Drought monitoring around Thailand, Laos and Cambodia, especially agricultural drought, is becoming increasingly important.

Remote sensing is capable of monitoring drought because it simultaneously detects spectral data from the surface of a wide area. Actually, several physical parameters can represent the severity of drought condition. Roughly divided, optical region (visible to infrared regions) and microwave region can be used to detect such parameters. For example, the Surface Energy Balance Algorithm for Land (SEBAL) predicts land moisture indicators such as Bowen-ratio and evaporation fraction from visible, near-infrared and thermal-infrared radiances through surface energy balance equation. On the other hand, microwave sensor is better to detect volumetric soil moisture and water body rather than optical sensor because the dielectric constant of water in microwave region can be easily discriminated from dielectric constants of other matters. The author examined techniques required to estimate soil moisture from Synthetic Aperture Radar (SAR) data, which is one of the active microwave remote sensing.

The author has installed equipments and measured soil moisture at several paddy fields in Buriram Province, northeastern Thailand from October 2005. Japanese Earth Resources Satellite-1 (JERS-1)/SAR images observed from 1992 to 1998 were available around field measurement sites. Firstly, the Integral Equation Method (IEM), which models scattering of microwaves between different matters, was used. In the present research, surface roughness was measured by leveling. Autocorrelation length of surface roughness, a quite difficult parameter to measure, was stably calibrated. By applying the IEM model to temporal JERS-1/SAR images, temporal change of soil moisture was estimated. Then, soil moisture distribution was mapped from 1992 to 1998. Long-term observation is quite indispensable to represent the regional trend of soil moisture distribution. It was found that temporal JERS-1/SAR data are quite informative about regional characteristics of soil moisture.

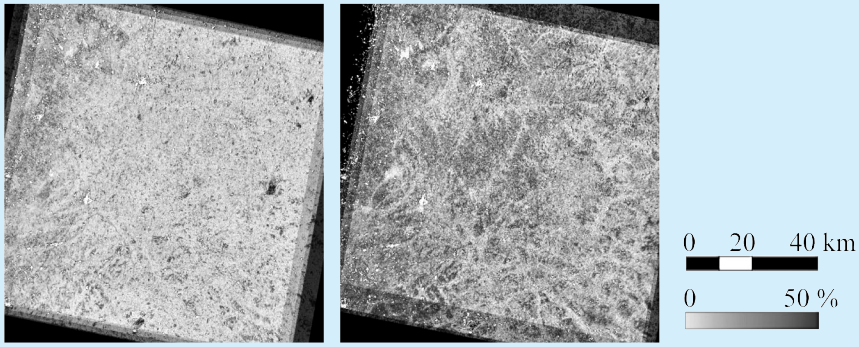
From time to time, high expectations are given to real or near-real time monitoring using remote sensing. However, in Thailand, it is quite difficult to obtain cloud-free optical image, and accordingly, difficult to exactly understand the surface conditions on a daily basis. Early drought warning system cannot be achieved without optical remote sensing. While SAR can detect at all-weather conditions and nighttime, the frequency of the observations, dozens of days, is low. Due to such long recurrent periods, SAR cannot be utilized for the real/near-real time monitoring. However, SAR images are highly capable of mapping distribution of potential soil moisture. The author expects that using both SAR data and optical data, it would be possible to better prepare for droughts.

COLLABORATION BETWEEN AIT AND JAPAN

Dispatching JICA experts to AIT by Japanese Government started in 1969. Long-term experts, i.e. with longer than six months stay, amounted to 118 persons. Lately, Japan started to gradually withdraw support to AIT. Eventually, it was decided that I would be the last long-term JICA expert dispatched. Other than me, there are other Japanese faculty members, four directly hired by AIT and four seconded by other institutes of Japan including Dr. Kato from ICUS.

In spite of this, the Japanese Government is still interested in contributing to the human development of South and Southeast Asia, and recognizes that AIT can be a partner to meet this purpose. Collaboration between AIT and many Asian universities has become more and more active in terms of research and education. Moreover, many master students of AIT are eager to study in Japan and obtain Ph.D. degrees with the support of Japanese Government scholarships. Actually, the Department of Civil Engineering, the University of Tokyo has welcome many students from AIT. With consideration of these different levels of interactions, I believe that AIT and Japanese universities will continue to collaborate in the future.

(By J. Susaki,
Graduate School of Engineering,
Kyoto University)



Mean of volumetric soil moisture of Burram Province, Thailand in dry season (Upper: March and April) and rainy season (Lower: July and August)

IIS — Chula Unisearch Workshop for Urban Safety

The first joint workshop between the Institute of Industrial Science (IIS), The University of Tokyo and the Civil Engineering Department, Chulalongkorn University was held at the Engineering Building of Chulalongkorn University on February 27, 2007. Fifty-seven participants attended the workshop.

The workshop began with opening speeches by Professors Y. Yasuoka and P. Lukkunaprasit. The following topics were presented:

- *'Seismic Hazard Mitigation — The Thailand Experience' by Prof. Panitan Lukkunaprasi.*
- *'Fire Egress Analysis for Buildings' by Assistant Prof. Thanyawat Pothisiri.*
- *'Importance of Maintenance of Concrete Structures for Urban Safety' by Prof. T. Uomoto.*
- *'Blast Load Test on Ferro cement Bomb Baskets' by Dr. Thanakorn Pheeraphan.*
- *'Satellite Observation Network for Environment and Disaster Monitoring in Asia' by Prof. Y. Yasuoka.*
- *'Rainfall Estimation by Remote Sensing Instruments' by Dr. Virat Chatdarong.*
- *'Urban transportation Safety: Current Situations and Improving Strategies' by Assistant Prof. Kasem Choocharukul.*

The workshop was closed with a speech by Prof. Uomoto. At the end of the workshop, it was agreed to hold the similar workshop at least once a year from now on. The participants were mostly engineers from industries and research institutes of Thailand.

(By T. Uomoto)

Symposium on Japanese Contribution to Worldwide Disaster Mitigation

On January 18, 2007, the symposium entitled "From Japan to the World: Initiatives to reduce seismic vulnerability" was held at the Kobe International Convention Center. Six presentations were delivered:

- Ms. M. Suzuki, Shanti Volunteer Association: "What has SVA recently done for natural disaster mitigation in developing countries?"
- Mr. M. Yoshitsubaki, Citizens Towards Overseas Disaster Emergency: "CODE's activities for addressing the recovery of affected people: What is safe and secure housing?"
- Prof. K. Meguro, ICUS, The University of Tokyo: "US$100 Retrofitting Method for Masonry Houses: Recent activities"
- Dr. M. Takashima, Fuji Tokoha University: "Development of a New Tsunami Disaster Mitigation System Considering the Regional Characteristics in the Indian Ocean Rim Countries"
- Prof. K. Okazaki, National Graduate Institute for Policy Studies: "Japanese Government Activities for Improving Low Earthquake Resistant Structures in Developing Countries"
- Prof. J. Kiyono, Kyoto University: "Cooperation Activities for Soil Testing and Disaster Education Supporting Activities between Japanese and Indonesian University Students"

After the presentations, discussion was opened. Because the number and frequency of seismic events is relatively low, the importance of sharing experiences was highlighted. It was also mentioned that funding for disaster mitigation is limited and affects the sustainability of non-governmental agency organizations.

(By K. Meguro)

RNUS Activities

Inspection of Reinforced Concrete Bridges exposed to Marine Environment in Thailand

RNUS conducted a project for the inspection of reinforced concrete bridges exposed to marine environments. Five bridges in 3 provinces in Eastern Thailand, namely Samutprakan, Chonburi, and Chanthaburi, were investigated. The aim of this project is to collect data about reinforced concrete bridges in Thailand, especially related to their durability. The project was led by Mr. Pakawat Sancharoen, currently a doctoral candidate at the Graduate School of Civil Engineering, the University of Tokyo, with the collaboration of a group of undergraduate students from Rajamangala University of Technology Thanyaburi, Thailand. This project was financially supported by the Central Research Institute of Electric Power Industry, Japan.

RNUS Seminar

Dr. Wonsiri Punurai, Lecturer of the Department of Civil Engineering, Faculty of Engineering, Mahidol University delivered the presentation 'An Introduction to Ultrasonics and Its Application for Characterization of Cement-Based Material' for the RNUS seminar held on February 8, 2007. She introduced the fundamental principles of ultrasonic waves with examples of their application in Concrete Engineering. The seminar received a remarkable interest from graduate students, researchers, as well as instructors of the School of Engineering and Technology (STE), Asian Institute of Technology (AIT).

(By R. Sahamitmongkol)

Locations of the bridges targeted by RNUS study

Inspection team taking sample to determine chloride concentration

Dr. Wonsiri Punura (second from left), with Instructors of the STE, AIT

The First IIS Alumni Party was held in Bangkok

The first IIS Alumni party was held in Bangkok on February 26, 2007. It was attended by 17 member including Prof Y. Yasuoka, Prof. T. Uomoto, Dr. Y. Kato and Dr. R. Sahamitmongkol and was held at the Pathumwan Princess Hotel, Bangkok. As this was the first IIS Alumni party outside of Japan, Prof. Y. Yasuoka made an opening speech on behalf of the Director General of IIS, Prof. M. Maeda.

The participants introduced themselves and selected Prof. Suvit as the first president of the IIS Alumni Bangkok branch. It was also agreed to hold such party once every one or two years.

(By T. Uomoto)

Group photo of the participants at the end of the party

Prof. Meguro promotes earthquake disaster mitigation in Iran

Prof. K. Meguro participated in the "Workshop on Strengthening Earthquake Resistant Capacity of Masonry Houses in Iran" jointly organized by the Building and Housing Research Center (BHRC), the Japanese Ministry of Land, Infrastructure, and Transportation (MLIT), the Japan Bank for International Cooperation (JBIC), the Infrastructure Development Institute (IDI), and The University of Tokyo at BHRC, Teheran, on March 14, 2007. The event was attended by approximately sixty participants including representatives of the Kerman Recovery Reconstruction Agency, the Japan International Cooperation Agency, JBIC, the Foreign Affairs Ministry of the Japanese Government, Iranian academicians, and professional engineers. The workshop was opened with speeches from Prof. Heidarinejad (BHRC), Mr. N. Yamane (MLIT), and Mr. H. Matsunaga (JBIC). After them, the following presentations were delivered:

- Mr. M. Sugahara: "Earthquake disaster-prevention measures in Japan"
- Dr. T. Tsugawa: "Latest earthquake resistant and damping technology in Japan"
- Mr. Eng. Zamani: "Results of static loading test on masonry wall specimens reinforced by PP-mesh"
- Dr. Hasan Moghadam: "Practical retrofitting experiments for masonry buildings"
- Mr. Eng. Honarbaksh: "Practical retrofitting experiments for Iranian public schools"
- Prof. K. Meguro: "PP-mesh technology and its availability/ applicability for masonry houses"
- Mr. Salehi, Deputy Governor of Kerman Province: "Earthquake disaster control policy and specific countermeasures in each province"

During the workshop, greetings from the Japanese Embassy, delivered by Mr. T. Yawata, were conveyed .

The proposal of retrofitting adobe/masonry houses by PP-meshes was welcomed by the audience as an alternative to solve the problem of many low earthquake resistant houses which is currently the largest issue for earthquake disaster mitigation in Iran. The Iranian research community expressed its eagerness to explore this option and assess the feasibility of adopting it. After the 1991 Manjil Earthquake, adobe houses have been officially but unsuccessfully banned in Iran. Therefore, it is a great accomplishment that discussions on the possibility to retrofit adobe structures to prevent their collapse have started in Iran.

(By K. Meguro)

BNUS Activities

Armenitola Governmental High School is situated in the most densely and hazardous area of Old Dhaka. In order to increase the knowledge base and make the students fully aware of their status during and after a disaster, BNUS has provided, for the last couple of months, different earthquake related trainings that may help in reducing the losses due to an earthquake .

The short course on First Aid trained 77 students of class VI to IX from Nov. 30 to Dec. 2, 2006. Each day they underwent a 3-hour training on First Aid. The general knowledge on primary treatment and special care of injuries especially with casualty due to earthquake was given emphasis in this program.

Next, the search and rescue (SAR) training program on how to deal with casualty after a disaster was considered. Thirty-three students out of 77 first aid trainee students were selected for instruction from December 10 to 12, 2006. Here the students learnt about different stages of SAR, different styles of rescue from a damage sector of a building, technique of stretcher use with casualty, casualty evacuation with fireman using a chair knot, technique of debris cleaning, etc.

Finally, a safety drill on the whole scene due to an earthquake and the duties of the public was demonstrated by the trained students at Armenitola Governmental High School, Dhaka on February 23, 2007 to have a clear cut view of the earthquake situation. One hundred fifty students participated in the drill. The program was carried out under the leadership of already trained 33 students. The guardians and the school authority were present in the program, in which the students presented their duties before, during and after an earthquake. To increase awareness, each school student was given an awareness poster.

(By M. Ansary)

Participants in the Safety Drill on Earthquake

ICUS Expands its Collaboration Network

Three new Memorandums of Understanding (MOUs) were signed between ICUS and the Department of Civil Engineering of the Shibaura Institute of Technology, Japan; the Global u-City Construction & Information (Gucci) Hub Department of Civil Engineering (BK21), Han Yang University, Korea; and the Department of Construction Engineering, National Kaohsiung First University of Science and Technology, Taiwan. The objectives of these agreements are to foster the exchange of researchers, information, and academic materials, to conduct joint researches, and to organize academic meetings, symposia, and workshops.

All these three institutes have very close research interests with ICUS and we are looking forward to having a fruitful collaboration among us.

(By P. Mayorca)

Scholars from National Kaohsiung First University of Technology in a previous visit to ICUS

Delegation from Shibaura Institute of Technology during visit to ICUS

Professors Byung-Wan Jo and Taketo Uomoto after signing MOU

Dr. Shinji Tanaka joins ICUS

Dr. S. Tanaka joined ICUS from March 1st, 2007. He received his Master degree from the University of Tokyo in 1999. After working as a researcher at the National Institute for Land and Infrastructure Management, he became a Research Associate at the Institute of Industrial Science, and obtained his Doctor of Engineering Degree from The University of Tokyo in 2007.

His major research field is traffic engineering, and his research interests are traffic control, operation, management and traffic behavior analysis. In his doctoral dissertation, he analyzed the influence of on-street parking on traffic flow, proposed a new on-street parking management scheme with creating parking spaces on street, and evaluated it by traffic simulator and driving simulator. Joining ICUS, he will conduct researches for a sustainable city from an aspect of traffic and transport.

Dr. Shinji Tanaka

(By T. Uomoto)

ICUS Activities

- *Prof. Uomoto visited Rheinisch-Westfälische Technische Hochschule Aachen University, Dusseldorf, Germany from February 10 to 14 together with Dr. Kato. They attended a seminar at the Bundesanstalt fur Materialforschung und -prufung (BAM.)*
- *Prof. Uomoto and Dr. Kato visited the Bosporus Channel Tunnel construction site at the Bosporus Strait, Istanbul, Turkey from February 14 to 18, and held meetings with relevant personnel .*
- *Prof. Uomoto attended the joint workshop between the Institute of Industrial Science (IIS), The University of Tokyo and the Civil Engineering Department, Chulalongkorn University held at Bangkok, Thailand on February 27. He also joined the IIS Alumni party was held in Bangkok on February 26.*
- *Prof. Meguro attended the High Level Meeting arranged by the Japan Science and Technology Agency, the National Research Institute for Earth Science and Disaster Prevention, the Ministry of Construction and Urban Development, the Research Center for Astronomy and Geophysics and the World Seismic Safety Initiative in Mongolia from February 6 to 8. He made a presentation on "Seismic Damage to Brick and Weak RC Structures."*
- *Prof. Meguro visited Teheran, Iran to attend the "Workshop on Strengthening Earthquake Resistant Capacity of Masonry Houses in Iran" held in March 14. He introduced there the latest developments of PP-band retrofitting for masonry houses.*
- *Dr. Kato stayed at AIT for his research work and teaching duties at RNUS from January 29 to March 2.*
- *Dr. Kanada visited Korea from March 11 to 16 to deliver the lecture entitled "Recent new NDT method for infrastructures" at the Han Yang University and the Korea Highway Corporation.*
- *Dr. Sahamitmongkol stayed at AIT for his research work and teaching duties at RNUS from December 29, 2006 to March 24, 2007.*
- *Prof. Byung-Wan Jo, Director of the Global U-City Construction and Information (GUCCI), Hub Department of Civil Engineering (BK21), Han Yang University, visited ICUS on February 22 to sign a memorandum of understanding with ICUS.*
- *A delegation of scholars from Shibaura Institute of Technology visited ICUS on March 8. ICUS members briefly introduced their research topics. Future possible research collaboration directions were discussed.*
- *After 3 years of research activities, the RC-39 Committee held its last meeting to summarize its work output on March 28. After it, Prof. Amano delivered the speech: "Examples of cooperation with an academic institution: ICUS, IIS, The University of Tokyo."*

Editor's Note

I have worked as the director of ICUS since April 2001 and I am retiring from ICUS at the end of March, 2007. In these six years, many problems occurred related to urban safety, such as Niigata-Chuetsu Earthquake (Japan, 2004), terrorist attacks on the World Trade Center (US, 2001), asbestos problems (Japan, 2005), Sumatra Earthquake and Tsunami (Indian Ocean Rim, 2004), faked building design scandal (Japan, 2005), among others. Even in March this year, two large earthquakes, the Notohantou earthquake (Magnitude : 7.1) in Japan and another in Indonesia (Magnitude : 6.4), killed people as reported by newspapers and TV programs.

It is impossible to eliminate all the hazards which may happen in the world. All we can do is reduce the number of deaths and other damage due to these hazards by ensuring people use infrastructure safely enough. After the Sumatra Earthquake, people and governments in South and South East Asia started projects to monitor tsunamis in the Indian Ocean, to teach the people about the tsunami hazard, and to warn people after an earthquake as soon as possible. Actually, when a smaller earthquake occurred in Indonesia after the Sumatra Earthquake, people living on the coastal lines tried to run away from the shores having the tragedies of the Sumatra Earthquake fresh in their minds.

Although ICUS members have been working very hard to reduce the negative impacts of hazards, it is not an easy task to accomplish. During my stay at ICUS, we tried to concentrate mostly on preventing disasters by all means. Some of the outputs of these works have already been published as reports, and some are still undergoing, such as a new disaster management system for the Hospital of the University of Tokyo and seismic strengthening of important buildings in the smaller cities in Japan.

I would like to thank all ICUS members for supporting me during these six years and I hope ICUS will continue its works to produce a much safer world from now on.

(By T. Uomoto)

If you would like to contribute an article to ICUS newsletter or have any comment or suggestion, please contact the editorial committee at icus@iis.u-tokyo.ac.jp.

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International Center for Urban Safety Engineering, ICUS
Institute of Industrial Science, The University of Tokyo
4-6-1 Komaba, Meguro-ku, Tokyo 153-8505, Japan
Tel: (+81-3)5452-6472, Fax: (+81-3)5452-6476
E-mail: icus@iis.u-tokyo.ac.jp
http://icus.iis.u-tokyo.ac.jp/

ICUS
INSTITUTE OF INDUSTRIAL SCIENCE THE UNIVERSITY OF TOKYO
International Center for
Urban Safety Engineering