ICUS NEWSLETTER

International Center for Urban Safety Engineering

Institute of Industrial Science
The University of Tokyo

VOLUME 8 NUMBER 4
JANUARY – MARCH 2009

FRAMEWORK AND METHODOLOGY OF PUBLIC SAFETY

By

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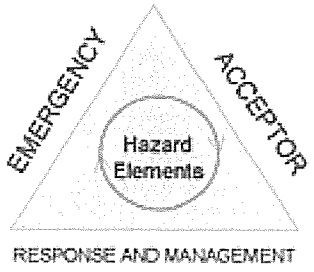
Governments all over the world are attaching increased importance to emergency management due to recent public emergency incidents, such as, the Indian Ocean Tsunami, double benzene plant explosion at Jilin Petrochemical Company in China, SARS outbreak in China, Hurricane Katrina in USA, 911 terrorist attack in USA, and the recent Wenchuan Earthquake in China. Our current society is probably becoming weaker to safeguard itself from these incidences. Highly developed technology is giving human society more convenience while bringing about more of these public emergency incidents. The assurance of public safety needs the supports of science and technology and public safety issues are posing challenges to scientific researchers. At present, it is still somehow difficult to provide a general view of public safety research due to its complexity. It is a multi-subsystem, multi-level, multi-function system, and the systems and factors involved are often non-linear, dynamic and uncertain. One existing question has been that, what is the connotation and extension for public safety research?

Looking into the whole process

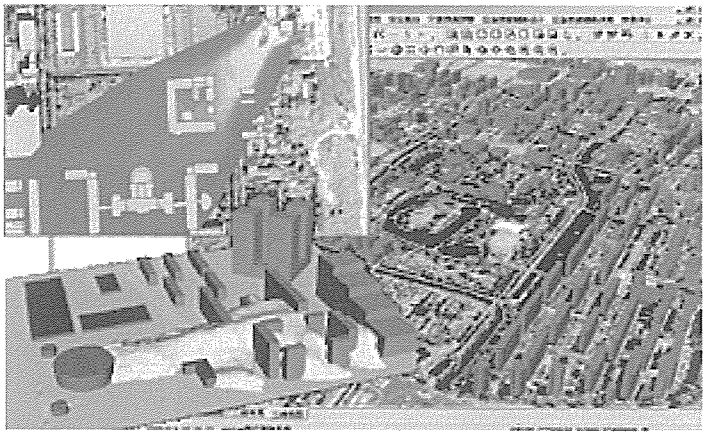


Public safety research triangle

of the emergency and its response, one can identify three key topics: the emergencies, the acceptors, and the response and its management. What links the topics is the so-called "hazard elements". Based on such ideas, the framework of public safety research is symbolized as a triangle shown in the left figure. Figure below shows an example of a public safety response platform with simulation of a chlorine leakage accident.

FRAMEWORK OF PUBLIC SAFETY RESEARCH

The hazard elements have forms of matter, energy and information. The way hazard elements induce emergency is to reach or exceed the critical value or meet with some



A public safety response platform showing simulation of a chlorine leakage accident

activators. For example, the earthquake's hazard element is crustal motion with the form of energy. Earthquake occurs when the crustal motion reaches a certain intensity, i.e. energy reaches a critical value.

The hazard element of a hazard material leakage accident is the hazardous materials with the form of matter. When the hazardous material mass exceeds the capacity of tank (critical value), or there are some cracks causing explosion (activator), the hazardous materials leakage accident would take place. One of the factors for society's panic about hazard elements is the rumors in various information forms. If the information mass reaches a critical value, or some inducing factors happen, the society's panic may occur.

The emergency refers to those disasters or events that will bring damages to human beings, physical objects, the social system and the natural environment. The emergencies behave as extremely huge or destructive actions of "hazard elements". The evolution of emergency obeys some certain laws, and study of emergency is normally to find the type, the intensity, and the temporal and spatial variation of the emergency's actions on the acceptors. The acceptor means the objects which receive the actions produced or released or carried by the emergencies. The acceptors are normally represented as human beings, substances (such as buildings, facilities, life-lines, etc.), and operational, social and economical systems. Acceptors' failure has two forms: body destruction or function failure. Failures of acceptors may cause unexpected release or activation of "hazard elements", which may induce secondary disasters forming the incident-chain-effects. We can think about the acceptors of earthquake as an example. The acceptors of earthquake include human beings, substance of buildings and lifeline system, and system of environment and society, etc. Body destruction and function failure of the human beings are death and injured, and behavioral ability decreases, respectively. For substance, the body destruction is building collapse and tube crack, and the function failure is no residency and no water, etc. The function failure of systems takes the form of ecosystem destruction and society function loss, etc. Fire is the often-occurred secondary incidents due to gas tube cracks from earthquake. It is evidenced that gas tube is the acceptor of earthquake and the gas inside behaves as the hazard element of fire. Unexpected delivery of "hazard elements" due to acceptor's destruction is the direct reason of secondary incidents. Studies of acceptor focus on the states variation, the failure criterion, the vulnerability and reliability, and strengthen method for acceptors. The response and management refers to all of mankind's interventions aiming to disaster prevention and mitigation. It includes evaluation, preparedness, response and recovery, etc. It could be performed on the emergencies or on the acceptors, so as to reduce emergencies' actions or strengthen acceptors or break down the incident chain effect. The way of response and management for the original catastrophes are obviously different from that for the secondary hazards due to the different initial and boundary conditions. Studies of response and management are to find suitable manner, strength, time and scale to perform mankind's interventions for both emergencies and acceptors.

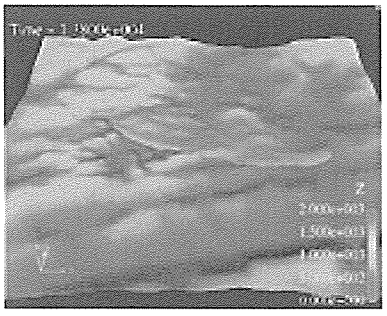
In summary, the core of the researches is to study the behaviors of hazard elements. That is, how the hazard elements convert to emergencies, how the hazard elements act on acceptors by emergencies, and how the failed acceptors cause incident-chain-effect via the hazard elements. Thereby one knows how to perform well-timed emergency management appropriately.

METHODOLOGY OF PUBLIC SAFETY RESEARCH

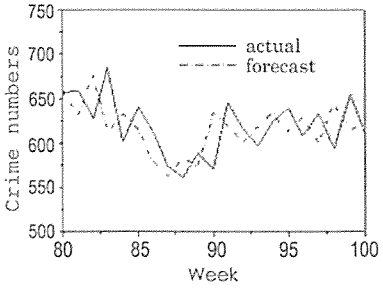
The methodologies of the above studies include five aspects of deterministic, stochastic, sensor-based methods, complex system approach, and combined methods.

The usual deterministic methods include experiments and simulations. Laboratory gravity currents are frequently used to model the dynamics of avalanches, accidental dense gas releases, and fire propagation. 3-D fluid dynamical models are used to simulate hazardous gas leakage. First, grids of landform and city zone are built. Second, number computation is carried out to get the hazardous gas distribution, and then the results are embedded into GIS. Bottom left figure shows results of sulfureted hydrogen gas blowout simulation. The flow rate is 200,000m^3/h, and the concentration at mouth of well: 0.12 kg/m^3.

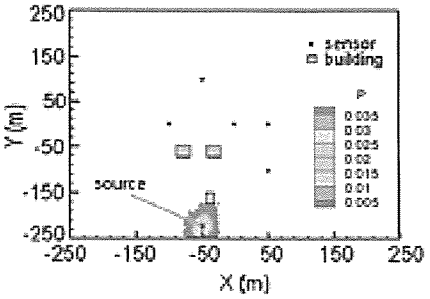
Unfortunately, the deterministic method is not practicable for all kinds of emergencies, and some have to recur to stochastic models. Crime forecasting is a new research field of public safety. It is difficult to forecast crime with deterministic method due to its complexity. With 110 CAD



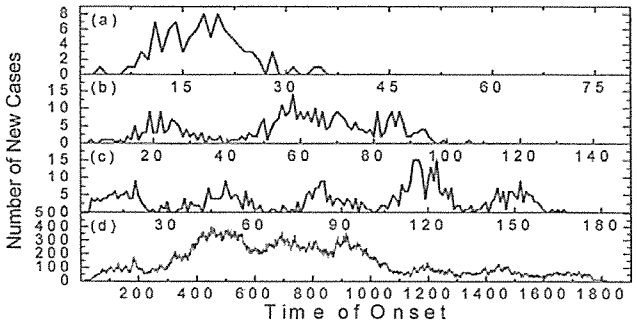
Sulfureted hydrogen gas blowout simulation result



Property crime and its forecasting trend (by week)



Joint distribution of the source location on the plane



Example time series of newly infected cases

crime data, time series model can be designed and short-term forecasting of property crime can be made. Two steps are designed to build the models. The first step is model recognition, and the next is to determine the model order and parameters. Based on the actual crime data, we can use moving average with the order of 1. The right figure on page 2 gives the forecasting trend and is consistent with the actual ones by week.

Sensor-based methods are also important tools for public safety research. Information captured by detection apparatuses and analyzed is used to understand the temporal and spatial variation of disaster. The relationship between logged forest fire and droughts caused by El Niño are studied using coarse- and high-resolution optical and radar satellite imagery. When the materials accidentally release in a densely populated urban center, it is important to predict the transport characteristics of the consequences. So it is necessary to develop an approach to determine the source location and its strength by an array of independent sensors distributed in the urban areas, combined with environment conditions, e.g. wind direction, wind velocity. A method of Markov Chain Monte Carlo sampling based on Bayesian inference is developed to determine the hazardous materials source using sensor data. Top left figure shows the joint distributions of the source location on the plane with this method.

Complexity in public safety results in more applications of complex system approach. Complex network theory is one of the most useful methods to study disease outbreak and rumor spread in groups. It is also frequently used to study the robustness and resilience of lifeline systems with the existing form of network. The human travel has scaling law and the social group has evolution self-optimization characteristics. Forest fire is an example of self-organized critical behavior. Decision-making is the key problem of emergency response and management, and the complex system approach (game theory, neural network, etc.) is usually used to understand the decision-making task. To explore the effects of human travel patterns on the spatio-temporal dynamics of large scale epidemics, heterogeneous spatial metapopulation networks is constructed with the scaling laws of human travel, i.e. $p(r) \sim r^{-(1+b)}$ and $p(tw) \sim tw^{-(1+a)}$. Top right figure gives the example time series of newly infected cases. The simulation results show that the occurrence probability of global outbreaks or the survival probability is significantly dependent on the characteristic travel distance, the characteristic waiting time and the memory effects of human travel.

It is not easy to solve a public safety problem using only one of the above four methods due to its complexity. It has frequently a case that a main method performs with some other methods as supplements, i.e. combined methods. Information from sensor-based method is usually used for determination of some parameters for deterministic method, and modification of the data for stochastic method. Node or link dynamics using the deterministic model is useful to understand the whole network mechanism with the complex system approach. Some models in the complex system approach are usually built by embedding the deterministic, stochastic and sensor-based methods. Integrated risk analysis is a typical case with the combined method. The occurrence probability of emergency is based on stochastic methods, and the evolution sequel of emergency is from deterministic methods. Failure effects of acceptor are frequently based on deterministic methods. Consideration of response and management are possibly based on sensor-based methods and complex system approach, etc.

CONCLUDING REMARKS

It should be noted that natural disasters and human-activity induced incidents are common enemy of humans, and public safety is a general problem all over the world. Public safety research is complex in the framework, and has extensive problems to be solved. International cooperation and exchange among the countries should be enhanced, so as to perform efficient cooperation when facing catastrophes.

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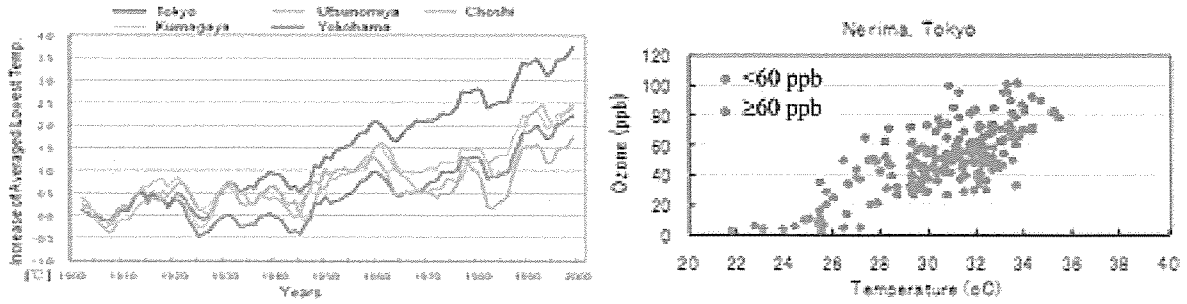
Relationship between Surface O_3 and Urban Heat Island Effect in Tokyo



Change of averaged lowest temperature in some cities of Japan (left) and relationship between surface ozone and temperature at every hour from 8:00 to 14:00 JST in August 2005 based on MM5/CMAQ simulation (right)

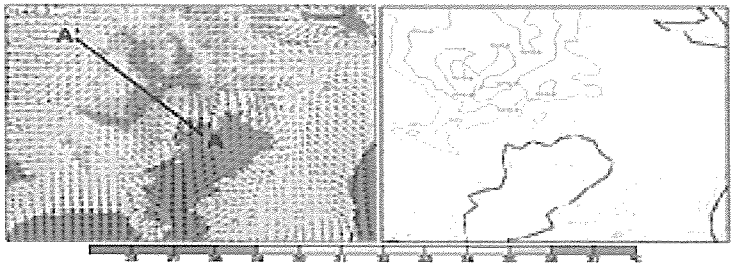
Urban air pollution has been increasing due to climate change and urban heat island. Ozone (O_3) is one of the pollutants currently drawing the most attention. It is a secondary pollutant produced as result of complex non-linear interaction between chemistry reactions and dominant climatic processes. Although only about 10% of earth's ozone are found in the troposphere, which is often referred to as surface ozone, it is recognized as one of the most serious pollutants detrimental to both human health and the environment.

According to measured data from National Institute for Environmental Studies, Japan, the concentration of most of air pollutants is decreasing in Tokyo Metropolitan area. However, the concentration of photochemical oxidant has not achieved the environmental quality standards (one-hour value of 0.06 ppm or less). This phenomenon is a very important research topic. Some factors for this increase of stratospheric ozone have empirical proof, e.g. the relationship between increase of air temperature due to global warming and Urban Heat Island (UHI) with increase in ozone concentration as shown in the figure above.

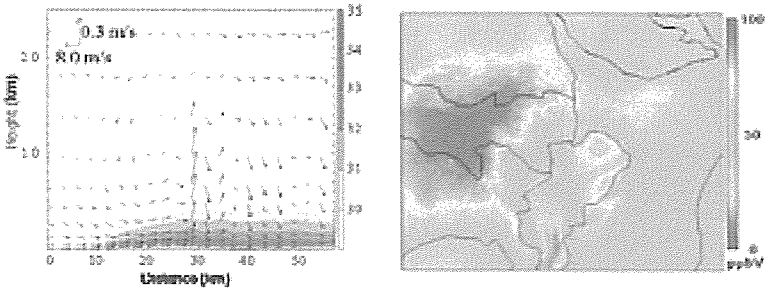
High temperature on UHI days is one of the climatic factors that has strong effect on stratospheric O_3 formation during summertime by increasing photolysis rates of ozone production and the production of ozone precursors, such as NOx and VOC. Indirectly, meteorologically stagnant conditions that accompany high daytime temperature also affect O_3 formation. In top right figure, the surface ozone simulated by mesoscale model at Nerima ward of Tokyo in August versus air temperature shows lower O_3 concentration at low temperature (less than 27°C), but increasing significantly with increasing temperature, exceeding standards (>60ppb) above 28°C. The figures below illustrate impact mechanism of UHI on ozone concentration in Tokyo Metropolitan area. High temperature associated with UHI causes pressure deficiency over the city. Air flow from suburban area meets sea breeze at city and goes up. This updraft of heat island circulation acts like a wall preventing the penetration of sea breeze inland, resulting in high O_3 concentration over city area.

The effect of climate conditions on air pollutions in general and ozone concentration in particular is very complex involving macroscale to mesoscale factors. It is also affected by many climatic factors and phenomena as well as its interaction. Therefore, to assess urban atmospheric environment, it is important to develop a comprehensive climate model in which the complex interaction among topography, city building environment, land use, anthropogenic emissions, etc. must be considered. This is our primary research interest in near future.

(By R. Ooka)



Simulation result from MM5 model at 12 JST August 4;
Left: 10m-temperature (°C) and 10m-wind; Right: surface pressure (mb)



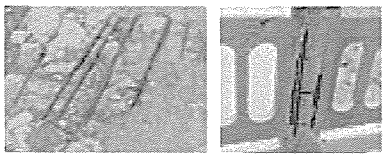
Simulation result from MM5 /CMAQ model at 14 JST August 4;
Left: circulation vector in the plain of A'-A; Right: O_3 concentration (ppbV)

At the USMCA2008, Beijing, PR China, five researchers were selected as winners of Young Researcher Award. In this volume of ICUS Newsletter, two among them introduce their award-winning research briefly below.

Co-effect of Initial Curing Conditions and Exposure Environments on Coastal Concrete Durability

For the concrete infrastructure along coastline, the chain reaction of corrosion of the reinforcement, cracking of concrete, spalling-off of cover concrete and the deterioration of structure performance are due to the chloride attack. Moreover, in some warm areas like Tokyo Bay, Japan or Hangzhou Bay, China, concrete structures are subjected to chloride ingression rather than freezing-thawing cycle or carbonization. In these situations, the apparent diffusion coefficient and chloride accumulation in the cover concrete are often used to estimate the durability state and predict the life span of the structures.

Initial curing is a beginning process in the service life of concrete structures and is a critical process



Reinforcement corrosion and concrete spalling-off from chloride attack

to form a dense concrete microstructure. Besides the effect from initial curing condition, following exposure environment needs to be considered in the study of concrete durability, since all the concrete infrastructure are exposed into real service environment after curing.

To discuss the combined effects from initial curing conditions and the following exposure environments on chloride moving properties in concrete, a six-month onsite exposing test that investigated concrete cured under different conditions was carried out. The testing results show that, (1) initial chloride-suction and the chloride moving ability in saturated-cured concrete are obviously weakened, (2) lack of pore water in the cover concrete, which is caused by wet-dry cycle from exposure, would reduce the chloride moving ability in concrete.

With this, it is inferred that the coupling effect of initial curing condition and following exposure environment should be taken into account in the durability design of concrete structures located in marine environment.

(By X. Wen,
Zhejiang University, PR China)

Shaking Table Test of Timber Roof Masonry House Models Retrofitted by PP-Band Meshes

To investigate the seismic performance of masonry houses and effectiveness of PP-band retrofitting technique, two models were built in the reduced scale of 1:4 using unburnt bricks as masonry units with a cement/water ratio of 33%. Model dimensions were 933mm x 933mm x 720mm with 50mm thick walls in all models. One of the buildings was retrofitted with PP-band mesh. Simple sinusoidal motions of frequencies ranging from 2Hz to 35Hz and amplitudes ranging from 0.05g to 1.4g (as shown in the table) were applied to obtain the dynamic response of the models.

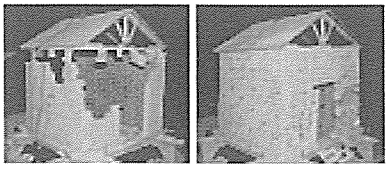
For non-retrofitted specimen, no major cracks were observed upto run 21. At run 28, crack was observed at one of the top corner of the door opening and it propagated up to top layer of the wall, upon which cracks widened with each successive run. At run 44, large amount of cracks were observed, exciting cracks widened and connection between adjacent walls became weak. In case of walls perpendicular to shaking direction, part above the door opening was totally separated from the specimen. At that point, the roof was only supported by two walls, which were in the direction of shaking. Therefore, due to walls subjected to out-of-plane load; there were bursts outwards in shaking direction. This finally led to the structure collapse.

For retrofitted specimen, from run 25, new cracks appeared and cracks widened with each successive run. Although the PP-band mesh kept the structure integrated during the shaking, it allowed the sliding of the bricks along these cracks to some extent. At the final stage of the test, at run 52, virtually all the brick joints were cracked and the building had substantial permanent deformations. However, building did not loose the overall integrity and stability, and collapse was prevented even in such high intensity shaking.

(By N. Sathiparan,
The University of Tokyo)

Loading Sequence

Amplitude	Frequency							
	2Hz	5Hz	10Hz	15Hz	20Hz	25Hz	30Hz	35Hz
1.4g		50						
1.2g	54	49						
1.0g		48						
0.8g	53	47	43	40	37	34	31	28
0.6g	52	45	42	39	36	33	30	27
0.4g	51	44	41	38	35	32	29	26
0.2g	46	25	24	23	22	21	20	19
0.1g	18	17	16	15	14	13	12	11
0.05g	10	09	08	07	06	05	04	03
sweep	01,02							



Non retrofitted & retrofitted model after run 45(right) and run 52(left)

Making Adobe and Brick Houses Stronger to Withstand Earthquakes

Adobe, or sundried mud blocks, and bricks, oven burnt clay blocks, have been used for many centuries to construct houses all over the world. In developing countries, where construction materials are costly and labor is relatively inexpensive, they are preferred over reinforced concrete or steel. Many of these houses are constructed by the house owners themselves or unskilled masons, mainly because of resource constraints.

During the last century many lives have been lost due to earthquakes. Collapse of adobe/brick houses, also called masonry houses, caused more than 60% of these deaths, mostly in developing countries. In the earthquake damage surveys that I had the opportunity to join, the situation I could observe was very similar regardless of the country. While poorly constructed masonry houses collapse killing their inhabitants, well constructed ones protect their occupants. Lack of know-how on "good construction" practices, risk unawareness, and limited resources, have resulted in a huge seismic vulnerable housing stock.

Addressing this situation is essential to reduce casualties in future earthquakes and to preserve existing housing stock thus reducing material losses. However, this problem presents a great challenge. On one hand, a technical solution

PP-band retrofitted model house built in Kashmir region after devastating earthquake in 2005

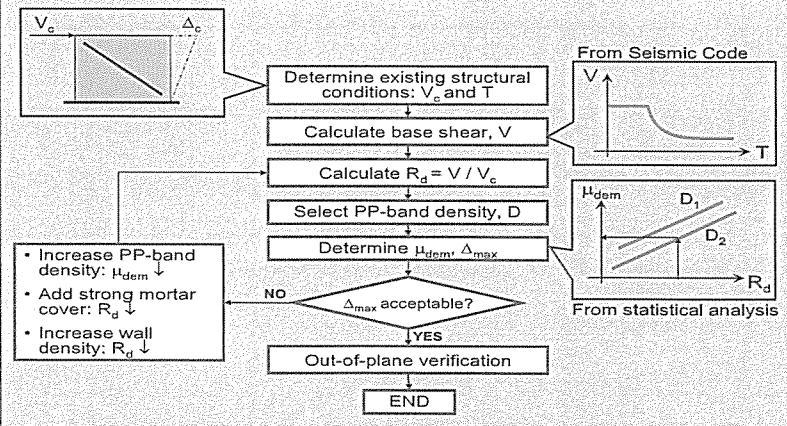
that can be easily implemented and is economically viable is necessary. On the other, raising awareness and creating an environment that encourages people to retrofit their houses are essential.

During my stay at the University of Tokyo, first at Meguro Laboratory and then at ICUS, I was involved in developing a solution to this problem together with a team of researchers led by Prof. Kimiro Meguro. The proposal is to use inexpensive and widely available plastic straps, known as PP-bands in the industry, to retrofit low earthquake resistant masonry houses. Walls are wrapped with meshes, made of these bands, on both sides. Inner and outer meshes are attached with wire connectors so that bricks/adobes are confined inside them. Finally, they are plastered to protect the meshes and provide a smooth finishing to the walls.

Experiments and numerical simulations have shown that PP-band meshes improve the seismic performance of poor earthquake resistant masonry houses. This is mainly achieved by increasing the structure ductility and energy dissipation capacities. Under moderate ground motions, PP-band meshes provide enough seismic resistance to guaranty limited and controlled cracking of the retrofitted structures. Under extremely strong ground motions, they are expected to prevent or delay the collapse, thus, increasing the survival ratio.

In order to effectively promote retrofitting with PP-band meshes, simple recommendations regarding amount of reinforcement, arrangement, and detailing, are necessary. Because the people who will actually install them are either the house owners or relatively untrained masons, it is important that the essence of the method is condensed in a set of few "rules of thumb". Behind it, a design procedure, such as the one outlined in the figure below, should be carried out. With it, it is possible to find out the necessary reinforcement for a particular seismic demand, considering the structure original capacity and acceptable displacements, i.e. ductility demand. Experimental observations and numerical simulation results should also be incorporated when preparing the "rules of thumb" mentioned before.

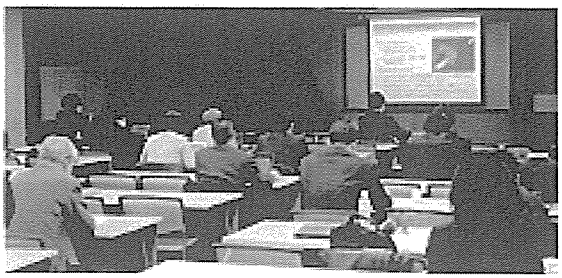
Although increasing the seismic strength of the many existing vulnerable masonry houses is not easy or achievable in a short time span, it is the only way to guaranty the sustainable development of the regions where these are widely used and where earthquakes are common. I am very grateful for the great opportunity that I had to make a small contribution to addressing the problem of low earthquake resistance masonry houses, at the University of Tokyo and ICUS.



Methodology proposed for PP-band mesh retrofitting design

(By P. Mayorca, DNV Norway)

18th Seiken Forum Was Held at IIS



Left: A forum snapshot
Right: Professor H. Sawada in his closing speech

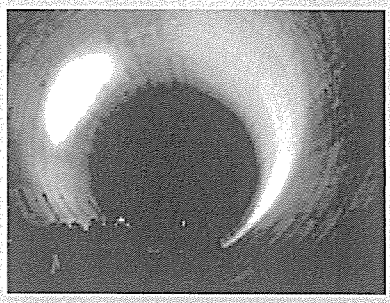
The 18th Seiken Forum was successfully held on March 9-10, 2009 at the Institute of Industrial Science (IIS), The University of Tokyo. This year the forum focused on "Collection and Usage of Meso-scale Information of Environment and Disaster Risk using Remote Sensing Technology".

There is a persistent lack of information exchange among various research fields, such as, hydrology, crop yield prediction, forest management, disaster mitigation in spite of using similar remote sensing technology. A total of six sessions on microwave remote sensing, evaluation of disaster risk, environmental monitoring, land use, ecological monitoring and thermal environment were organized in the forum. There were approximately 100 participants in the forum and 31 presentations were delivered in 2 days. In the disaster risk session, researches on development of UAV (unmanned airborne vehicle) based disaster monitoring system, ASTER image database for volcanoes, estimation of agricultural damage by natural disaster using satellite data (2008 cyclone damage in Myanmar), estimation of forest and land fire risk using multi-criteria decision analysis and GIS in west Kutai district of East Kalimantan, estimation of reduction in tsunami inundation flux by costal forest in Hambantota district of Sri Lanka and production and verification of land surface water coverage map by using AMSR-E, etc. were presented. During the forum, information exchange was actively done. All participants recognized that an approach from different perspectives such as advanced technology and disaster issues is most important for solving various problems. Several participant expressed their interest to join the Seiken forum next year. The closing remarks were delivered by Prof. Haruo Sawada.

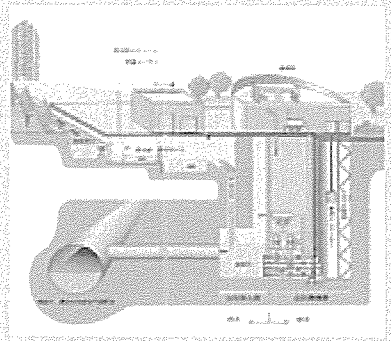
(By T. Endo)

Visit to Flood Control Reservoir in Tokyo

The Ministry of Education, Culture, Sports, Science and Technology (MEXT) has been leading a special project for mitigation of metropolitan earthquake disaster since 2007. Prof. K. Meguro and Dr. M. Ohara are involved in the study group for "Establishment of widespread crisis management and mitigation system" and "Developing efficient information sharing system for disaster-related organizations". The study group has general meetings every three months for sharing disaster information in Tokyo metropolitan area among over 100 researchers involved in this project. The general meeting was held on January 6-7, 2009. On the first day, we visited one of the densely built-up residential areas for understanding its earthquake disaster risk. After that, we visited a flood control reservoir at the Zenpukuji-kawa river which is one of the flood disaster mitigation facilities in Tokyo. This is a tunnel over 50 m beneath the National Ring Road 7 in Tokyo and it can store 540,000 m³ of flood water from Zenpukuji-kawa river. The length of the tunnel is 4.5 km and its inside diameter is 12.5 m. When the typhoon No. 22 attacked Tokyo area in October, 2004, this flood control reservoir took in flood water and the number of damaged houses due to the typhoon was limited only to 46. One can realize the mitigation effect of the flood control reservoir by considering that the number of damaged houses was 3,117 in case of Typhoon No.11 in 1993 with the same manitude. On the second day, we had a workshop on multiplied effects from disasters on society.



Inside the flood control reservoir



Flow of water to the reservoir

(By M. Ohara)

Visiting Chengdu: An earthquake effected area in Sichuan Province of China

From January 2nd to 5th, 2009, Prof. Kimiro Meguro, Director of ICUS and Dr. N. Sathiparan, the University of Tokyo, visited Chengdu in respond to invitation by China Development Research Foundation (CDRF). This visit began at the city of Chengdu, which was accessible by air from Beijing International Airport. The Shuangliu Airport is about 12km from the Chengdu city center. Chengdu is located in the Sichuan Province and is the center of China's Southwest culture, government and economy.

On-site instruction given by Prof. Meguro at Luobuzhai Village

Same day a meeting was convened to discuss and coordinate trip activities. The participants to the meeting were Prof. K. Meguro, Dr. N. Sathiparan, Mr. Lu Mai, Secretary General, CRDF, and several members of CDRF. The objectives of the trip and the roles of both organizations were discussed at length.

Day 2 started with travel from Chengdu to Sichuan earthquake affected area along the road. Most of the people were still living in temporary accommodations at the time of visit.

Around noon, a meeting was convened with Mr. Zhang Tongrong, Governor of Wenchuan County. He explained about the government of Wenchuan County activities for on-site rehabilitation and reconstruction in Wenchuan. Also, he requested Prof. Meguro to provide technical support on this issue.

Prof Meguro and Mr. Zhang after long discussion

Afternoon, visit was made to the Luobuzhai Village and Buwazhai Village; which are mostly affected by the earthquake in Wenchuan Country. Prof. Meguro introduced the PP-band method to local people. Most of the instructions were giving by the aid of image and video, and it had a strong impact on local people.

After the village visits, Prof. Meguro gave a presentation entitled "Implementation of earthquakes safer housing through technological and social approaches" at Wenchuan County government office. The meeting was attended by around 30 participants; those were mainly government officials and some local leaders from Luobuzhai and Buwazhai Village.

Day 3 started with travel from Sichuan earthquake affected area to Chengdu. Along the way earthquake damage inspections were conducted. Afternoon, a seminar on "Advanced Seismic Technology for Scientific Post-earthquake Reconstruction" was organized by CDRF and Sichuan Construction Department at Chengdu XiangYang Hotel conference hall. The objective of the seminar was to provide details on advanced technology for construction of buildings in earthquake prone regions. The seminar was attended by around 400 participants.

Prof. K. Meguro was the Special speaker invited by CDRF. His speech on simple and economical retrofit method for masonry houses and its promotion systems let audience impress. His talk emphasized the essential elements for creating houses that would be less susceptible to earthquake damage. Employing images and video based on actual experiences and introducing data from a number of earthquake disaster areas, Prof. Meguro led the audience through an easy to understand presentation. He concluded his presentation by emphasizing the need to focus on creating safer built environment which will drastically reduce structural damage and human casualties from future earthquakes.

The proposal of retrofitting masonry houses by PP-band meshes was welcome by participants as a good technology to solve the problem in non-engineered structures in earthquake prone region.

Presentation given by Prof. Meguro

On day 4, the visit ended with brief meeting with CDRF members in the morning before leaving from Shuangliu Airport to Tokyo.

(By N.Sathiparan)

Student Receives Award for Bachelor Thesis

Prof. Hotate, Dean, School of Engineering awarded the prize to Ms. Sato.

Ms. Mari Sato of Kuwano Lab is awarded Dean's Prize of School of Engineering.

Ms. Mari Sato, an undergraduate student of Civil Engineering Department, the University of Tokyo, received the Dean's Prize of School of Engineering for her outstanding Bachelor thesis. The prize is awarded to the best student in all engineering departments. She is the first winner of the prize in the Civil Engineering Department. In the graduation ceremony held in March 24, 2009, the prize was awarded by Prof. Hotate, Dean of School of Engineering.

She conducted her undergraduate project research under the supervision of Dr. R. Kuwano. She performed a series of experiments to explain how the underground cavity forms, expands and eventually causes cave-in. Field investigations were also carried out to explore ground loosening formed around the cavity. Outcomes of the study can be an important clue to develop a novel technique to detect a hidden ground cavity which can be a source of large scale ground cave in.

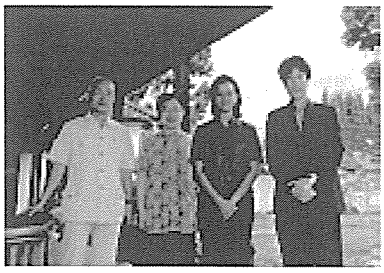
(By R. Kuwano)

RNUS Activities

Promotion of PP-band technology in Yogyakarta, Indonesia

During 7-15 February 2008, Dr. Kawin Worakanchana joined the JICA expert team consisting of Mr. Masayuki Watanabe and Mr. Masato Kuroda to promote the poly propylene (PP) band retrofitting technique in Yogyarkata, Indonesia.

The team started the trip by visiting Klaten and Kotagede districts to investigate what the condition of the damaged buildings and their reconstruction was after the 2006 Java Earthquake. In both districts, some damaged buildings were still left unrepaired. In Klaten, the team observed that most of the damaged structures have been replaced with lightly reinforced concrete structures. The local government of Yogyakarta has provided 15 milllion Rupiah (approximate 1425 US$) to each family whose house was destroyed during the earthquake. We found by interviewing local people that this fund could only contribute to re-build some parts of a damaged house. In Kotagede, which is the old city located in Yogyarkata, most of the structures which collapsed have been reconstructed and retrofitted. During the trip, we visited Omah UGM wall, which is an ancient structure. It was heavily damaged during the 2006 earthquake.



Top: The visiting team
Bottom: Demonstration of PP band retrofit

During our visit, some parts of the structure were being repaired by the fund given by a private company.

The team organized several meetings and participated in seminars to promote the PP-band retrofitting method. We expected that this retrofitting technique will provide the people with a cheaper alternative method to save their lives from building collapse. In this occasion, the team was honored to be granted a presentation on PP-band technology in front of His Royal Highness Pembayun.

Finally, the team has reached an agreement with Dr. Ir. Soeleman Saragih to retrofit the Omah UGM wall with the PP-band retrofitting technique. This place will be used as museum in the future and we planned to use this place as a prototype for people who are interested in retrofitting their house with PP-band technology.

Progress report on the Master Plan for Earthquake Disaster Mitigation and Building Collapse Prevention project

RNUS joined AIT and Panya consultant team to present the results from progress report on Master Plan for Earthquake Disaster Mitigation and Building Collapse Prevention Project in Thailand to the Department of Disaster Prevention and Mitigation (DDPM). The team consists of Dr. Pennung Warnitchai, Dr. Kawin Worakanchana and Mr. Kasidi Vichitugsornpong. The topic of this presentation from the AIT side mainly focused on the acqusition of earthquake source data and geological data for microzonation, building and infrastructure inventory.

After the presentation, DDPM was satisfied with our progress report. The team is now preparing the draft final report which will be submitted in May 2009.

(By K. Worakanchana)

BNUS Activities

Interviewers with Prof. M.A. Ansary (left)
Interview with J.R. Choudhury, Vice Chancellor, Brac University (top right) and
Md. K.A. Khan, Deputy Chief Coordinator, Cyclone SIDR Operation (bottom right)

BNUS continues interview survey on cyclone SIDR management in Bangladesh

BNUS performed interview survey from November 26 to December 07, 2008, in Dhaka on the role of Standing Orders on Disaster (SoD) of Bangladesh and the Cyclone SIDR management operations. The interviews were conducted to the policy makers and personnel associated with cyclone management activities in some organizations such as, Disaster Management Bureau, Directorate of Relief and Rehabilitation, Bangladesh Red Crescent Society (BDRCS), Cyclone Preparedness Programme (CPP) and Comprehensive Disaster Management Programme. Earlier BNUS performed a similar survey from May 5 to May 12, 2008 at local level administrations and cyclone management authorities in two Districts of Patuakhali and Barguna, which were worst affected by cyclone SIDR 2007. The current survey is the continuation of a previous research by BNUS. The interview surveys in Dhaka were performed jointly with Mr. Taiki Kou, an undergraduate student of Meguro Laboratoiry and affiliated to Department of Urban Earthquake Disaster Mitigation Engineering, ICUS. Mr. Kou is working on "Disaster management operation by governments in case of Cyclone SIDR in Bangladesh". Through the interviews discussions were held on various issues such as historical changes of disaster management plan and SoD in Bangladesh, cyclone management operation flow of Ministry of Food and Disaster Management, information flow and sharing, maintenance of logistics, efficiency of cluster approach during disaster stage, current action plans, CPP and BDRCS activities, relief works, plans and activities regarding cyclone shelters and so on.

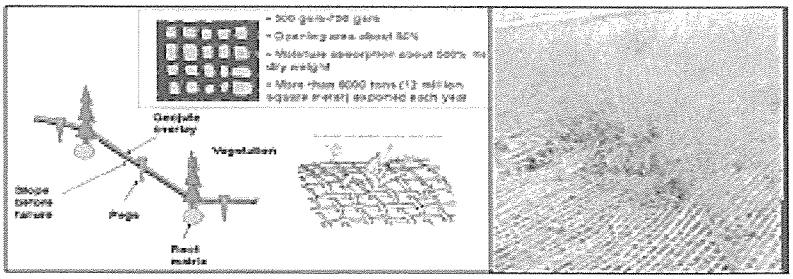
BNUS works on rain-induced erosion control in Bangladesh

In recent years, there is common occurrence of rain induced hilltop erosions or landslides in greater Chittagong and the adjacent rolling areas including the Chittagong Hill Tracts of Bangladesh. Loosening of topsoil by rainwater during heavy rainfall from deforestation and cutting of the hills was found to be main cause of these landslides.

On August 18, 2008, a total of 11 persons were killed and more than 30 were injured in a landslide in Motijhorna area in the port city of Chittagong. In June 2007, a landslide at Mati Jharna colony of Lalkhan Bazar, right in the heart of Chittagong, killed 128 people when a hill collapsed on to an adjacent slum. Statistics show more than 300 people have been killed in landslides in Chittagong in recent years. These occurrences have posed yet another challenge to the engineering know-how, administrative decisiveness and mass awareness in Bangladesh. To investigate these landslides and find a probable solution, BNUS organized a field visit for the experts/ researchers to some landslide areas of Chittagong district from September 10 to 11, 2008. The team consisted of Dr. Abdul Jabbar Khan, Professor and Dr. Raquib Ahsan, Associate Professor, Department of Civil engineering, Bangladesh University of Engineering and Technology. Later, Prof. Khan presented his findings as well as a couple of recent projects implemented by 16 Engineering Construction Battalion at Rangamati area using Geojute for rain-induced erosion control under his guidance.

Geojute is a bio-engineering solution to rain-induced landslide. It is biodegradable, locally available in Bangladesh and cheaper than other available methods. The jute nettings spread over seeded slopes shield the soil and seeds from the impact of rain drops, minimise runoff and slow down its velocity, maintain the capacity of soil to absorb water and retain soil moisture. Once seeds germinate and grow through the gaps in the fabric to cover the area, Geojute nets starts to degrade. Geojute is also suitable for slopes with high erodability where mechanical methods prove unsuitable.

(By M. A. Ansary)



Left: Schematic of Geojute application on degraded slope;
Right: Vegetation growing through Geojute

ICUS Activities

- Prof. K. Meguro, Director, ICUS, visited the earthquake affected areas of Chengdu, PR China during January 2-5. He made a keynote speech at the seminar in Beijing titled "Advanced Seismic Technology for Scientific Post-earthquake Reconstruction" in a seminar arranged by China Development Research Foundation and Sichuan Construction Department. (please refer page 8 for details). He again visited Beijing, China from March 8 to 9 to attend 2nd Japan-China Forum. From March 14 to 16, he visited BNUS in Dhaka, Bangladesh.
- Prof. H. Sawada visited Khon-kaen, Thailand from January 7 to 12 to join and present at the Workshop on Monsoon Asia Tropical Forest Carbon Dynamics and Sustainability. From March 14 to 20, he visited Bangladesh University of Science and Technology (BUET), Dhaka, Bangladesh and carried out an observational survey of natural environment of Dhaka and around.
- Dr. Tanaka stayed in Bangkok, Thailand during the period of January 14-27, February 12-28 and March 2-27 to carry out his teaching and research duties as a co-ordinator of RNUS at AIT. During February 14-17, he visited Dhaka, Bangladesh to carry out a survey of traffic flow in Bangladesh.
- Dr. Worakanchana remained in AIT till March 1 to carry out research and teaching duties.

Research Committee (RC) Activities

Prof. K. Meguro, Director, ICUS presided over the concluding meeting of RC-58 (left). Seated next is Prof. H. Sawada and Dr. S. Miyazaki; Dr. M. Soejima presented the findings of Working Group-2 (center). RC-58 members at a group photo shoot (right)

Starting in year 2007, 13 companies joined the Research Committee 58 (RC-58) to work on "Business Continuity Management (BCM) Systems Suitable for Japanese Society." The industry-university collaboration research group concluded and presented their final research findings in a meeting on March 30. Three working groups carried out extensive interactive discussion, presentation and research on: 1) suitable BCM systems for private companies, 2) suitable BCM systems for local governments and 3) suitable methods for evaluating BCM. The final report of RC-58 research outcomes will be published in April, 2009. RC58 will hold a forum on April 21 to report its results to the general public and to host a special lecture by Dr. S. Nishikawa, Ministry of Land, Infrastructure, Transport and Tourism.

Research Committee 62 (RC-62) held its meeting on March 17 and is preparing the interim report to be submitted in May.

Awards

Asian Concrete Federation (ACF) conferred its Best Presentation Award in January to Prof. H. Yokota, ICUS Visiting Professor, for his splendid presentation of the paper on *Chloride Ingress in Cracked Concrete with Water Repellent Treatment* and his invaluable contribution during the 3rd ACF International Conference held in Ho Chi Minh City, Vietnam on 11-13 November 2008.

Call for papers

USMCA 2009, Incheon S. Korea, October 15-16 2009

ICUS is happy to announce that, *the 8th International Symposium on New Technologies for Urban Safety of Megacities in Asia (USMCA2009)* will be held in Incheon, South Korea on October 15-16, 2009. Organized by ICUS, National Institute for Disaster Prevention (NIDP) and Korea Disaster Prevention Association (KDPA), the symposium will bring together expertise in areas of design, construction and maintenance of urban infrastructure and those engaged in the development of new tools that could be used for implementation of safer built environment in urban areas. Focusing on 10 key areas relevant to urban safety in Asian megacities, the Symposium will provide a forum for decision makers, practicing professionals, and researchers to share their expertise. For more information and submission of abstracts, visit the USMCA2009 webpage below.

http://www.usmca2009.org/

Mark your calendar, Join us at Incheon, Korea

Editor's Note

There are many old cherry blossom trees in the Komaba II research campus of the University of Tokyo where Institute of Industrial Science is located, and we could enjoy the cherry blossoms in full bloom again this April. In Japan, cherry blossom season coincides with the start of a new fiscal year and new students start their campus life with full of hopes. Recently, IPCC (Inter-governmental Panel for Climate Change) reported that, the global warming induced by human activities are affecting natural environment and phenomena. The impact on natural environment is one of our/humanity's biggest concerns. Although, under the Kyoto Protocol, Japanese government has started several activities to reduce 6% of CO_2 emission from the baseline of 1990, these activities are not sufficient and have not been successful yet. Environmental condition is becoming much worse as indicated by the article by Dr. Fan and his colleagues. As the front of cherry blossom flowering goes north, the new influenza which caused numerous deaths in Mexico also threatened Japanese populace. Also as it spread quickly in Japanese mega cities, it influenced our daily life. Considering these situations, there are many challenges to deal with these problems related to urban environments as well as natural disasters for safety of life. We again recognize the importance of ICUS activities and determine to do our best to achieve fruitful solutions for urban safety. These ideas and thoughts came up to me while I was enjoying and under the cherry blossom trees in full bloom. I cordially invite you to visit our campus to see the old trees by yourself next year, which will bring you plenty of hopes.

(By H. Sawada)

If you would like to contribute an article to ICUS newsletter or have any comments or suggestions, please contact the editorial committee at icus@iis.u-tokyo.ac.jp.
Any article within the scope of urban safety engineering and management will be considered for publication after internal peer review by the editorial committee. To know the scope of ICUS activities, please visit ICUS homepage at http://icus.iis.u-tokyo.ac.jp/

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