

ICUS

Newsletter

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International Center for Urban Safety Engineering
Institute of Industrial Science, The University of Tokyo

Design and Operation of Intersections considering Human Behavior for Safe and Sustainable Societies

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Intersections as key to traffic performance

Traffic accidents are one of the most common risks in our daily lives. In 2013, 4373 people were killed and more than 770,000 people were injured by traffic accidents in Japan.

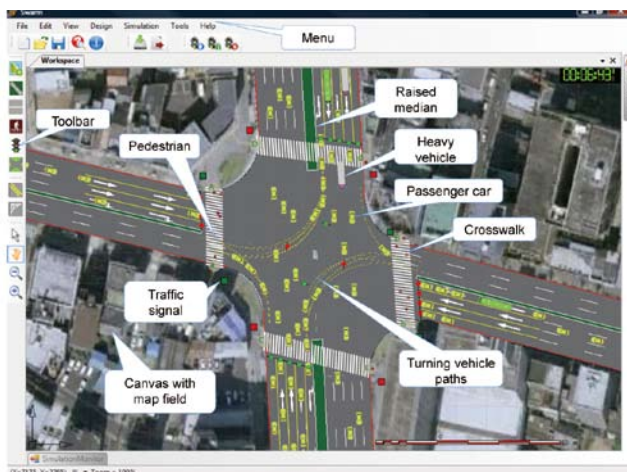
Intersections are key points in a road traffic network. They manage traffic flows toward different

directions and have a high possibility of experiencing hazardous conflicts; half of all traffic collisions occur at intersections.

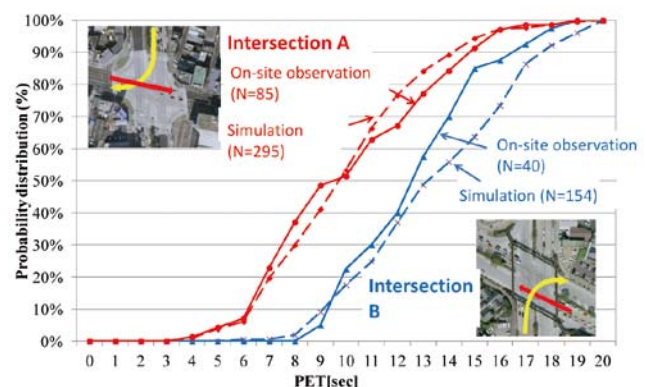
Traffic simulation for safety evaluation

Although proper effective countermeasures are required, prior quantitative evaluation of how much their implementation can

improve safety at intersections is difficult. For congestion evaluation, traffic simulation is a powerful tool and widely used in practice. Practitioners can try different scenarios and find the best solution to reduce congestion. However, in safety evaluations, conventional models are not sufficient to represent hazardous maneuvers (e.g., vehicles enter during a red light or do not give way to pedestrians at crosswalks).



Snapshot of traffic simulation for safety evaluation
(Collaboration with Prof. Hideki Nakamura, Nagoya University)



Validation of surrogate safety measure by simulation

We are currently developing a simulation tool to evaluate traffic safety. The proposed simulation uses stochastic user maneuver models that are sensitive to geometry and traffic control based on detailed user behavior analysis from extensive field observations. This model represents surrogate safety measure distributions, which are important indices to compare the possibility and severity of potential collisions for different intersection layouts and signal setting conditions.

Illegal pedestrian crossings: do they really want to do so?

Pedestrian safety at intersections is an important issue. In Japan, 36% of fatalities in traffic accidents are pedestrians, which is comparable to developing countries; in contrast, 10%–20% of pedestrian fatalities occur in European countries and the USA (National Police Agency, 2013 and WHO, 2010). Although signalized crosswalks prioritize the pedestrians' right of way, 29% of pedestrian fatalities (42% of elderly fatalities) can be attributed to illegal crossing behavior.

There is huge variety in pedestrian signal indications and durations in different countries. In Japan, the flashing green indication after the

green phase means that some of the pedestrians on the crosswalks should return to their origin side, and its duration is set based on this concept. However, almost all pedestrians try to complete the crossing. According to our observation, more than 40% of pedestrians who started crossing at the end of the green phase remained on the crosswalks after the signal turned red. This is also “illegal” behavior.

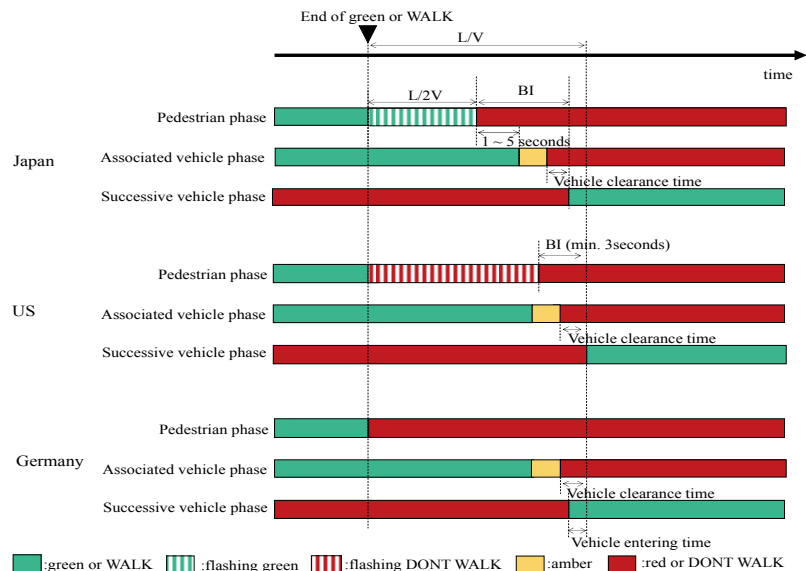
The flashing “DON’T WALK” and red indications in the USA and Germany, respectively, provide sufficient clearance time so that pedestrians who start to cross at the end of the green phase can finish crossing. This seems much more logical, although many pedestrians start to cross even after the green

signal. As each system has its own advantages and disadvantages, determining the signal indications and timings that best achieve pedestrian safety is necessary.

Removal of unnecessary traffic signals

Unsignalized intersections are being reexamined since signalization may not always be the best solution for efficiency and safety. The following issues with signalized intersections have been revealed: (1) unnecessary waiting time at major arterials in ordinary situations, (2) maintenance costs, and (3) intersection operations during disaster evacuations.

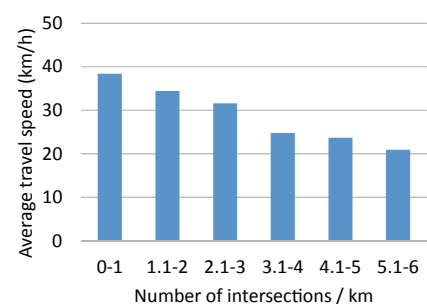
Excessive installation decreases travel speeds, as shown in the figure



Comparison of signal indications in Japan, USA, and Germany



Many remaining pedestrians after onset of vehicle green



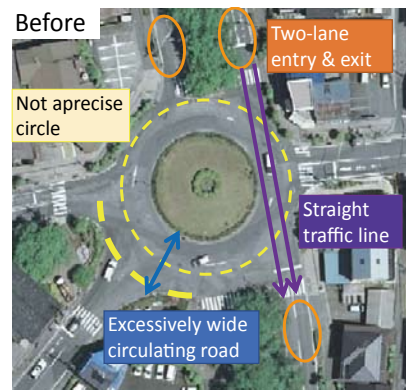
Relationship between density of signalized intersections and travel speed (Hokuhara and Hasegawa, 2003)

below. Traffic lights need to be replaced for maintenance approx. every 20 years to maintain function, which is a non-negligible cost. For disaster prevention, traffic lights are poor during blackouts. After the 2011 Great East Japan Earthquake, blackouts meant that many signalized intersections were not able to control traffic for effective evacuation. Although key intersections can be equipped with non-utility generation facilities, they cannot be installed for all 200,000 signalized intersections in Japan.

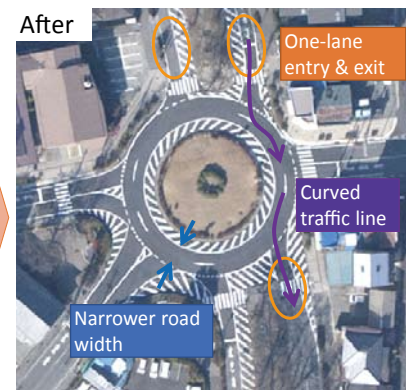
As traffic volume will decrease due to population decline, more traffic lights will become unnecessary in terms of congestion management as far as safety is guaranteed. In December 2013, the National Police Agency first issued a notice about technical criteria for traffic light removal at signalized intersections with low traffic demand. It recommends that such intersections can be switched not only to ordinary unsignalized intersections but also to roundabouts.

Roundabouts: safer unsignalized intersections

Roundabouts (or “modern roundabouts”) are defined as a rotary that gives priority to circular traffic. (Note that not all round-shaped intersections are roundabouts.) In the last decade, roundabouts have rapidly spread in Europe and the USA. As entry vehicles only need to pay attention to the circulating vehicles in the roundabout, the conflict type is much simpler than signalized intersections. According to a survey in Germany, the number of fatalities decreased by more than 80% following the installation of roundabouts at signalized intersections. Although



Wide circulating road makes vehicle paths inconsistent → frequent hazardous conflicts
Two lanes induce parallel runs and overtaking at intersection
Straight traffic line increases vehicle speed, which may cause fatal crashes



One-lane entry and exit and **narrower circulating road** align vehicle paths
Curved traffic line decreases vehicle speed
Dashed lines at entry clarify priority of circulating road

Roundabout geometry improvement in Azuma-cho, Iida city, Nagano, Japan

their capacity is lower than that of signalized intersections, they can reduce the delay to pass through intersections. Therefore, roundabouts are suitable for intersections with relatively low demand.

The first modern roundabout installed in a public road in Japan is located in Iida city, Nagano. Prior to this there was a rotary that did not have proper lane marking and its circular lane was not a precise circle. After layout improvement, conflicts between users significantly decreased, and the traffic conditions were proved to be safer and more efficient.

So far, more than seven roundabouts have been installed in Japan (including field operational tests). The speed of installation nationwide will be accelerated since the new Road Traffic Act will be enforced this year; that is, roundabouts will be officially considered as an alternative intersection type.

Shared or Mess? User Behavior and Traffic Performance

Roundabouts are a good example of autonomous traffic control using driver judgments. In more extreme

cases, one may imagine every road user can spontaneously pass through without specific control devices. Shared space is a challenge toward this direction. It is becoming popular in European countries and is defined as “a street or place designed to improve pedestrian movement and comfort by reducing the dominance of motor vehicles and enabling all users to share the space rather than the clearly defined rules implied by more conventional designs.” (Department for Transport, UK)

It is reported to improve safety but is counterintuitive to conventional road design, which separates traffic by devices to make conditions safer. Whether or not this system increases safety may depend on the traffic rules. If users have sophisticated road use discipline, like in Europe, this kind of system will work well. However, the effect is questionable in some Asian countries, where people tend to have smaller safety margins.

When optimizing design and control, we always need to consider user response. General and global understanding is important not only for applying existing safety countermeasures but also for proposing better new traffic operation systems.

Role of mass media from experiences after the 2011 Great East Japan earthquake

M. Numada and K. Meguro

Three years have passed since the 2011 Great East Japan earthquake. The impact of this earthquake disaster caused long-term problems during recovery and reconstruction not only in damaged areas but also all over Japan. People, governments and researchers have been trying to solve these problems.

Following the earthquake, mass media (news media) reported the conditions of the damaged areas. Even with the development of social network technology, information disseminated by mass media is still considered as major information source to understand the damage, social trend and the activities in affected areas.

However one of the major problems of mass media during disaster situations is the focus on particular areas with easy access or with shocking events. Therefore, it is difficult to understand the total picture of the disaster.

The important roles of mass media are mainly two functions in terms of before and after the hazard attacks.

(1) The first important role of mass media is to contribute to disaster risk reduction before a disaster happens.

In the case of a national level crisis, it will be difficult to respond to the damage and to make an effective decision for the recovery and reconstruction. The only way to deal with this level of disaster is to reduce the vulnerabilities before a hazard and reduce the potential damage so that the hazard can be managed.

There are mainly two approaches to reduce vulnerabilities, namely the retrofitting of structures and effective land use management.

The mass media can play an important role to inform past disaster knowledge and lessons learnt through experiences to the next possible disaster area and people to reduce vulnerabilities.

Fig. 1 shows the list of extracted keywords related to the earthquake resistance of structures from the reports after the earthquake by NHK, which is the national TV broadcast and its reported time (minutes) from March 11, 2011 to March 31, 2014.

For example, “housing” means that the problems about retrofitting of housing were reported more than 100 minutes after the earthquake. “Apartment”, “Building”, “School”, “Ceiling” “Escalator”, “Infrastructure”, and “Ground” are indicated frequently.

(2) After the hazard, it is necessary to contribute to the effective disaster response by introducing the probable problems and necessary actions along the disaster recovery process. Also, long-term continuous monitoring of the damaged area is important for the evaluation of effective recovery and reconstruction.

Just after the 2011 Great East Japan earthquake, a lot of information was reported by the mass media. But as time passed, reports from mass media decreased except during the anniversary of the event, as shown in Fig.2.

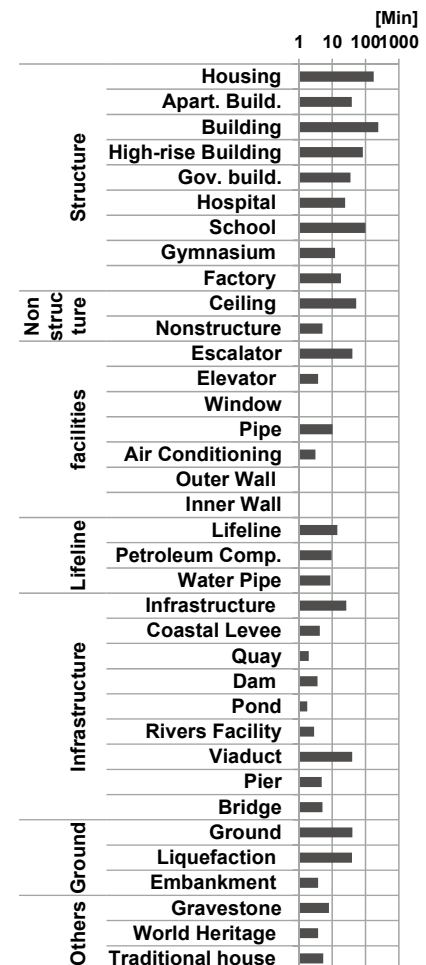


Fig. 1 Keyword list and its reported time

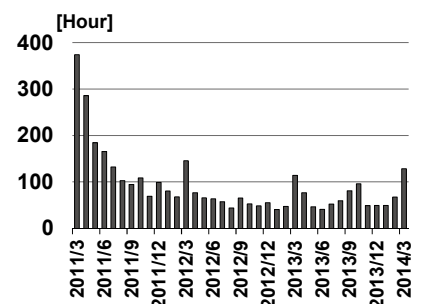


Fig. 2 Time history of reported hours by NHK

To consider the impact of mass media, it is important to continuously report the progress of the damaged area with total framework of disaster management. By doing so, it can be contribute to the mitigation of vulnerabilities.

The authors acknowledge complete cooperation from JCC Corp.

The 28th ICUS Open Lecture on "Methods for Community-based Disaster Mitigation Machizukuri Practices Accommodating for Societal Trends –accommodating for community diversity and universalization –"

On 3rd of February, the 28th ICUS Open Lecture was held. The focus this time was on "neighborhood collaboration" in disaster scenarios. To be prepared for the next large-scale disaster, it is essential to understand disasters and continue to put in steady efforts towards the development of a community-based disaster-mitigation planning and activity system. This lecture used different pioneering cases of community initiatives on disaster-mitigation planning and activity from different regions as the basis on which to build the vision of the coming decade's disaster-mitigation planning and methods to disperse the appropriate Machizukuri practices across communities, while considering the future societal trends. The discussion was particularly focused on the how to establish a culture of disaster-mitigation

Machizukuri within the community, while at the same time taking into consideration the diversity of the different regions. The venue was nearly full, with about 200 people attending, one-third of which were personnel of national or municipal government.

First, Mr. Fujiyama in charge of the Cabinet Office's Disaster Mitigation Department explained the recently released report on "Damage Estimation Report Assumed Inner-plate Earthquake in the Tokyo Metropolitan region" on December, 2013. Following this, Associate Professor Takaaki Kato, explained the necessary stance to follow through with disaster-mitigation in the future with consideration of the periodic societal trends as the basis of which the following panel discussion developed. Mr. Onogi, Director of Chigasaki City, Mr.

Seino, Chief of Katsushika-ward, and Mrs. Watanabe, Director of NPO Ah! Safety and Amenity Machizukuri participated as representatives from the communities undertaking disaster-mitigation-oriented Machizukuri initiatives. It was an enthusiasm-filled discussion throughout.

ICUS plans to continue to carry out similar activities as part of this series of endeavors to establish a platform that connects the leading-edge technology and specialist know-how to society, and in turn receives feedback from society. This symposium was also broadcasted by NHK. (Author: ICUS Associate Professor Takaaki Kato)



Organized 10th Asia Pacific seminar in Yangon

By A. Kawasaki

10th Asia-Pacific Seminar, titled "Further Development of Friendship and Cooperative Relationship between Japan and Myanmar; International Contribution in Asia-Pacific" was jointly organized by Yangon Technological University (YTU), Japan's Association for Communication of Transcultural Study (ACT Foundation), and ICUS, IIS, UTokyo, in Yangon, Myanmar, on January 8th, 2014.

Japan has been more active making contributions to Myanmar's

development. In order to sustain Myanmar's development, Japan is expected to provide human resource development from a long-term perspective.

Experts from the Japanese and Myanmar government, industry and academia participated in this one-day seminar including many graduate students from YTU.

11 speakers from Myanmar and Japan gave presentations on the topics of infrastructure development, geospatial technologies, disaster

management, and rural vitalization, to share views and knowledge for future development in Myanmar with participants, followed by fruitful discussions with participants.

Dr. Aung Kyaw Myat, Deputy Minister of Ministry of Science and Technology in Myanmar, gave a guest remarks at the seminar, and Mr. Yoshitaka Shindo, Minister of Ministry of Internal Affairs and Communications in Japan, gave guest remarks at the reception of the seminar.



Organizers from YTU and UTokyo



180 participants from Myanmar and Japan

Held UTokyo alumni party in Bangkok and Yangon

By A. Kawasaki

The University of Tokyo (UTokyo) alumni party was jointly organized by three Thai alumni groups, including the Institute of Industrial Science (IIS) Alumni Thailand Chapter, in Bangkok, Thailand, on January 4th, 2014. This was the third joint alumni party, since the first held in October 2011. A total of 43 alumni from the 1960s to 2000s were able to reunite at the party along with their families. Attendees included not only Thai alumni working in various fields such as government, universities, and companies, but also 16 Japanese

alumni working in Thailand.

On the following day of January 5th, UTokyo alumni party was jointly organized by IIS Alumni Myanmar Chapter and UTokyo Club of Myanmar, in Yangon, Myanmar. Both alumni groups were just established in 2013, and this was the first whole UTokyo alumni party in Myanmar. A total of 43 alumni were able to reunite at the party, including 15 Japanese alumni working in Myanmar. Those high ratios of Japanese alumni in both countries show the

expansion of Japanese business in ASEAN countries and the need of enhancement of UTokyo's alumni network in Asia and beyond.

Vice President Takehiko Kitamori presented congratulations on behalf of UTokyo in both alumni parties. The party was filled with a friendly atmosphere including greetings from the representatives of each alumni group, as well as short self-introductions by all alumni including their current status and memories of their time as a student at UTokyo.



Group photo of UTokyo alumni in Thailand



Group photo of UTokyo alumni in Myanmar

Visit to institutions in Yangon with Vice-President Kitamori, UTokyo

By K. Nagai

ICUS members, Prof. Meguro, Dr. Kawasaki, Dr. Nagai and Ms. Yoshimoto, visited institutions in Yangon, Myanmar with Vice-President Kitamori of UTokyo on 6th-7th January 2014.

Firstly, they visited Yangon Technological University (YTU) and met Rector and Faculty members. Vice-President Kitamori explained the global vision of UTokyo and the importance of collaboration in education and research. Recent activities and future collaboration between YTU and ICUS were confirmed there. A

festival for new students was held on the day where there was a welcoming atmosphere of the campus. Next, a meeting was held with the Myanmar Engineering Council (MEC), established in recent years, consisting of leading academics and engineers. MEC

promised to support ICUS activities in Myanmar. Lastly, in the visitation of the JICA Myanmar office, overall activities of JICA were introduced and discussion was made especially on education. These visits were fruitful to continue and expand ICUS activities in Myanmar.



Farewell to ICUS STAFF

By Prof. Kimiro Meguro

From April 2014, Professor Haruo Sawada, Visiting Professor Hiroshi Yokota, Dr. Miho Ohara retired from ICUS. Prof. H. Sawada transfers to Geoinformatics Center, Asian Institute of Technology (AIT), Thailand as a professor. Dr. M. Ohara joins International Center for Water Hazard and Risk Management (ICHARM), Public

Works Research Institute (PWRI), Japan. Prof. Yokota is currently an ICUS Researcher. In addition, Dr. Suwal Laxmi Prasad retired

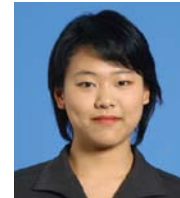
from ICUS to join The University of Newcastle, Australia as a post-doctoral Associate from 1st March 2014.



Prof. H. Sawada



Prof. H. Yokota



Dr. M. Ohara



Dr. Suwal Prasad

ICUS Activities January- March

Titles of graduated students

Lab.	Name	Grade	Title
Meguro	Mr. Tetsuji Noda	Master	Study on estimation of necessary labor quantity for wide-area disaster response by municipalities
Meguro	Mr. Kenjiro Yamamoto	Graduate	Experimental study on seismic retrofitting of masonry wall with special fiber reinforced paint
Okai	Misato Okaneya	Master	Study on the development of a method assessing the vulnerability to famine in each country
Okai	Shizuki Fukuda	Graduate	Assessment of the impacts of the progresses of MDGs on subjective well-being in each nation
Kuwano	Mari Sato	Doctor	Study on progress of internal erosion and its effects on mechanical properties
Kuwano	Tsubasa Sasaki	Master	Microbial precipitation of calcium carbonate for liquefaction mitigation of sand containing fines
Ohara	Jiang Fei	Master	A study on needs of victim transportation to hospitals in case of Tokyo inland earthquake
Ohara	Takanori Sawara	Master	Study on effect of disaster information dissemination service by new vehicle information and communication system
Nagai	Yoshiyuki Takano	Master	An investigation of shear performance under stress rotation field with effective mix proportion of fibers and coarse aggregate in SHCC
Nagai	Ram Chandra Neupane	Master	A study on reinforced concrete corbel subjected to local failure criterion and its residual performance and retrofit
Nagai	Mari Makashima	Graduate	Bridge management system in local government and indicator analysis of the assessment

Date	Name	Country	City	Purpose	
Jan. 01-15	Dr. Kawasaki	Thailand	Bangkok		Operation of RNUS & lectures
Jan. 04- 09	Prof. Meguro	Thailand,	Bangkok, Yangon	Meeting,	To attend Alumni parties, meet YTU and attend to 10 th
Jan. 05- 08	Dr. Kawasaki,	Myanmar		Seminar	Asia-Pacific seminar in Myanmar
	Dr. Nagai				
Jan. 11- 17	Prof. Meguro	Nepal	Kathmandu	Symposium	To attend the Symposium ESD and take on thesis for dissertaion doctor
Jan. 25- 02.09	Prof. Sawada	Brasil	Sao Paulo, Manaus	Project	For Carbon Dynamics of amazonian forest
Jan. 28- 02.13	Dr. Kawasaki	Thailand	Bangkok		Operation of RNUS & lectures
Jan. 28- 31	Dr. Kuwano	Myanmar	Yangon	Lecture	At Yangon Technology University
Feb. 07- 11	Dr. Nagai	Myanmar	Yangon	Interview	For Japanese Grant Aid for Human Resource Development Schlarship
Feb. 18- 03.01	Dr. Kawasaki	Thailand	Bangkok, Loei		Operation of RNUS & lecture, workshop
Feb. 22-28	Dr. Kawasaki	Myanmar	Yangon	Meeting	At Yangon Technology University
Feb.24-03.01	Dr. Ohara	Thailand	Bangkok, Loei	Workshop	For disaster informatin dissemination in agricultural and mountainous area
Mar. 10-20	Dr. Kawasaki	Thailand	Bangkok		Operation of RNUS & lecture
Mar. 14- 17	Dr. Kawasaki	Myanmar	Yangon	Meeting	At Yangon Technology University
Mar. 18- 28	Dr. Kuwano	England	London	Workshop	ISSMGE Technical Committees and 54th Rankine Recture
Mar. 24- 27	Dr. Kawasaki	Thailand	Bangkok		Operation of RNUS & lecture

Editor's note...

Three years have passed since the Great East Japan Earthquake and Tsunami disaster happened in March 2011. The disaster affected not only a nation inside but also other countries by economically damaging the global supply chain, which was also seen in the Chaopraya River Flood in Thailand in the same year. In the era of rapid globalization, a big disaster in a nation is not often just a problem for that country. Responding to a great disaster, similar to global warming, is an agenda which can't be handled by a single country.

Tackling these global disaster and environmental challenges as an academic institute, ICUS has been promoting scientific collaborations beyond the border, particularly in Asia, as some examples were introduced in this newsletter such as organizing the Asia Pacific seminar in Myanmar and the UTokyo alumni parties in Thailand and Myanmar. At our annual event, "13th International Symposium on New Technologies for Urban Safety of Mega Cities in Asia (USMCA 2014)" in Yangon, Myanmar will be jointly organized with Yangon Technological University (YTU) in November

2014.

Network forming is one of ICUS's main missions. In addition to strengthening the human networks and research bases accumulated from ICUS and INCEED's activities since 1991, we would like to explore new frameworks for research collaboration with both domestic and overseas partners. I hope you join ICUS's activities and seek an opportunity for collaboration with us or other colleagues in our network for making a basis for tackling global disaster and environmental challenges.

By A. Kawasaki

USMCA2014: Nov 3-5, Yangon, Myanmar

The 13th International Symposium on New Technologies for Urban Safety of Mega Cities in Asia (USMCA2014) will be held in Yangon, Myanmar on November 3- 5, 2014, collaborating with Yangon Technological University (YTU).

Submission deadline for abstract is Sunday, June 15th ,2014

<http://icus.iis.u-tokyo.ac.jp/usmca2014/index.html>

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The International Center for Urban Safety Engineering (ICUS) is a research center located at the Institute of Industrial Science, The University of Tokyo.

The purpose of ICUS is to identify, investigate, and resolve issues towards the realization of sustainable urban systems for the prosperity and safety of society considering challenging socio-economic problems.