

# ICUS Newsletter

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

### **Activities of ICUS and n-ICUS since Their Establishment**

#### Introduction

The International Center for Urban Safety Engineering (ICUS) was originally established in April 2001 at the Institute of Industrial Science (IIS), The University of Tokyo (UTokyo) with 10-year period. The objective of ICUS was to carry out researches from global viewpoint on urban safety engineering including structural safety, maintenance and management of safe use of urban infrastructure. The ICUS was a successor research center of International Center for Engineering Disaster-Mitigation (INCEDE) which was established to support United Nation's IDNDR (International Decade for Natural Disaster Reduction) from the viewpoint of university academia in April 1991. When the INECDE completed its 10-year period, based on the review of INCEDE's activities, ICUS was built expanding

INCEDE's research fields.

At the time of its establishment. the number of official members was 10 in total, including two Professors, Associate Professors. Research Associates, and Visiting Professors, respectively, and one foreign Visiting Professor, with an additional support staff member employed under the Center's budget. Later, when competitive external funds were acquired, the composition of staff in 2015 became three Professors, Associate Professors, and Lecturer, two Research Associates, reserchers, Visiting Professors, and supporting staff members, respectively.

Prof. Taketo Uomoto was the Director of ICUS from the time of its establishment in 2001 to 2006; subsequently, Prof. Kimiro Meguro has been serving as the Director of ICUS.

#### **ICUS was reborn**

The original ICUS completed its



ICUS members in the year of 2015

10-year period in March 2011. Based on the evaluation of its activities by the external evaluation team composed of the experts in relevant fields from Japan and overseas countries, ICUS was reborn in April 2011.

Figure in the next page below shows three major research divisions of a new ICUS (n-ICUS). They are "Urban Safety and Disaster Mitigation," "Environment Informatics," and "Social Infrastructure Management", and the activities in these fields are intended to fulfill the n-ICUS's objective by the "promotion of advanced researches," "construction of networks," and "information collection and dissemination."

About the promotion of advanced researches, besides research topics in three divisions, topics located between divisions are considered important by n-ICUS. Publication of ICUS Newsletter and Report, ICUS Open Lectures, and International Symposium for Urban Safety of Mega Cities in Asia (USMCA) are the major activities of construction of networks, and information collection and dissemination.

#### **Results of ICUS and n-ICUS**

Aggregating the results of research since 2001 to 2015, the break-up for all three divisions were: peerreviewed papers -721, books -103, papers for international conferences -858, conference papers presented -1,298, investigation reports -55, and other journals -868. About graduate school education, 135 PhD and 143 master students could get doctor and master degrees, respectively, under supervision of ICUS faculty members. ICUS staff members have visited overseas 1,071 times. Including graduate students supervised by ICUS faculty, ICUS has won 111 awards for its excellence in research.

#### Research Activities for Urban Safety and Disaster Mitigation Division

The urban safety and disaster mitigation division carries out development of management technologies to ensure structural safety of urban infrastructure from earthquakes, floods and so on, and the safe use of the infrastructure during a disaster. In the division, there are four research groups; Urban earthquake disaster mitigation engineering and international strategy for implementation of disaster resilience society (Meguro lab.), Crisis management (Ito lab.), Planning and engineering for social safety system engineering and urban engineering (Kato lab.), Disaster management process engineering (Numada lab.).

#### Research activities for Environment Informatics Division

The environmental informatics has been one of the three pillars of ICUS, and consisted of diverse disciplines to develop resiliency in urban built environment by producing and providing proper information to societies.

Prof. Haruo Sawada utilized remote sensing technology, and developed a semi-automatic recognition of the damages in Tsunami suffered regions after the 2011 Great East Japan Earthquake and Tsunami Disaster, for example. He also promoted forest monitoring system which can detect natural and artificial changes on a large scale. Environmental remote sensing was promoted also by Dr. Takahiro Endo. Prof. Sawada now serves as the President of Forestry and Forest Products Research Institute in Tsukuba.

Prof. Mikio Koshihara created a new framework to apply antiseismic reinforcement for memorial town houses to meet the conflicting needs for safety and conservation of traditional landscapes. Dr. Hiromi Sato also contributed to test and analyze the behavior of traditional timber buildings against seismic motions, and proposed the better method to reinforce and conserve traditional structures. Dr. Yosuke Nakaso analyzed the fallouts of ceilings due to seismic motions, and assessed the impacts to the head part of human body.

Dr. Miho Iryo just became an Associate Professor, and has been working on the monitoring the movement of individual objects, such as pedestrians and mobile cars, analyzing the behavior of the objects, and evaluating the efficiency of spatial patterns of the pathways. Dr. Shinji Tanaka also contributed for ICUS activities from perspectives of traffic engineering, and proposed and validated various methodologies to control car traffics. Dr. Yudai Honma applied operational research framework to analyze and optimize routing flow in a general sense, which can be applied either for human movement and path selection of automobile cars under disaster conditions, or more efficient routing of the packets on the Internet. He also developed a model to simulate urban development considering the capacity of buildings in addition to the costs of commuting, business transferring, and uncomfortableness due to congestion, identified the equilibrium and optimum solution, and validated against observed data.

Global hydrology and world water resources group, led by Prof. Taikan Oki, contributed for assessing the potential impacts and possible adaptation for climate change, and estimating the mortality risks of the exposure for radiation through drinking water and food intakes caused by the accident at Fukushima Daiichi Nuclear Power Plant of Tokyo Electric Power Company associated with the Tsunami due to the 2011 off the Pacific coast of Tohoku (Great East-Japan) Earthquake. The Chao Phraya River in the central part of Thailand experienced a historical gigantic flood in 2011, as well. More than 800 factories in 7 industrial parks were submerged, and due to the destruction of supply chain, particularly the parts of automobile cars and hard disk drives, the economic impacts propagated to all over the world. The group carried out immediate survey during the flood, analyzing the situation and informing policy makers in Thailand on the possible alternatives to be taken.

We are proud of ourselves that we



could somehow contributed for real society when there were adverse and difficult situations, through promotion of academic researches by enduring efforts and dedications in harness.

However, it is too early to feel relieved. In September 2015, there was a historical flood in Kinuriver, a tributary of Tone-river, the biggest river basin in Japan. Even though extremely heavy rainfall was observed more than a day and serious situation was supposed by responsible agencies and experts. media reported serious Mass situation in real time, however, local municipal governments delayed or could not issue evacuation directives. People were watching the serious situation but did not evacuate beforehand. Unfortunately, there were several segments where flood overflew the river dyke and a break down occurred at a point. As a result, approximately 4,300 people were rescued by boats and helicopters. Approximately 6,500 houses were damaged and 10,000 people required evacuations.

Since INCEDE era, started in 1991, we have been trying to design, propose, and implement disaster mitigation systems consisting of both infrastructure and early warning systems. Looking at the case of Kinuriver flood, not a small portion of people still underestimate the risk of natural disaster and are overconfident of their security. The behavior may be called as "reverse gambling". Yes, the probability could be low enough to neglect, and most of the people continue wining the gamble for their lives, however, there are always certain number of people who hit the jackpot, under this context, which means they suffer and become unfortunates. How can we improve the situation even a little? We believe that we will also be able to contribute to answer this question through ICUS activities in coming another decade.

#### Research activities for Social Infrastructure Management Division

The social infrastructure management is one of three main

themes in ICUS. Importance and significance of the proper infrastructure management has been long recognized for the safe, resilient and comfortable urban life.

Associate Professor Nagai and Lecturer Matsumoto have developed advanced and detailed methodologies that of analysis of concrete structure, utilizing it to aim at efficient and economical construction method, to examine the current performance of existing structure and to propose suitable reinforcement technique.

Visiting Professor Yokota is one of prominent researchers in the infrastructure management in Japan. Based on his abundant practical experience, he has carried out research on the life cycle management of steel and concrete structures. The lifecycle management is a series of actions to assess the grade of deterioration and structural performance degradation by inspection, to predict the future progress of performance degradation, and to propose the appropriate remedial action based on lifecycle cost minimization or performance maximization under budget capping.

Visiting Professor Dobashi is an expert engineer in tunneling, working at Metropolitan Expressway Co. Ltd. He has been trying to develop the rational design methods for constructing large underground space, and the maintenance and management system for Metropolitan Expressway, considering various aspects including environmental protection, disaster mitigation, structural aging and so on.

Professor Kuwano is a researcher of geotechnical engineering, investigating long-term behavior of earth and buried structures, including road embankment, river levee, cut slope and buried lifeline systems in urban cities.

In general, evaluation of the performance of an existing structure is far more difficult compared to the design of a new structure. A proposal of appropriate reinforcement and/or renewal of an old degraded structure is also a tough challenge. Aging of urban cities in Japan have already progressed and various practical problems have actually revealed. Currently the practical problem advanced the research and we are trying to catch up with the problems. Other Asian countries will face to the similar situation to Japan sooner or later if no preparation is made. We hope that international collaborative activities such as SATREPS and SIP contribute to Asian cities.

Although the main concern for the members is constructing long-term sustainable infrastructure system, we realize that this issue is closely related to the natural disaster mitigation. The deteriorated infrastructure due to aging might fail catastrophically by or in case of earthquake or flooding, which may be the source of additional human casualties. Various issues are inter-connected and strong cooperation and communication is required to tackle these problems. We hope that our continuous efforts through ICUS activities as ever contribute to the safety of urban cities in Asia.

# ICUS will be born again to continue its activities

On April 1, 2016, ICUS will be reborn again. As the n-ICUS was established in April, 2011 with 5-year period, its period will be finished at the end of March, 2016.

According to the current IIS regulation, extension of period of research center is exceptionally accepted only once. But external review committee strongly recommended us to continue n-ICUS to carry out on-going several big research projects, to keep good relation between n-ICUS and many international and domestic research institutes, and not to stop great contribution for urban safety of the world and for international academic society. Responding the committee's such advice, we have decided to continue n-ICUS for another five years by our competitively obtained project money.

The n-ICUS will continue its activities aggressively henceforth too with the assistance and understanding of a large number of organizations and friends with whom it has worked jointly until now in various activities. We hope to receive their guidance and assistance as before.

### Kick-off meeting of Disaster Management Group

M. Numada, H. Gokon, T. Matsushita, K. Meguro U Ko Ko Gyi (MES), U San Kung (RRD), Dr. Toe Aung (YCDC), Prof. Khin Than Yu (YTU)

Disaster Management Group (DMG) of the SATREPS project started its activity starting from April 2016. Prof. Meguro, Dr. Numada, Dr. Gokon, and Ms. Matsushita visited Yangon Technological University (YTU) to have a kick-off meeting together with leaders of all six groups of SATREPS project from YTU as well as strategic partners in Myanmar.

#### **Kick-off meeting**

At the kick-off meeting held on the 12th of March, 2016, participants from Myanmar and Japan have shared the objectives of the project and its research approaches. Prof. Meguro gave a general introduction of the project and explained about the idea of disaster management system that will be developed by this project.

As for the schedule of the activities of DMG in 2016, the team will conduct workshops and interviews in order to get information on the roles and responsibilities during the disaster of various stakeholders at



Photo of Disaster Management Group members



Kick-off meeting of Disaster Management Group

township, national and international levels during the disaster.

In 2017, DMG will define the system design to build the Disaster Management System (DMS) according to the job descriptions of each stakeholder acquired through the activities in 2016.

Based on the system design developed in 2017, DMG will develop a prototype of DMS in 2018. In 2019, a prototype of DMS will expand its application to be used by the Research Center which will be established in YTU.

DMG will conduct interviews monthly or bi-monthly by visiting the ministries in Naypyidaw as well as townships in Central Business District (CBD) to find out the roles, responsibilities, and job descriptions of concerning organizations.

#### Lecture by Prof. Meguro at YTU

Prior to the kick-off meeting, Prof. Meguro gave two lectures on the Disaster Management to approximately 30 students and faculties from YTU on 12th of March, 2016.

The lecture provided a basic idea of a comprehensive disaster management cycle. The importance of how to manage mitigation and reduction of disaster risk was clearly explained with discussing total disaster management.

The disaster management matrix



Lecture by Prof. Meguro

was shown to compare the current conditions and ideal structures.

Ideas about disaster management manual, disaster imagination capacity, disaster response flows and information management were introduced and these ideas will support the discussion for promoting ideal or future disaster management system in Myanmar.

# 1<sup>st</sup> Workshop held on 5<sup>th</sup> of April, 2016

DMG will conduct its first workshop with stakeholders from city level (Yangon City Development Committee (YCDC)), national level (Ministries), and international level (UN/ NGO). The workshop will consist of two parts - seminar and group discussion. The seminar will include lectures by representative stakeholders to share information and understand the general condition of the current disaster management system in Myanmar. There will be a lecture by Japanese side to share the lessons learned from its experiences in Japan with international perspective. The group discussion will be made by all participants concerning disaster management to discuss several themes related to the roles and responsibilities as well as the current issues of disaster management to share among all stakeholders.

Over 20 ministries concerning disaster management will be invited to join this workshop. DMG will analyze the basic roles of the ministries as well as all concerning organizations in the disaster management in Myanmar as a final output of the activities in 2016.

### **Recent Activities of Water-related Disaster Group**

R.A. Acierto, A. Kodaka, T. Shimozono, Y. Tajima, A. Kawasaki, D. Komori (Tohoku University), N. Kohtake (Keio University), Win Win Zin (YTU)

The Water-related Disaster Group (WDG) has been actively carrying out a lot activities from last end of the fiscal year October 2015 to March 2016. Main activities include several workshops with stakeholders, tidal effect field surveys, and installation of observation system at the Zaung Tu Weir.

#### Workshops with Stakeholders

Various workshops have been facilitated by the WDG with the various stakeholders and experts on water-related disaster research. These workshops include "Waterrelated disaster management in the Bago River Basin" at Yangon Technological University (YTU) on 23<sup>rd</sup> of November 2015, "Workshop on Flood Disaster Reduction in Myanmar" at University of Tokyo on 29th of February 2016, and "Disaster Management System Design Workshop" at YTU on 7/8th of March 2016. These consecutive workshops were aimed to facilitate collaborative communication between stakeholders and experts in dealing with different aspects of the water-related disasters focused in the Bago River Basin through focused discussions on project implementation issues. and constant research progress updates. This creates a participatory and collaborative environment



Workshop at YTU

among the group in designing the water-related disaster management component of the SATREPS project. In addition, this frequent workshops facilitate continuous and active involvement among stakeholders and SATREPS project members.

#### **Tidal Effect Field Surveys**

The lower reach of the Bago River Basin is affected by the tidal fluctuations. The objective of the field surveys were to determine the impact of tidal fluctuations through field observations near the confluence of the Bago River and the Yangon River. The field measurements were also aimed for the development of tidal model. This is an initial step in the seamless model development for the Bago River Basin incorporating hydrologic modeling, flood inundation, and tidal effects. There were two field surveys conducted on 27<sup>th</sup> to 30<sup>th</sup> of October 2015, and 20th to 25th of February 2016. During the two field surveys, brief introduction and hands-on demonstration regarding the tidal effect observations were also given and led by Prof. Tajima and Dr. Shimozono to YTU representatives as a part of capacity building. These field surveys facilitate both procurement of in-situ observations necessary for model development and capacity building activity.

#### Zaung Tu Weir AWS

WDG's primary goal is to contribute in designing a disaster management system for waterrelated disasters in Myanmar, particularly for the Bago River Basin. To achieve this goal, part of this system includes installation of automatic observation and telemetry system at the Bago River Basin. The group plans to install a total of 5 weather stations and 2 to 3 water level gauging stations from 2016 to 2017. First installation of automatic weather station at Zaung Tu Weir was done on 22<sup>nd</sup> February 2016. The installation was led by Mr. Akira Kodaka with great support from Dr. Komori of Tohoku Before installation, University. lecture was given to stakeholders to introduce and discuss the components of the weather station and telemetry system. After the installation discussion on future installations for the telemetry system, data management issues were also facilitated.

WDG is currently procuring the equipment and in active collaboration with stakeholders to finalize implementation plans for future installation on other selected sites.



**Observation at Thilawa Port** 



Installation with Stakeholders

# Lectures and field study trip of geo-informatics group in Yangon, Myanmar

Wataru Takeuchi, Tanakorn Sritarapipat Sao Hone Pha (YTU), Tin Tin Aye (YTU) and Tu Aung (YCDC)

We are the group of Remote Sensing (RS) to do research about disaster risk in Yangon, Myanmar (the largest city and former capital of Myanmar). During 7-11 March 2016, we had an opportunity to visit Yangon, Myanmar as the field study trip. The objectives of this trip are to provide on-the-job training, to introduce our research, and to obtain the validating data.

On 7<sup>th</sup> March 2016, we gave lectures to students in Department of Civil and Architecture at Yangon Technological University (YTU), the premier engineering university of Myanmar, with cooperation with Dr. Sao Hone Pha. Dr. Takeuchi gave a lecture on the fundamental Photogrammetry and RS. Mr. Tanakorn introduced the example application of RS about Assessment of Land value and Disaster Risk in Urban Area in Yangon, Myanmar.

#### Taking group photo at YTU

On 8<sup>th</sup> March 2016, we also gave lectures to students in Department of Civil and Architecture at YTU. Dr. Takeuchi gave a lecture about how to measure the heights of the objects, such as a tree and a building, etc. by using smartphone applications. Mr. Tanakorn



Group photo with students and professors at YTU

introduced how to visualize the heights of the buildings in the 3D model by using QGIS.

#### Giving a lecture by Prof. Takeuchi at YTU

On 9<sup>th</sup> March 2016, we visited Yangon City Development Committee (YCDC), which is the administrative body of Yangon and discussed with Dr. Toe Aung. We introduced our research of Assessment of Land value and Disaster Risk in Urban Area in Yangon, Myanmar. We asked about the local information that is necessary to validate our research.



Lecture about how to measure the height by Prof. Takeuchi

# Visiting YCDC in Downtown areas Yangon

On 10<sup>th</sup> March 2016, Mr. Tanakorn attended the workshop for Water Management in the Bango River. The previous activities to evaluate water management in the Bango River were present. The current and ideal situations of water management in the Bango River were introduced also the steps to succeed in water management was discussed.

On 11<sup>th</sup> March 2016, Mr. Tanakorn attended the workshop for Disaster Risk Management in Myanmar. The fundamental of Disaster Risk Management was introduced. The actions and plans to reach the goals of disaster management was present.

For obtaining data for our research, for land value, the information of land price in Myanmar language was obtained. For flood risk, the historical flood events in urban areas were not provided. For earthquake risk, the heritage buildings in Yangon were obtained. The slope problem was recommended that the urban areas in Yangon do not have the slope problem. The seismic sensors to detect the earthquake were not provided.

In the study trip in Yangon, Myanmar, we can transfer some knowledge and experiences in the study field of RS to the students of YTU who are interested in RS. Then, we can share and learn each other about the research of RS among some professors in YTU and some staffs in YCDC. Also, we can get valuable data to validate our research results. Moreover, we have a chance to learn other aspects of the study fields relating to Myanmar from the other activities of the other groups.



YCDC in Downtown areas Yangon

### Annual report of infrastructure group in FY2015

#### Bv K. Matsumoto

The main activities of infrastructure group of the SATREPS Project in the fisical year 2015 were as follows.

#### **Development of bridge database**

Ministry of Construction (MOC) kindly gave us their bridge data sheets. We have translated them to English. From now on, lacking information, such as construction year, bridge location (lat/long), photos, etc. will be added and linked to the visualized map.

#### **Investigation of deteriorated** bridges

The investigation of deteriorated bridges was conducted on May and September in 2015, including Yangon area and Rakhine state.

Some bridges in Rakhine state have severe damage due to steel corrosion (Fig. 1), while damage to the bridges in Yangon region is often caused by the soft ground condition. It is reported that the movement of anchorages of Twantay bridge affects the tensioning of main cables and the main towers of the suspension bridge are inclined toward the mid span (Fig. 2(a)).

#### **Bridge monitoring**

We selected Twantay bridge for one of the targets of bridge monitaring. On 18th February, 2016, we set up an inclinometer on the main tower to measure the inclination (Fig. 2(b)). Continued monitoring of the inclination of the tower will be done

for coming one year at least.

#### **Investigation of ruptured bolts**

In Yadanarbon bridge (Mandaly) (Fig. 3(a)), after this bridge was constructed in 2008, over 6,000 hightension bolts have been ruptured as show in Fig. 3 (b) (as of Feb 2016). We tranferred the ruptured bolts to Japan and analyzed them (Fig. 3(c)). As a result, it was noticed that material characteristics of the bolts are not so bad, indicating that the environment of the bridge is the main factor of the bolt rupture. Form now on, we are aiming to propose an optimum maintenance scenario of this bridge by conducting futher investigations such as redundancy analyses.







0123456789401234567895 (b) Ruptured bolt



(a) Inclined main tower

Fig. 3: Investigation on rupture of high-tensioning bolts in Yadanarbon bridge



(c) 3D model for measuring inclination Fig. 2: Investigation and monitoring of the Twantay bridge



ICUS Newsletter Jan. to Mar. 2016

### Annual report of transportation group in FY2015

#### By Y. Sekimoto

The main activities of transportation group of the SATREPS Project in the fisical year 2015 were as follows.

#### Implementation of Real-time public bus trajectory data collection by GPS

By collaboration with Matatha (Yangon City transportation committee), we installed smartphones on public buses and collect bus locations, speeds, directions, etc. from remote server in real-time basics. A bus GPS data collection team in Yangon has been installating smart phone to individual bus (Figure a). 35 smart phones were already installed and 400 are planning to be installed within a year. We proposed a system

for geospatial data collection, analyzing, and development of end user applications to Myanmar.

#### Acquisition of MPT CDR data for human mobility studies

We received Call Detail Record (CDR) data from Myanmar Post and Telecommunication (MPT) and reconstructed into origin and destionation (OD) data of indivitual person movement in order to understand human mobility patterns in Yangon City (Figure b)

# Meetings wirth YTU and MPT members

Discussions were made with Yangon Technology University (YTU) and MPT members for further data acquisition, data policy, effective utilization, project collaboration and other research issues (Figure c). Students from YTU were also presented their destertations during the meeting (Figure d).

## Technical training and research tour for YTU members

We provided technical training and research tour (May 9-28, 2016) in Japan for four YTU members to handle geo Big Data (Person trip, bus GPS and MPT CDR) preprocessing and discussed disertation progress of two master students. The team also visited to traffic control center of NEXCO (Nippon Express Company Ltd.) and obserbed real-time traffic monitoring system and traffic accidents management in Japan (Figure e).



Figure: Transport group activities

(a) Smartphone installations and functional investigations; (b) Visualization of human mobility form MPT CDR data; (c) Discussion with YTU members; (d) YTU students present their dissertations; (e) Technical visit to traffic control center of NEXCO in Japan

### Annual report of Earthquake-related Disaster Group in FY2015

#### By T. Matsushita

In the fiscal year 2015, the Earthquake-related Disaster Group (EDG) has conducted activities, such as seminars, workshops, building surveys and inspection tours of heritage buildings and old infrastructure facilities from the colonial period. Participants included researchers, students and practitioners from Japan as well as YTU faculties and students, engineers, architects from Yangon City Development Committee (YCDC), Myanmar Engineering Society (MES), Association of Myanmar Architects (AMA) and Yangon Heritage Trust (YHT).



Seminar conducted at YTU in December 2015

In order to achieve the objectives of the EDG which is to construct a database and to make an earthquake vulnerability map of Yangon City by developing fragility curves, we started by investigating the availability of building and ground data, whether information, such as structural type, construction year, the number of stories, usage of buildings as well as soil type, exist and in what format they are if they are available. After discussing with counterpart and stragetic partners, we found out it is not easy to get such data mainly because they are not organized in a way that can be used readily or due to some restriction regarding the sharing of data. However, there are some useful data that are available, such as the report from JICA's project for the Strategic Urban Development Plan of the Greater Yangon conducted in 2013 and ongoing analysis of building height by Dr. Takeuchi of the Remotesensing and GIS Group.

Two seminars & workshops were conducted to share knowledge and deepen an understanding of the project objectives in order to promote active participation and information sharing, and also to discuss issues that may arise. The seminars were organized with lectures by both Japanese and Myanmar faculty members and they were followed by workshops to discuss earthquake disaster risk and urban planning issues with members from YTU, YCDC, MES and UN-Habitat.



Typical streetscape of Yangon's CBD with RC + brick buildings

Field surveys were conducted to investigate the building types in the Central Business District (CBD) and Yangon City. In December 2015, EDG team conducted an occular survey of approximately 100 buildings to find out the distribution of building types. According to the survey findings, the majority of the buildings in the surveyed area were RC + ramp with brick nfill masonry wall structure and that majority of such structures and those more than 7-story were built after 1981.

A trial survey using microtremor equipment was conducted to measure the dymawic properties of YTU campus buldings, commercial and residential buildings as well as some ground points.



Measuring microtremor at a development site in Yangon

Based on the activities and discussions with the couterpart, EDG members are now working in mainly three sections; 1) development of fragility curves, 2) urban planning and 3) heritage conservation and reuse with respective counterpart and involving students from YTU and related organizations.

### Annual report on activities of SIP project (FY2015)

By K. Matsumoto

SIP (Cross-ministerial Strategic Innovation Promotion Program) is a program steered by the Cabinet Office of Japanese Government. ICUS takes charge of international of "Infrastructure activities maintenance. renewal. and management." In this report, as the activities in the fisial year 2015, which is the second year of the project, following three activities are introduced.

#### Development of educational programs of engineers for infrastructure maintenance in Vietnam

To ahiceve an implematation of technologies of infrastructure management, which is the main purpose of the SIP project, not only elementary technologies but also rules and human resources are essential. Especially, demand of educational system in Vietnam is very high because of the significant increase of population as well as the rapid construction of infrastructure.

As the first step of the development of educational programs in Vietnam, we invited specialists of Vietnam and university professors to Japan and conduct a site visit tour of educational programs of engineers for infrastructure maintenance from 22<sup>nd</sup> to 24<sup>th</sup> June in 2015. Places of the site visit tour were Center for Advanced Engineering Structural Assessment and Research (CAESAR) in Public Works Research Institute (PWRI), N2U-Bridge in Nagoya University, E-MAC in Central Nippon Expressway and ME (Maintenance Experts) Trainning Program in Gifu University. After the participants Vietnam visited from and experienced each facility (Fig. 1), they well realized the significance of the educational program for infrastructure maintenance.

In the next stage, we are going to conduct activities for developing educational programs of engineers in Vietnam such that lectures of infrastructure maintenance will be installed to the curriculum of Vietnamese universities.

# SIP Special Session held in EASEC-14

On 7<sup>th</sup> January in 2016, with an aim to exchange information on infrastructure management between Japan and other countries, we organized SIP special sessions in the 14<sup>th</sup> East Asia-Pacific Conference on Structural Engineering and Construction (EASEC-14) in Ho Chi Minh City, Vietnam.

Table 1 shows a list of the presentations given in the special sessions. A total of 13 presentations were given from the SIP project "Infrastructure maintenance, renewal, and management." Latest technologies on inspections, life elongation, life prediction, management, etc. were explained and diligent discussions were made by the audiences from each country (Fig. 2).



(a) CAESAR



(c) E-Mac



(b) N2U-Bridge



Fig. 1: Site visit tour of educational programs of engineers for infrastructure maintenance



(a) Presentation by Prof. Iwaki of Nihon University



(b) Question from audience Fig. 2: SIP Special Session in EASEC-14

#### Table 1: Presentations in SIP Special Session

Title	Presenter
In-situ none-destructive evaluation system for PC structures using X-ray and neutron sources	Y. Oshima (PWRI)
Development of remote monitoring system for concrete structure with high-sensitive near-infrared spectroscopy	K. Tsuno (TME)
Corrosion resistant steel in concrete under high chloride environment	T. Nishimura (NIMS)
Deformation measurement and damage detection of structural material by Moire method using digital camera	S. Kishimoto (NIMS)
A method of response-based road profile estimation using multiple observables	B.Y. Zhao (UTokyo)
Development of technologies on a wide variety of data: processing, storage, analysis and applications to achieve advanced infrastructure management	T. Matsuzaka (NEXCO East)
Hammering-test system for bridge/tunnel inspection using flying robot	T. Wojtara (ACSL)
Development of a bridge inspection support robot system that uses a two-wheeled quad-rotor helicopter	M. Nakao (Fujitsu)
Experimental study on fatigue durability of RC road bridge decks subjected to chloride induced deterioration or ASR	I. Iwaki (Nihon Univ.)
The alkali-silica reactivity of volcanic aggregates and its preventive measure using fine fly ash	K. Torii (Kanazawa Univ.)
Scenario designs from preemptive maintenance to preventive maintenance for aging concrete bridges with chloride attack	S. Miyazato (Kanazawa Institute of Technology)
Tunnel inspection technology using rapidly scannable non-contact radar	R. Yasuda (Pacific Consult.)
Practical application of precast concrete member with super-high durability concrete	T. Avano (Okavama Univ.)



(a) Presentation from MPWT



(b) Presentation from ITC (c) Fig. 3: Presentations in the 3rd SIP International Seminar



### (c) Fully occupied seats by audiences



(a) Rebar inspection

#### The 3<sup>rd</sup> SIP Interntional Seminar in Phnom Penh, Cambodia

We organized and held the 3rd SIP International Seminar on Infrastructure Asset Management on 1st and 2nd March in 2016 in Phnom Penh, Cambodia. The seminar composed of presentations conducted in Institute of Technology of Cambodia (ITC) on the first day and demonstration tour of inspections at real bridges on the second day. On the first day, presentations from Ministry of Public Works and Transportation (MPWT) in Cambodia and ITC were given as well as the presentations by Dr. Nagai (ICUS), Prof. Yokota



(b) Inspection by using fiberscope Fig. 4: Demonstration tour of bridge inspection

of Hokkaido Univ. (former ICUS member) and Mr. Narisawa of Tokyo Metropolitan Expressway (TME) (Fig. 3). Total number of audiences in this seminar exceeded 200 persons. We noticed the high motivations of people in Cambodia for infrastructure maintenance.

On the second day, over 30 people participated in the demonstration tour. Basic equipment for bridge inspection in Japan, rebar inspection by using electromagnetic radar (Fig. 4(a), visual inspection of narrow space by using fiberscope (Fig. 4(b)), high-place inspection by using pole camera, and remote inspection by using drone (multicopter) (Fig. 4(c)) were demonstrated. The



(c) Inspection by using drone

participants were highly interested. Continued questions were made from the participants during the demonstrations.

Thus, we could successfully hold the  $3^{rd}$  SIP seminar. Especially, the demonstration tour conducted on the  $2^{nd}$  day could be a benchmark in our activity in the future. We would like to conduct similar events in each country if we have such an opportunity.

We appreciate Metropolitan Expressway Co. Ltd. and Metroplitan Expressway Engineering Co. Ltd. for their supporting the demonstration tour.

#### Editor's note...

This is the last paper printed ICUS Newsletter. From the next volume, ICUS Newsletter will be put ICUS website only.

With a strong support and understanding by international and domestic research institutes and friends, ICUS has been actively working to achieve its goal for the last 15 years. ICUS was established on April 1, 2001 as a successor research center of International Center for Disaster-Mitigation Engineering (INCEDE) and was reborn as n-ICUS and restarted its activities on April 1, 2011 with five-year term.

According to the current IIS regulation, extending the term of

research center is allowed only once as an exception. However, the external review committee strongly recommended that n-ICUS shall continue to sustain good relationships among n-ICUS and many research institutes both national and international societies and not to stop contributing urban safety of the world. Responding the committee's advice, n-ICUS has decided to continue its activities for another five years with competitively obtained research project fund, such as SATREPS and SIP whose activities are introduced in the volume. The SATREPS stands for Science and Technology Research Partnership for Sustainable Development and it is supported by Japan International Agency and Japan Science and Technology Agency. The SIP stands for Cross-ministerial Strategic Innovation Promotion Program and it is supported by Cabinet Office of Government of Japan. We plan to report regularly the activities of SATREPS and SIP in ICUS web site.

The n-ICUS will continue its activities aggressively henceforth too with the assistance and understanding of many supporting organizations and friends with whom it has worked jointly in various activities. We hope to continue to receive their guidance and assistance as before.

#### by K. Meguro

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