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

Retrospective overview of advances of liquefaction studies since the 1964 Niigata earthquake

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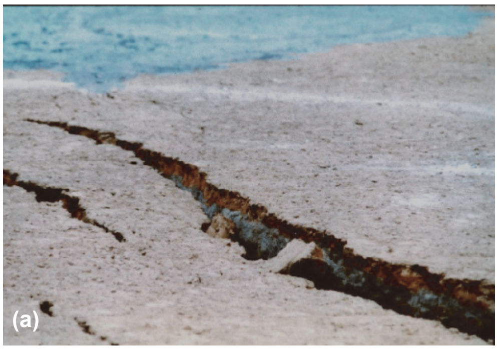
In the pit excavation of archeological studies, traces of sand-packed fissures are often found running vertically through the near-surface soil deposits. These are considered as evidence of liquefaction in ancient era and generally cited as paleo-liquefaction. In many old Japanese documents describing disastrous damage due to historical large earthquakes, more often than not, there are statements about the destruction of the ground such as openings or offsets of the ground surface and massive movements of soils or rocks, accompanied by spurting and inundation of muddy soils. These



(a) Cracks caused by a seismic ground motion (after 10 to 20 seconds)
(b) Sand boiling and liquefaction (after 20 to 60 seconds)
(c) Formation of sand boiling opening after expansion of the sand and water (after 60 to 180 seconds)
(by Mr. Morimura, Minehamahanawa, Yamamoto-gun, Akita,, 1983 Middle Japan Sea earthquake.)

descriptions are historical evidences apparently indicating the occurrence of liquefaction.

Evidence of liquefaction, as mentioned above, have simply been the observation and recognition of the phenomenon. Extensive occurrence of ground damage at the time of the 1947 Fukui earthquake (M=7.1) in Japan was probably the first occasion where liquefaction was recognized as an issue of engineering importance. The site of devastation was traversed by Professor T. Mogami of the University of Tokyo. After performing simple tests in the laboratory, he identified acceleration as being a primary factor associated with the triggering of liquefaction.

Afterwards, the sand-rich city of Niigata was devastated vastly in the 1964 earthquake (M=7.5) predominantly by the widespread occurrence of liquefaction. One of the notable features of the destruction was the damage to large-scale infrastructures such as bridges, ports, harbors, buildings, oil storage tanks and gymnastic stadium. These infra-facilities were all new and modern having been constructed over the last 10-15 years preceding the earthquake. In fact, there had been a big fire in the 1950's blazing the area of the city center. Backed by the motivation to modernize the city, restoration work had been carried out for implementation of infra-facilities based upon update design and technology, and this renovation work had been finished by 1964.

The city of Niigata had developed historically over the medieval era as a harbor city at the mouth of the large Shinano River. The means of traffic was, thus, small ships or canoes crosswise traversing in the network of small canals or waterways within the city. Along with the advent of motorization after World War II, the waterways were buried by dumping sandy soils and transformed into roads. Thus, the major parts of the city were potentially made up of man-made fills composed of sandy soils, which prevails over the downstream area of the Shinano River.

The Niigata earthquake indeed was an unprecedented event and a great surprise for the engineering community. It was, in fact, the first-ever event to make geotechnical and seismic engineers keenly aware of the importance of liquefaction during earthquakes. In cognizance of the potential threat for the safety and integrity of structures and properties, extensive soil investigations got off to a start immediately in the devastated city area primarily by means of the Standard Penetration Test (SPT). Outcomes of the efforts in this early period are reported in the Journal of Japanese Geotechnical Society, Soils and Foundations. Professionals in the United States. showed much interest as well. Some important works were performed by Seed and Idriss in 1969 indicating how liquefaction can be reproduced in laboratory tests and what main factors influence the triggering of liquefaction. It was also shown how the occurrence or non-occurrence of liquefaction can be identified through the use of the SPT N-value.

In Japan, significant efforts were made towards studying various factors influencing the triggering of liquefaction. Effects of irregular loads and initial shear stresses were among those investigated by means of several kinds of tests apparatus. The attempts in Japan were focused mainly on the conduct of laboratory tests on undisturbed samples. Extensive studies were also made to exploit an in-situ technique to recover undisturbed intact samples of sandy soils from loose deposits below the ground water table. Various ground freezing techniques were explored and multiple series of tests were performed on undisturbed samples primarily using the cyclic triaxial test apparatus. The outcome of these efforts in the formative period was integrated for the first time in the Japanese Code of Bridge Design 1972. It should be noted that the urgency to put it into the public code came from the experience of devastating damage to large public bridges in Niigata. Afterwards, several public organizations in Japan came up with the incorporation of items of liquefaction in their respective codes of design.

In addition to the triggering of liquefaction, no less important are the factors influencing the level of damage to the ground which is a consequence of liquefaction. The simplest among these would be the settlement of flat grounds due to dissipation of excess pore water pressures. This is, however, influenced by the degree of disturbance incurred to soils by the shaking during earthquakes. More difficult would be the assessment of lateral spreading, which could occur in sloping ground or at sites where there is an offset in elevation such as retaining structures at waterfront. Simple methods to this end are still a matter yet to be explored.

When assessing liquefaction resistance of in-situ sandy soils it has been a routine practice to make use of the penetration resistance such as SPT N-value and qc-value in cone penetration. Efforts for establishing empirical relations have been made in the United States mainly by drawing upon what is called performance-based methodology. It would be a realistic method but its application may be limited to identification of liquefaction at shallow depths as it is based on evidence manifested on the ground surface. In contrast, advances in Japan have been based on the results of laboratory tests on undisturbed soil samples. Much improvement has been made since the 1970's towards recovering high-quality undisturbed samples from deposits of sandy soils and also for improving test equipment in laboratories.

In the United States, another effort has been made to collect in-situ values of shear wave propagation Velocity, and to establish its correlation with the cyclic strength determined by the performance-based method. There are, however, some concerns about the appropriateness of this kind of correlation, because while the cyclic strength is associated with the dilatancy manifested with medium to large strains, the shear wave propagation Velocity is related with very small strains.

There have been great efforts expended for developing constitutive models for formulating deformation characteristics of cohesionless soils. It is noteworthy that the endeavor in this direction was instigated by the recognition of the importance of liquefaction. Several schools of thought have emerged. Although variable in details, the basic tenets upon which the constitutive laws are established are the same in principle, that is, stress-dilatancy relation (flow rule) and hardening rule.

In the course of overarching advances as outlined above, there have been several large-scale earthquakes in the world which enhanced motivation of studies continuously. These events gradually instigated interest and widen concerns amongst geotechnical engineers. New problems were unearthed. which are considered locally inherent.

The earthquake on January 14, 1978 (M=7.0), which occurred off Izu Peninsula about 150km southeast of Tokyo, caused breach of a tailing dam at the top of the mountain and released a large amount of liquefied tailings, which ran down the valley and contaminated a river channel. The tailing deposits from a silver and gold mine consisted of rock flour containing more than 70 % fines and had been thought to be free from liquefaction. This event was the first time that non-plastic fines such as rock flour was found to be susceptible to liquefaction.

At the time of the Nipponkai-Chubu Earthquake (M=7.7) that occurred in 1983 off the coast of the northern part of Japan Mainland, the lateral spread over the wide area and breach of low-height dams in the agricultural area were among new features of the ground damage caused by liquefaction. Silty sands containing fines were found as well to induce liquefaction. From around the mid-1980's, sands with low plastic fines have, thus, become important issues of concern for evaluating liquefaction resistance. While there were several large earthquakes in Japan since then, the most drastic was the Kobe Earthquake (M=7.3) in 1995. The shaking was remarkably strong with recorded accelerations as intense as 800 gals. Man-made islands reclaimed in 1960-1970 with disintegrated granite were vastly devastated by liquefaction and consequent lateral spread. The liquefaction of the soils composed of a potpourri of silt, sand and gravel developed violently and consequently lateral spread caused seaward movements of large caissons at the waterfront, paralyzing the operation of harbor works. It was again recognized that the materials derived from weathered rocks containing 30-50 % of non-plastic fines could cause liquefaction if they undergo violent shaking with a peak acceleration as high as 700-800 gals. Interaction of laterally spreading soils and underground structures such as caissons and piles was addressed as a new challenge in the geotechnical engineering.

The Alaska earthquake in 1964 (M=9.2) and San Fernando earthquake in California in 1971 (M=6.6) were among the big events in the United States, which brought about large-scale landslides in the coastal area and movements of earth dams to the verge of complete failure, which were identified as being caused by liquefaction of sands in man-made or Pleistocene deposits. These events instigated grave concern among geotechnical engineers and comprehensive efforts have been made to study factors under which liquefaction is triggered and conditions in which its effect could influence on the level of damage.

In Europe, a series of events such as the Vrancea earthquake (M=7.2) in 1977 in Romania, the Monta Negro earthquake (M=7.2) in 1974 in ex-Yugoslavia and the Irpinia earthquake (M=6.5) in south Italy in 1980 seem to be the major quakes making geotechnical engineers aware of the importance of liquefaction.

The largest event ever encountered in recent times was the East-Japan earthquake on March 11, 2011 with a magnitude of M=9.0. The novel issues in the technical aspect were: (1) effects of long-duration motions on liquefaction, (2) easier susceptibility of man-made or man-reformed lands and (3) vulnerability of sandy silts containing fines as much as 70~80 %. On the social aspect, deleterious effects were manifested pronouncedly on privately owned houses or small facilities. There was practically no damage to public infrastructures, which had been designed in accordance to the design code. It had been practically difficult, however, to implement requirements of liquefaction code for vast areas of reclaimed lands. Thus, private houses built in these man-made lands had been left out of the code requirements of liquefaction mainly because of the cost for soil stabilization. Thus, it may be mentioned that the liquefaction code started to be implemented first in the design of public infrastructures such as bridges, storage tanks in the water-front areas. It has gradually penetrated into large underground structures such as utility tunnels and car-parking. The last facilities, which had been left untouched, were the private houses. Because of the tens of thousands of owners, this issue has created law suits. This trend created an urgent need for firming up of the forensic aspect in the realm of geotechnical engineering.

Earthquake-related geotechnics has evolved through bitter experiences from one event after another, thereby identifying new problems inherent to local circumstances. In this sense, earthquake engineering is typically cited as "experience engineering". Thus, it is very important in field investigations after earthquakes to make efforts to find out new problems not yet identified and address them properly as new subjects for further studies.

In the course of bitter experiences and many efforts for studies over the last 50 years, a large group was formed in the community of geotechnical engineers. One of the major moves in this context was the proposal from the Japanese Geotechnical Society (JGS) to form a technical committee in the International Society of Soil Mechanics and Foundation Engineering (ISSMFE). This proposal was officially approved in 1989 at the time of the 10th ISSMFE held in Rio de Janeiro, as a Technical Committee 4. This activity grew into the periodical holding of the International Conference on Earthquake Geotechnical Engineering every 4 years. The first inaugural conference was held in Tokyo in 1995. It was followed by the 2nd one (1999) in Lisbon, the third (2003) in San Francisco, the fourth (2007) in Thessaloniki, Greece, and the fifth (2011) in Santiago, Chile. The success of the conferences established the place of geotechnical engineering in the practice throughout the world.

There is no doubt that the expertise of the geotechnical earthquake engineering will survive for ever and continue being active. It is hoped that these activities will be incorporated in the design and conduce to mitigating the ground damage and consequent social distress during large earthquakes in future.

Radial cracks at a flat depression

Springs at circular depressions in Rosarno

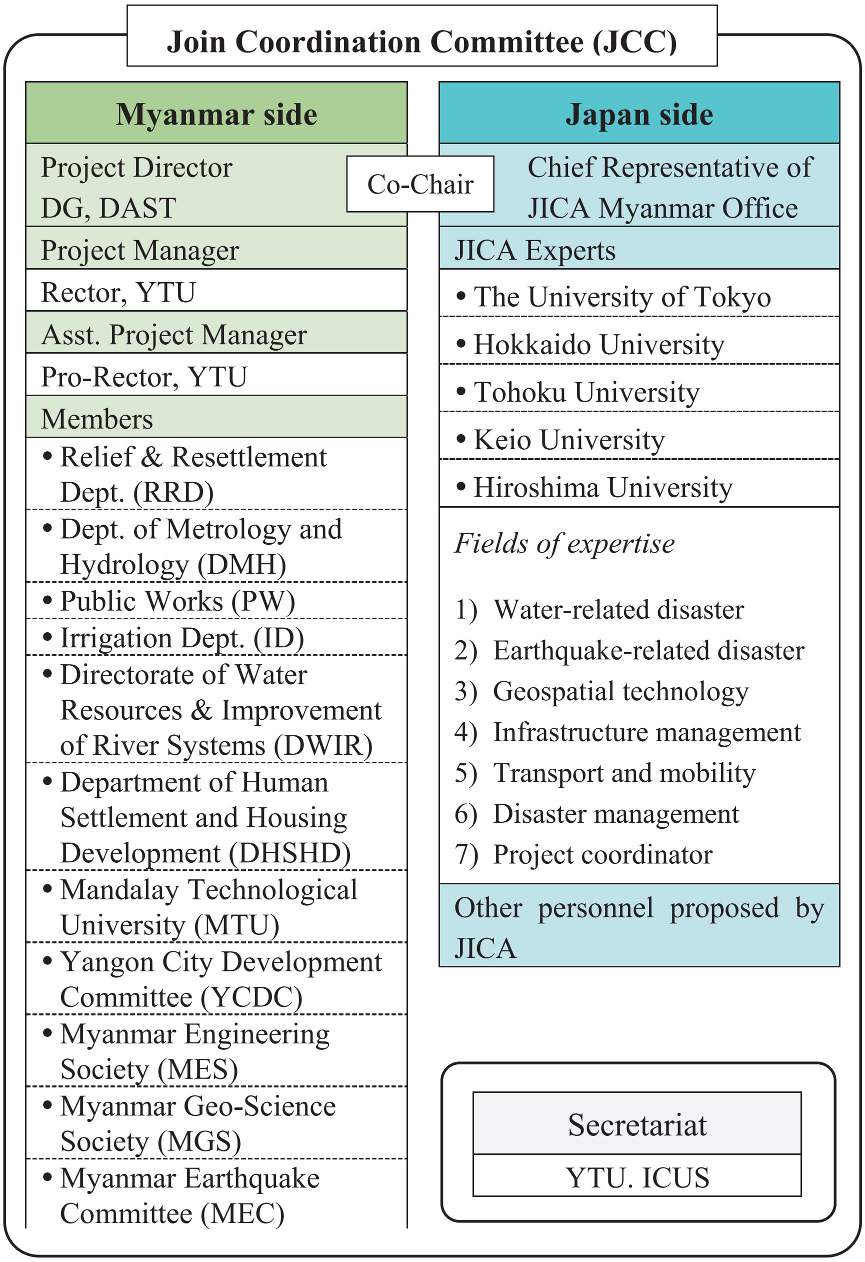
Source: "Earthquakes at Calabria Sicilia in 18th century" by Domenico Carbone Grio, Barbaro Inc., 1884 (first edition), 1999 (reprint)

SATREPS keeps moving forward to be officially launched

As we announced in ICUS Newsletter Vol. 14-1, ICUS has been forwarding a process for Science and Technology Research Partnership for Sustainable Development (SATREPS) to be launched officially from April 2015. In July 2014 at Nay Pyi Taw, Myanmar, project members made a courtesy visit to H.E. Dr. Ko Ko Oo, Union Minister of Ministry of Science and Technology (MOST) to ask for future cooperation on the project as a supervisory organization from Myanmar. U Kyaw Zwa Soe, Director General (DG) of the Department of Advanced Science and Technology (DAST), project director from Myanmar, also accompanied the visit.

Subsequently, a Detailed Planning Survey Team (the Team) consisting of ICUS members, Japan International Cooperation Agency (JICA), The Japan Science and Technology Agency (JST), and a consultancy company, visited Myanmar from September 14 to 27, 2014. During this visit, the Team had a series of discussions with Myanmar counterparts on the mutual views of the project. In addition, the team also visited Embassy of Japan in Myanmar and JICA Myanmar Office to discuss the detailed project implementation plan and to ask their cooperation and coordination with governmental organizations and other institutions in Myanmar. As a result of the visit, the Team successfully signed a Minutes of Meeting (M/M) with DG, DAST and Prof. Dr. Aye Myint, Rector of Yangon Technological University (YTU). M/M is an agreement in principal to sign a Record of Discussion (R/D), final agreement between Myanmar and Japan to implement the project. M/M includes a draft of the R/D, administrative framework, necessary machinery and equipment, and the main contents of the project as attached documents being understood by the both countries. Moreover, a Joint Coordination Committee (JCC) will be held in order to facilitate inter-organizational coordination of the project. Tentative JCC's members are shown in the following chart.

In the next stage, a final version



Project organization chart

Discussion with DG of DAST, U Kyaw Zwa Soe,
project director of Myanmar side (second from right)

Courtesy visit to Union Minister of MOST,
H.E. Dr. Ko Ko Oo (right)

of the R/D will be prepared by JICA based on the discussion made with relevant organizations during the team visit and agreements under M/M and submitted to DAST to be signed by the DG, and Rector of YTU.

On the other hand, ICUS and YTU have also been discussing the establishment of a contract called Collaborative Research Arrangement (CRA) between the two universities under the JST scheme other than R/D since SATREPS is a research collaboration project. Draft of CRA is temporary agreed by SYG U Nyi Hla Nge, Chairman of Steering Committee of Center of Excellence and YTU. Now CRA is under processing to be approved by Myanmar government.

Thanks to the efforts of all members and relevant organizations involved in this project, we are steadily making strides forward to the official kick off of SATREPS in 2015. We are very much looking forward to announcing the official acceptance of the project in the near future. We will keep you updated about this aspect.

SYG U Nyi Hla Nge (Center), and project members

What should we do for a bicycle-friendly city?

Y. Honma

As methods of transportation in sustainable society, lots of new systems such as electric vehicle, fuel cell vehicle, and personal mobility vehicle are proposed. Nevertheless, the most reasonable and earth-friendly system is still a "bicycle".

Amsterdam is one of the world's most famous "bicycle-friendly city". There are enough equipments available such as bike lanes and signals. Today, according to statistical data, nearly 30% of all trips are made by bicycle. A bicycle system is absolutely necessary for Amsterdam citizens.

Meanwhile, during a two-day study trip, plenty of problems related to the bicycle system were still observed in Amsterdam. Photos 1 and 2 show many abandoned bicycles at central station and canal-side. It indicates that Amsterdam also has a serious bicycle-parking space problem. Photos 3 and 4 show citizens nearly run over by a tram and a car, and similar scenes were often observed during the trip.

Even in a "bicycle-developed country", it is quite important to prepare both hard-infrastructure such as bicycle-parking spaces and soft-infrastructure such as transportation rules.

Photo 1 Abandoned bicycles at central station

Photo 2 Abandoned bicycles at canal-side

Photo 3 Citizens nearly run over by a tram

Photo 4 Citizens nearly run over by a car

BNUS: Fire risk assesiment in Old Dhaka

Fire Risk Assessment in Old Dhaka

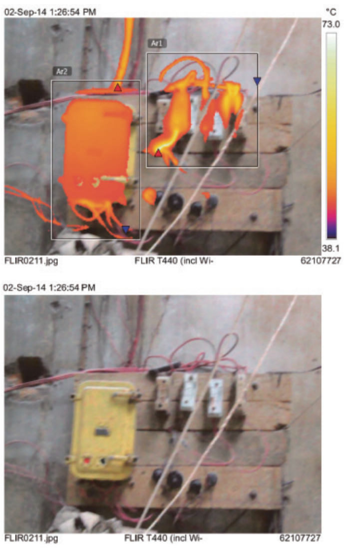
Fire incidence is increasing all over Bangladesh particularly in Old Dhaka and is occurring mainly in the factories or godowns. The main causes of such frequent fire incidences are rapid unplanned urbanization and the absence of adequate safety measures. There are other underlying reasons responsible for such frequent fire incidents in Old Dhaka.

Firefighting is a very important job, but fire prevention is more crucial. In general, we always think

Measurements		°C
Ar1	Max	72.7
	Min	39.3
	Average	43.8
Ar2	Max	53.3
	Min	40.2
	Average	44.4

Parameters	
Emissivity	0.95
Refl.temp	20℃
Distance	3.3ft
Atmospheric temp.	20℃
Ext. Optics temp.	20℃
Ext. Optics trans.	1
Relative humidity	50%

Geolocation	
Compass	S

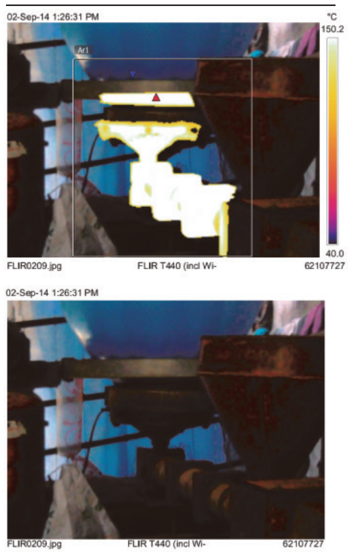


A defective fuse

Measurements		°C
Ar1	Max	150.2
	Min	42.1
	Average	85.0

Parameters	
Emissivity	0.95
Refl.temp	20℃
Distance	3.3ft
Atmospheric temp.	20℃
Ext. Optics temp.	20℃
Ext. Optics trans.	1
Relative humidity	50%

Geolocation	
Compass	E



A Heat generation from a machine

about fire protection equipment and the use of firefighting tools and neglect the importance of practicing fire preventive measures to prevent an actual fire accident from happening. The purpose of the Fire Prevention Plan is to eliminate the causes of fire and to prevent loss of life and property by fire. The Fire Prevention Plan is required to be prepared for Old Dhaka. However, for the preparation of a successful fire prevention plan, understanding of the causes of fire is very important. This study aims at finding out the causes of fire incidents in Old Dhaka, mainly in buildings with small-scale industrial occupancy i.e. factories, godowns, welding shops etc., where machineries are used and different material are stored.

Methodology of the Study

The reasons behind fire hazards in the small-scale industrial buildings of Old Dhaka can be assessed by identification and observation of the sources of fire hazard i.e. ignition sources, fuel and oxygen, assessment of structural condition, and identification and observation of availability of safety measures. Considering these factors, the methodology for fire hazard assessment is developed involving both a questionnaire survey and visual assessment. The assessment process is divided into five segments as follows.

Ignition Sources: Electrical conditions, condition of mechanical equipments, hot works and smoking condition will be assessed. To detect unsafe electrical and mechanical conditions thermal images will be used, which detect faults through thermal radiation i.e. temperature difference. Left figure above shows a thermal image detecting defective fuse in a plastic factory in Old Dhaka and Right figure above shows a thermal image detecting heat generation from machine in a plastic factory in Old Dhaka.

Fuel Sources: Condition and storage of combustible materials, flammable materials and accelerants will be assessed.

Oxygen Sources: Condition of ventilation and air circular system will be assessed for the oxygen source.

Structural Condition: Structural conditions i.e. building material, conditions of wall, roof, exit door, stair will be assessed.

Safety Measures: Safety measures i.e. width of access road for the access of firefighting vehicle, availability of firefighting system and water source, etc. will be assessed.

Based on the findings of the study, the Fire Prevention Plan can be developed for the small-scale industrial buildings of Old Dhaka to avoid any fire or explosion risks by eliminating either the potential ignition sources or potential fuel sources, or both. However, it is not possible to eliminate all the sources, so strategies can be developed to reduce fuel loads, eliminate ignition sources or prevent the fuel/ignition interaction by keeping potential ignition sources apart from potential fuel, then fire loss and human death and injury can be reduced.

Field survey of debris flow in Hiroshima city

M. Numada and Jo Inaba

On August 20, 2014, a devastating debris flow occurred in Hiroshima, Japan. 74 people were killed by this destructive debris. Several stakeholders such as governments, from national to local levels, and NPO, etc. responded. On September 19, 2014, around 800 policemem were searching for the last missing person, who was found on the following day.

Effective initial response is important to save human life, prevent secondary disasters and recovery and reconstruction of the damaged area. However, it is difficult for the disaster headquarters to conduct effective initial operations at a municipal level. For this debris flow, effective early warning was not provided by Hiroshima city , thus, quick responses were not done.

We surveyed initial responses to this disaster to clarify the total initial responses for establishing the standard initial responses to achieve the effective initial responses.

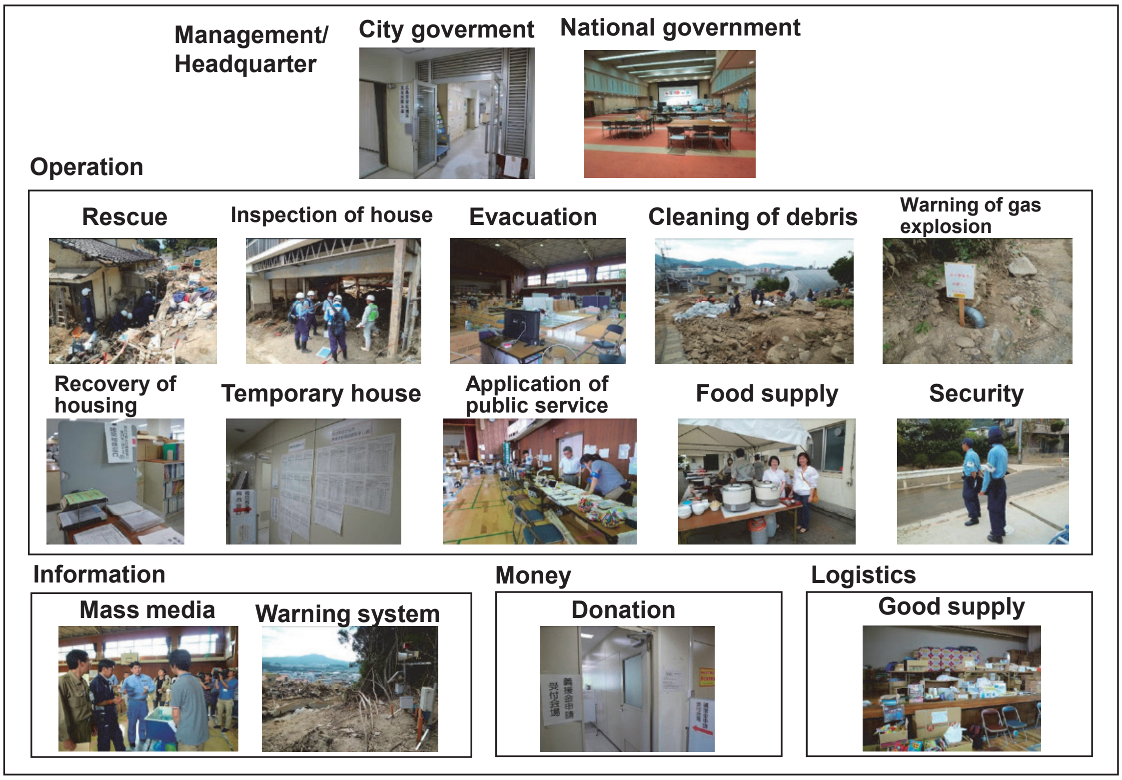
The structure of initial responses can be categorized as management, operation, information, money (law) and logistics as shown in the figure below.

Two main headquarters were established in the damaged area by the national government and Hiroshima city. The actions of the first response, on a municipal level, were based according to the Disaster Basic Act. The government decided the necessary support by governmental resources immediately after the disaster. The headquarters of the government managed the rescue of missing persons, the cleaning of debris, quick inspection of damaged houses, setting up of wire sensor to detect warnings of secondary debris flows, etc. On the other hand, the headquarters of Hiroshima city managed evacuation facilities, recovery of house, temporary housing, food supply, mass media report, donation, etc.

Details of initial responses were is analyzed by Hiroshima city. However, so far we have not described the total initial responses and, therefore, we will continue to survey the total disaster responses and how the decision makings for many kinds of disaster responses were conducted by each stakeholder and how information were shared between two headquarters.

To make a standard disaster responses system, it is necessary to compare the disaster response at Hiroshima to that at Oshima Island in Tokyo to the debris flow on October 16, 2013.

Structure of initial responses



Categorized initial responses

Site visit of bridge inspection of Tokyo Metropolitan Expressway

ICUS members visited a bridge inspection site of Tokyo Metropolitan Expressway on 29th July 2014. Deterioration of the infrastructure and its maintenance became a serious problem in Japan since many infrastructures were constructed during the high economic growth period, 1950s-1970s. Tokyo Metropolitan Expressway is also facing this challenge and conducting various countermeasures. ICUS members visited the inspection site at Maihama Bridge, which is a steel girder bridge. Several inspection techniques were performed including steel painting fracture check test, concrete hammering test, magnetic-particle testing to find steel fatigue cracks, and camera scope method for narrow space, etc. Although the latest technologies are applied for efficient maintenance of damaged infrastructures, automation of inspection is still difficult and detailed inspection by skilled inspectors is the most important method because the structural system of bridges are complex.

Partially corroded steel girder

Camera scope

Group photo

The 29th ICUS Open Lecture on "Research on Nuclear Emergency Preparedness System"

The 29th ICUS Open Lecture was held on September 3, 2014 at IIS Convention hall. Firstly, Mr. Ohba, project researcher at IIS, gave a lecture about the findings of the research project titled "Initiatives for Atomic Energy Basic and Generic Strategic Research" supported by the Ministry of Education, Culture, Sports, Science and Technology. And, Mr. Saito, Technical Advisor, Radiation Protection Department, the Secretariat of the Nuclear Regulation Authority, presented the nuclear disaster prevention plan including future research trends of the emergency response system. Lastly, Professor Meguro, Director of ICUS, presented the research outcomes on effective disaster management planning and implementation against natural disasters.

About 60 participants, from various fields who are mostly relevant to nuclear emergency preparedness including electric power companies and research institutes, attended the Open Lecture. A social gathering was also held after the lecture. Further ideas and opinions about the topic were discussed in a friendly atmosphere.

Dr. Ryoji Ohba

Mr. Minoru Saito

Prof. Kimiro Meguro

Welcome to ICUS

By Prof. Kimiro Meguro

ICUS welcomes Mr. Akira Kodaka from 1st July 2014 as a project researcher. He received his master degree of Engineering from Asian Institute of Technology in 2010. He had been working in local NPO at rural mountainous area in Thailand for 3 years, and has been active in research on public warning using a mobile phones for local communities in the area using mobile phones. We expect him to contribute to our international activities especially the SATREPS project in Myanmar.

ICUS Activities July-September

Travel to abroad

Date	Name	Country	City	Purpose	
Jul. 13-20	Dr. Honma	Spain	Barcelona	Conference	IFORS 2014
Jul. 15-20	Dr. Nagai	Australia	Melbourne	Conference	International Conference on Infrastructure Failures and Consequences (ICIFC2014)
Jul. 23- 28 **Jul.24-25**	Prof. Meguro Dr. Nagai	Myanmar	Yangon/ NayPyi Tai	Meeting	JICA-JST SATREPS project
Jul. 30-Aug. 1	Dr. Nagai	Thailand	Bangkok	Meeting	YRGS
Aug. 20-23	Dr. Nagai	Myanmar	Yangon/ Nay Pyi Tai	Meeting	JICA-JST SATREPS project
Aug. 20-23	Dr. Numada	Chinese Taipei	Taipei	Conference	2014 Society for Risk Analysis – Asian Conference
Aug. 21-24	Dr. T. Kato	China	Chengdu	Lecture	The Disaster Recovery Infrastructure Rebuilding Workshop Project
Sep. 2-9	Dr. Honma	Germany	Aachen/	Conference	OR 2014
		Netherlands	Amsterdam	Research	Research for sustainable society
Sep. 14-21	Prof. Meguro	Myanmar	Yangon/ Nay Pyi Tai	Meeting	JICA-JST SATREPS project
Sep. 16-21	Dr. Nagai	Myanmar	Yangon/ Nay Pyi Tai	Meeting	JICA-JST SATREPS project

Title of graduated students

Lab.	Name	Grade	Title
Meguro	Dar Adnan Mahmood	Master	Experimental study on reduction of PP-band Mesh connectivity for effective seismic retrofitting of brick masonry house
Kuwano	Abilash Pokhrel	Master	Development of large size disk transducer to evaluate elastic properties of coarse granular
Kuwano	Nguyen Ngoc Duyen	Master	The effect of partly loosened backfill to the behavior of buried flexible pipe
T. Kato	Shusuke Matsubara	Master	Constructing a framework for pre-planning for disaster recovery through cross-sectional engagement within the municipal organizations -validating the potential of the cross-sectional framework-

USMCA 2015: Oct. 29–31, Kathmandu, Nepal

The 14th International Symposium on New Technologies for Urban Safety of Mega Cities in Asia (USMCA 2015) will be held in Kathmandu, Nepal on **October 29-31, 2015**.

Tentative Schedule Day 1

Opening Ceremony
Plenary: Keynotes
Sessions
Poster Sessions: continuous
Conference Dinner& Cultural Program

Tentative Schedule Day 2

Sessions
Posters
Plenary Session
Closing Ceremony

Tentative Schedule Day 3
Field Visit

1, Earthquake Walk
2. Kathmandu Durbar Aquare
3. City Core asrea and so on

Editor's note...

It is 50 years since the 1964 Niigata earthquake. Since then, as described in the main article, liquefaction studies progress significantly. However, in spite of years' efforts, a newly happened earthquake would still make us recognise a new problem. Interaction between human beings and natural disasters seems to be endless.

We had a lot of rain in the summer of 2014, due to persistent rain front and visits of typhoons. The precipitation of western part of Japan in August recorded a maximum in the observation history. Heavy concentrated rain caused inundation and landslide in various areas of Japan and especially devastated debris flow in Hiroshima. Although the location had been recognized as one prone to debris flow, many houses had been built due to recent rapid urbanization. Mt. Ontake, one of active volcanos in Japan, suddenly erupted in the end of September and killed more than 50 people. It was unfortunate that many people were around the summit at the time of eruption, because it was a clear sunny day of the best time for enjoying beauty of autumn mountain. Natural disasters always occur in the interaction between human and natural activities. We usually enjoy blessing of nature. We need trying to let whatever the natural fierce forces go past without damaging human life and properties.

by R. Kuwano

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PRINTED MATTER

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.