GADRI
Global Alliance of Disaster Research Institutes

GADRI ACTIONS

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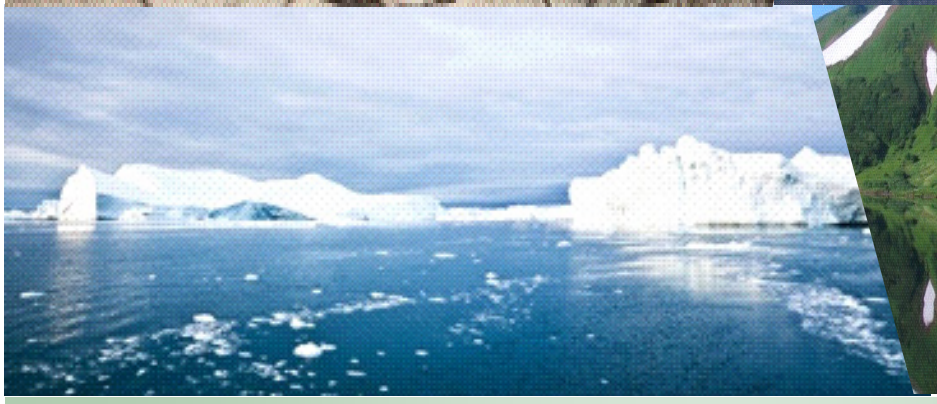

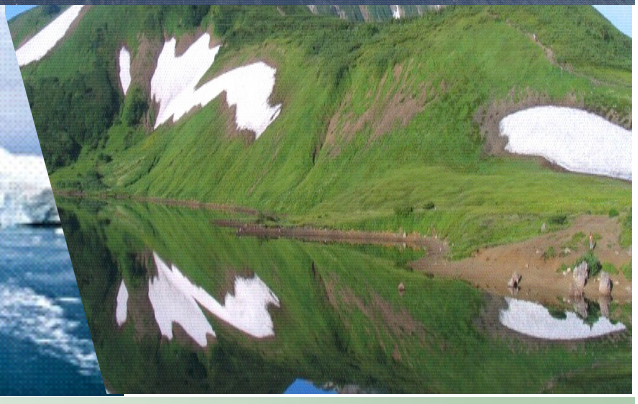

Welcome to the First issue of the *GADRI Actions*.

Since the inception of GADRI in March 2015, GADRI was quite active during the first half of the 2016.

The First International Symposium on Flash Floods in Wadi Systems took place at the Disaster Prevention Research Institute (DPRI), Kyoto University, Japan from 14 to 15 October 2015. The conference was attended by over 70 participants.

GADRI Round Table Discussion Workshop: Towards an Integrated Disaster Risk Research Platform for Hydro-Meteorological Hazards was conducted on 13 and 16 October 2015. The workshop was arranged back to back with the Symposium and it was attended by some of those who attended the symposium.

Two workshops were organized under the thematic areas of Earthquake and Volcanic Disaster; and the Geo-Hazards groups: workshop on Bridging Strong-motion and Earthquake Damage on 25 February 2016; and the Workshop on New Generation of Geohazard Mapping and Strategy for Its Social Application on 12 March 2016 respectively.

On 22 March 2016, the First Board of Directors' meeting was organized. The Board of Directors' consists of 3 member institutes from Europe and Africa; 4 members from Asia and Oceania; and 3 members from the Americas.

The GADRI logo and website were launched to coincide with the first meeting of the Board of Directors.

Taking advantage of the presence of the Board members, an Open Discussion Forum: GADRI Projects and Activities were organized on 23 March which was attended in addition to the Board Members by Japanese government officials, NGOs, and UN Agencies.

All of the events were held at the Disaster Prevention Research Institute (DPRI), Kyoto University, Kyoto, Japan which is the current GADRI Secretariat.

Further GADRI was represented at various international conferences and meetings promoting GADRI presence and visibility among the international groups.

In addition to the GADRI activities, this Newsletter will present special reports on the earthquakes and its impact on society highlighting the events of the Taiwan Earthquake February 2016; and the Kumamoto Earthquake 2016. The articles provide details of the earthquakes, disaster prevention measures taken, and the impact on society.

We are proud to publish the first edition of the GADRI Actions. We hope to continue the publication with your continued support and contributions.

Prof. Hirokazu Tatano, Secretary-General, GADRI

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Highlights

On the Cover

The photographs are from various research activities conducted by the researchers of the Disaster Prevention Research Institute (DPRI), Kyoto University, Japan.

GADRI Actions is designed, formatted and edited by Wilma James.

Message from the Chair of Board of Directors

Prof. Andrew Collins, Leader, Disaster and Development Network (DDN), Northumbria University, UK was elected as the first Chair of the GADRI Board of Directors.

It is a great pleasure to Chair the Board of Directors of the Global Alliance of Disaster Research Institutes. The demand for research that strengthens human capacity to reduce disaster has never been greater. This is not an agenda that can be provided by research institutions operating on their own, neither by any particular disciplinary orientation or sector; it is indeed everyone's business. I see at least three core contributions this alliance can make to address disaster in the interests of human well-being and appropriate developments of the future. This includes across all forms of disaster risk reduction and of disaster response. It will be firstly through the greater and inclusive cooperation and coordination between scholarly institutions engaged in driving the research that informs evidence based learning. Secondly, we will witness that this form of international level alliance can also encourage both specialist and broad dialogue across many nations ultimately impacting on the will of our political leaders. Thirdly, an alliance whose membership is well-grounded in their local and regional communities of practice and society as a whole is capable of effecting change in human behaviour for better. These are fundamental aspects of an agenda that is simply too critical to settle for anything less; to deliver the hope on which we thrive. Congratulations to Kyoto University in providing the first Secretariat for GADRI. On behalf of the GADRI Board I also deliver a warm thank you to all of the many institutions who have already joined or whose membership is forthcoming.

GADRI Board of Directors from around the world

Board of Directors (BoD)

Europe and Africa

1. International Institute for Applied System Analysis (IIASA)
2. European Commission (EU), Joint Research Center (JRC)
3. Disaster and Development Network (DDN), Northumbria University

Asia and Oceania

4. International Research Institute of Disaster Science, Tohoku University
5. National Research Institute for Earth Science and Disaster Prevention (NIED)
6. GNS Science
7. National Science and Technology Center for Disaster Reduction (NCDR)

Americas

8. Disaster Risk Research, Institute of Geography, National Autonomous University of Mexico (UNAM)
9. Natural Hazards Center, University of Colorado, Boulder
10. Pacific Earthquake Engineering Research Center (PEER), National Information Service for Earthquake Engineering, University of California, Berkeley

Secretariat

11. Disaster Prevention Research Institute (DPRI), Kyoto University

Message from the Director, Disaster Prevention Research Institute (DPRI), Kyoto University

I wish to congratulate Prof. Andrew Collins, Chair, GADRI Board of Directors, GADRI members and the Secretariat for resonantly moving forward in implementing GADRI activities.

The date to hold the First meeting of the GADRI Board of Directors could not have timed more perfectly than 22 March 2016 as GADRI completed one year since it was approved by the Second Global Summit of Research Institutes for Disaster Risk Reduction held at Disaster Prevention Research Institute (DPRI), Kyoto University, Japan in March 2015. It was a historical occasion as this year 2016, DPRI, Kyoto University celebrates the anniversary of 65 Years since its inception in 1951, and the Natural Disaster Research Council celebrates 15 years since it was established in 2001 by DPRI, Kyoto University as a network of Japanese academicians.

As GADRI pursues its goals to support the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) and the work of the Scientific and Technical Advisory Group of the United Nations Office for Disaster Risk Reduction (UNISDR), I wish to give our assurance to assist GADRI achieve even higher heights in the years to come and to share the knowledge and experiences across borders.

Thank you very much for your continued cooperation.

Dr. Kaoru Takara
Professor and Director
Disaster Prevention Research Institute (DPRI), Kyoto University

Disaster Prevention Research Institute, Kyoto University

The Disaster Prevention Research Institute (DPRI), Kyoto University was established in 1951 and is located at the Uji Campus of the Kyoto University. Today with 65 years of research knowledge and experience, it is one of the pioneering institutions in disaster risk reduction, prevention and mitigation and is recognized as a Global Center of Excellence in the area of disaster risk management.

Since its inception in 1951, DPRI has been pursuing principles of natural disaster reduction, establishing integrated methodologies for disaster prevention on the basis of natural and social sciences, and educating students in related fields.

DPRI has five research institutions. There are over one hundred faculty members and over two hundred researchers and graduate students in various disciplines at DPRI, Uji Campus, Kyoto University. DPRI serves as a national research center on natural disasters and their prevention and mitigation, authorized by the Ministry of Education (MEXT). Many researchers from abroad and within Japan conduct joint research initiatives using the state-of-the-art experimental and observatory facilities at DPRI.

The past decades have been notably marked for the intensity in increased natural disasters. By using accumulated research knowledge, and experience, DPRI strives to enhance its research efforts and respond to the serious needs for the protection of lives and assets of people and society.

The Kyushu Japan Earthquake Sequence of April 2016

Prof. James Goltz
Visiting Research Professor
Disaster Prevention Research Institute
Kyoto University

This report is based on a review of English language news media articles, reports available on the web pages of the Japan Meteorological Agency, the Fire and Disaster Management Agency of the Ministry of Internal Affairs and Communications, the Cabinet Office of Japan, the Prefectural Government of Kumamoto and the United States Geological Survey, and field reconnaissance conducted in several areas of significant earthquake damage between April 29th and May 1st 2016. The field reconnaissance included observation of damage in cities and towns within Kumamoto Prefecture including Kumamoto City, Mashiki, Nishihara and Mifune. The town of Minami-Aso, also severely impacted by the April earthquakes was not accessible due to road closures during our field reconnaissance. Members of our team included Dr. Tomohide Atsumi of Osaka University, several of his graduate students and me.

The Earthquakes

The Initial earthquake which later proved to be a foreshock was recorded by the JMA at M6.5 (USGS Mw6.2) and occurred at 9:26 PM Japan Standard Time, on April 14, 2016. It was located at latitude 32.7, and longitude 130.8E at a depth of 10km, 12.0 km (7.5 mi) WNW of Kumamoto City, Japan. The maximum JMA Intensity recorded was 7 (highest on the intensity scale). The earthquake was a result of strike slip faulting at shallow depth on the Hinagu fault. Within 3 hours of the initial earthquake, several significant aftershocks occurred.

Significant aftershocks of the April 14 event:

10:07 PM 4-14 M5.7 Intensity 6-
10:38 PM M5.0 5-
11:43 PM M5.0 4
12:03 AM 4-15 M6.4 6+

In addition to these large aftershocks, there were:

M4.0 to M4.9 12 JMA 4
M3.0 to M3.9 13 JMA 3-4

At 1:25 AM JST on April 16, 2016 a larger earthquake occurred which was recorded by the JMA at M7.3 (USGS Mw7.0) located at latitude 32.8 and longitude 130.7E at a depth of 10km. It was located 1.0 km (0.6 mi) WSW of Kumamoto City. Like it's foreshock, this earthquake had a stike-slip fault mechanism and occurred at shallow depth along the Futagawa fault. JMA reported a maximum JMA Intensity of 7. The M6.5 event and other earthquakes that preceded this event are regarded as foreshocks of this, the largest earthquake in the sequence.

Significant aftershocks of the April 16 event:

1:46 AM April 16 M6.0 JMA Intensity 6-
3:55 AM M5.8 6+
9:48 AM M5.4 6-

Surface Rupture and Liquefaction: surface rupture was observed, as was liquefaction along rivers and in other areas of the impact zone. Ground failure was a significant factor in damage to buildings and infrastructure.

Aftershock Warnings: The JMA, which routinely issues aftershock probabilities following a mainshock, reportedly provided warnings after the 4-14 event but discontinued doing so after the mainshock of 4-16. According to a Yomiuri Shimbun article that appeared on 4-21, the JMA released a statement following the 4-14 M6.5 event stating that there was a 20% probability of aftershocks measuring lower 6 or higher. The rationale for cessation of aftershock forecasts, according to the article was that the JMA felt that past occurrences of aftershock sequences were not providing adequate guidance for this sequence.

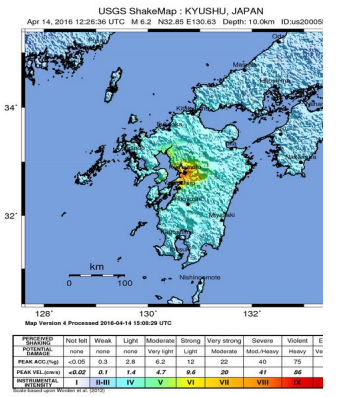


Figure 1: Shake Map for Mw6.2 Event

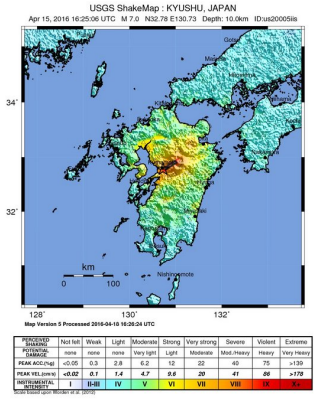


Figure 2: Shake Map for Mw7.0 Event

Basic Situation Statistics

Impact Areas: Kumamoto City, Mashiki, Nishihara, Mifune and Minami-Aso. There are other towns in Kumamoto and Oita prefectures but these are the areas with the most significant casualties and damage.

Fatalities: 50 as a direct effect of the earthquakes, 19 additional fatalities indirectly attributed to the earthquake.

Injuries: 1,666, 350 serious injuries and 1,316 minor to moderate injuries.

Displaced: the number of evacuees peaked immediately following the April 16 mainshock at 180,000. By April 24, the Japan Times cited "government reports" of 89,513 evacuees in Kumamoto Prefecture and 637 from Oita Prefecture. By the time of our field reconnaissance at the end of April, the media were reporting 30,000 evacuees. By the end of June, there were still 1,900 people in shelters in Mashiki Town.

Shelters: There are 623 official shelters as reported by the Yomiuri Shimbun on 4-21 mainly public buildings and schools. At least three ferry boats serve as shelters and the Kumamoto Prison was opened to evacuees where 250 people were sheltered as of 4-21.

Building Damage: A Kumamoto Prefectural Government report dated June 30th indicated that 150,000 residential structures were damaged in the earthquakes. The breakdown in terms of severity was 7,900 totally destroyed, 23, 663 with significant damage and 117, 612 with slight damage. In addition, 243 public buildings were damaged and 1,384 commercial buildings were damaged.

Loss Estimates: The Cabinet Office of Japan has estimated losses in the earthquakes at between 2.4 and 4.6 billion yen.

Mutual Aid: The national government has deployed 26,000 Self Defense Army, Navy and Air Force personnel to the region. The US base in Okinawa dispatched 4 MV-22 Ospreys which delivered 20 tons of relief supplies (food, water and blankets) to Minami-Aso.


Volunteers at the Nishihara volunteer

Volunteers: Hundreds of volunteers from the impact region, and many from other parts of Japan joined municipal and prefectural personnel in responding to the earthquakes. They assisted in the distribution of food and supplies at the evacuation centers, cleared debris and helped clean up homes. That number increased during Golden Week as people spent vacation days as disaster volunteers. A number of volunteer organizations with experience in other earthquake disasters assisted in coordinating and managing volunteer activities.

Specific Incidents and Issues

Shinkansen Derailment: A Shinkansen train and 6 cars derailed while traveling at approximately 80 kph between Shin-Minimata and Kumamoto during the April 14, M6.5 foreshock. No passengers were on board and the driver was not injured. The derailed train and cars were cleared and this stretch of the railway opened on April 28. The Japan Times reported on 4-29-16 that the Kyushu Shinkansen resumed all services in Kyushu on April 29th.

Transportation Impacts: The Kyushu Expressway reopened on Friday April 29, but many secondary roads in Kumamoto Prefecture remained blocked by debris and landslides per Japan Times 4-29-16. Blockages exist at 295 locations in the prefecture.


Closure of Rt. 235 in Mashiki tTown

Conditions at the Shelters: Conditions at the shelters were a subject of nearly daily news reports though the end of April. There are 623 officially recognized shelters mostly in public buildings. Some shelters were reported to be extremely crowded, and in the immediate aftermath of the April 16 earthquake, were inadequately provided with potable water, food and blankets. While many evacuees have homes that are uninhabitable, others have evacuated due to utility outages and lack of adequate food and water supplies at home. A large number of people have evacuated to their cars due to fear that ongoing aftershocks will cause their houses to collapse, giving rise to concerns among health care professionals that some of these people who spend lengthy periods of time confined to their cars will develop blood clots that could cause death, this situation has been referred to as "economy class syndrome." A total of 35 people were diagnosed with economy class syndrome, caused by prolonged inactivity, according to a Kyodo News Survey (Japan Times, 4-29-16). Some evacuees chose to remain in their cars because pets were not permitted in the shelters. NHK TV reported outbreaks of Norovirus at one the evacuation centers in Minami-Aso and health officials were concerned about the disease spreading.

Temporary Housing: The Kumamoto prefectural government has decided to secure some 4,200 temporary housing units, half through construction and the other half by renting, using a supplementary budget of ¥36.6 billion for fiscal 2016 (Japan Times, 4-29-16). As of June 30th, 3,364 temporary houses were under construction in Kumamoto Prefecture.

Weather in the Region: Search and rescue/recovery and activities in response to the earthquakes were hampered by persistent rain causing concern that further landslides would be triggered, particularly in mountainous Minami-Aso, one of the hardest hit areas. An Asahi Shimbun article on 4-22 reported that 1000 people (500 households) had been ordered to evacuate due to possible flooding. The rain also resulted in lengthy confinement of people who evacuated in their cars prompting increased concern that they would develop "economy class syndrome."

Impacts on Schools: Between April 19 and 23rd, 1,267 school buildings at 163 locations were inspected for damage. A total of 134 locations had buildings that were "red tagged" meaning that they were considered dangerous and unusable. Another 354 sites had buildings that were "yellow tagged" meaning "caution needed." (Asahi Shimbun, April 26).

Disabled and Special Needs Persons: In 2012, Kumamoto signed agreements with 176 social welfare facilities that accommodate the elderly, disabled and others with special needs in the event of a disaster. But following the earthquakes of 4-14 and 4-16, only 34 of these facilities were able to accept special needs evacuees. These facilities were expected to take in 1,700 evacuees. Damage to these facilities, utility outages and staff shortages were blamed for the inability to accept more special needs evacuees. Volunteers were assigned to these facilities to ease some of the difficulties. (Asahi Shimbun, 4-27)

Damage to Historic Sites:
Asojinja Shrine: Destroyed were its worship hall and main gate. The gate has been designated and "important cultural property" and is one of three famed "Romon" two-story temples and shrine gate structures in Japan. There are plans to rebuild it.

Kumamoto Castle: Drones were employed to do a damage assessment of Kumamoto Castle's main tower because on-site inspection was too dangerous due to continuing aftershocks. Engineers noted damage to the supporting foundation of the castle due to use of smaller stones and a 1960 reconstruction of the main tower was thought responsible for damage due to use of steel reinforced concrete rather than wood (used in the original construction) that made the structure heavier and less flexible. The castle also lost most of its roof tiles as well as "shachihoko" a fabled fish roof ornament.

School Closures: approximately 150,000 children were unable to attend classes on Monday April 25 due to damage to schools and the use of schools for evacuation centers.

Business Impacts

Business Interruption
Toyota suspended production at most of its factories (15) in Japan due to scarcity of parts with cascading effects on other manufacturers.

Honda's motorcycle plant in Kumamoto was severely damaged in the earthquakes.

Sony reported a fourth-quarter loss after booking a charge against its chip business and delayed giving a full-year forecast to assess damage from an earthquake that shut its main plant for camera sensors. The net loss was ¥88.3 billion in the quarter that ended in March. Operations at its Sony's Kumamoto facility remained suspended after this month's earthquakes, with some parts that reopened at the end of May. The company reported damage to the building, clean rooms and equipment. The facility is the primary manufacturing site for image sensors used in digital and security cameras as well as micro-display devices. (Japan Times, 4-29-16; Associated Press, 4-29-16)

Renesas Electronics Corp. in Kumamoto was closed for safety evaluation particularly for dangerous gases used to maintain antiseptic conditions for chip production.

Japans Nikkei 225 stock index fell by 3% on Monday April 18, in addition:

Toyota was down 4.8%
Nissan was down by 2.8%
Sony down by 6.8%

The above figures are from an Associated Press report that appeared on April 18. The report, which focused on business interruption, also noted that Kyushu is home to about 25% of Japans semi-conductor production. Kyushu is known as "Silicon Island." The island also has auto, steel and ship manufacturers.

The earthquakes impact on business (losses and impacts on supply chains) will depend on how long factories are closed.

Insurance: According to the Insurance Information Institute, earthquake damage in Kyushu is not likely to have a significant impact on insurance pricing nor will it cause insurers or modeling companies to reassess their catastrophe models.

Tourism: According to an Asahi Shimbun article on April 21st, tourist numbers in Kyushu have plunged since the earthquake disaster. China and Hong Kong issued travel warnings against visiting Kyushu according to the Japan Tourist Agency. Fukuoka, Miyazaki and Kagoshima Prefectures have also observed declines in visitors. The Camellia Line ferry, which makes a daily round trip between Busan Port in South Korea and Hakata Port in Fukuoka reported 2,400 cancellations after April 14th. Areas within Kyushu that are popular tourist destinations including Mt. Aso, which receives about 16 million visitors per year will experience declines due to damage to many of the inns and businesses that cater to visitors. Also, the Asojinjja Shrine and the Kumamoto castle, also popular with tourists have been severely damaged and will be closed for lengthy periods of time. Golden Week, during which many Japanese people take vacations, began on Friday April 29th.

New Legislation: The central government adopted an ordinance Thursday (April 28) for extending deadlines for some administrative procedures, including updating driver licenses. Among the more than 200 special measures expected to be launched based on the ordinance is one to freeze bankruptcy procedures for companies that went bust due to the earthquakes for a maximum of two years. The measure is designed to prevent chain-reaction bankruptcies (Japan Times, 4-29-16).

Issues Cited in Editorials

Citing the conditions at the shelters, Kumamoto prefectural government was criticized for poor planning and failure to conduct adequate needs assessments resulting in shortages of food, water and other necessities at the evacuation centers (Yomiuri Shimbun, 4-19).

An editorial writer expressed concern about health impacts on the evacuees and advocated the movement of vulnerable people—the elderly, people with disabilities and infants to neighboring jurisdictions that have offered publicly run housing free of charge. The article also urged better information sharing, particularly about the status of the Sendai Nuclear Power Plant run by Kyushu Electric Power Company. (Yomiuri Shimbun, 4-20)

This editorial emphasizes health impacts of evacuation and that conditions at the evacuation centers would result in stress and fatigue, leading to illness and possibly death. It noted that 80% of the post-earthquake fatalities following the 2004 Chuetsu earthquake were due to the effects of long-term evacuation. (Yomiuri Shimbun, 4-19)

This article was critical of local government due to the severe damage to municipal buildings and hospitals that are critical to an effective disaster response. The writer identified several such buildings including the Uto Municipal Government building that was in danger of collapse, the Uto Disaster Control Headquarters that was badly damaged and whose personnel were forced to respond to the earthquake from tents, and Kumamoto Hospital, which was forced to move patients to other hospitals. (Yomiuri Shimbun, 4-16)

This editorial was critical of the Japan Railway for the derailment of a Shinkansen train and 6 cars. The writer noted that "derailment prevention guards" had been installed in some areas but not the stretch of track where the train derailed and called for a more aggressive program of hazard mitigation for the Shinkansen, which travel at high speeds and usually have large numbers of passengers. (Japan Times, 4-23)

Sheltering

Photo1: Tents for evacuees at Mashiki Sports Complex, April 29, 2016

We visited the Mashiki Sports Complex on April 29th, 30th and May 1st where approximately 1,300 people were evacuated. Prior to the earthquake, the center, owned by Mashiki Municipal Government, provided recreational facilities for Machiki Town and was managed and operated by the YMCA. As an evacuation center, it continued to be managed by the YMCA. At the time of our field observation, there was a significant Self Defense Army and Navy presence as well as volunteers in numbers sufficient to supplement the small YMCA staff. In addition to those housed in the building, many people are sheltered in tents (See Photo 1) or were living in their cars parked in the large parking lot of the Sports Complex (See Photo 2).

Photo 2: Evacuees chose to remain in their cars

The facility had only nonstructural damage though there was heavy damage to houses, small businesses and infrastructure in the immediate vicinity. Mr. Kazuki Yamane, one of the YMCA staff provided a tour of the complex including the interior damage that consisted of collapse of the ceiling tiles and metal bracing in the gymnasium. Yamane explained that the gymnasium floor was being cleared of debris after which he anticipated housing an additional 300-400 evacuees. These additional evacuees were expected to come from area schools currently being used as shelters, so that school could resume. The building was crowded with evacuees and each individual or family had only about nine square meters for the belongings they salvaged and bedding. Army SDF personnel prepared and served meals, and food and water seemed to be adequate, but for evening meals, there were long lines of evacuees and I was told that those at the rear of the line would wait about 2 hours to be served (See Photo 3).

Photo3: Lengthy line - waiting to be served dinner

The Japan Red Cross has also been active in this disaster and had set up a medical aid station at the Mashiki Sports Complex. In addition to the walk-in clinic, Red Cross workers walked among tents and those spending long hours in or near their cars to address any medical needs of evacuees.

Debris and Debris Clearance

Photo 4: Separating debris at temporary dumpsite

Upon arrival in Kumamoto City at approximately noon on Friday April 29th and driving our rented car toward Mashiki Town, the first evidence of an earthquake disaster noted were large piles of discarded household items damaged in the earthquakes. Observed among the debris were televisions, furniture, refrigerators and small appliances that were broken or damaged during the earthquake.

Photo 5: Debris accumulation at

Later, when we arrived in Mashiki Town we observed a large central dumpsite near the Mashiki Sports Complex, which served as an evacuation center. Heavy equipment had been brought in to separate the debris into huge piles of metal, wood, plastic and miscellaneous debris (See Photos 4-5).

Photo 6: Ground failure and settlement around foundation

Trucks lined up along an access road and on to the highway waiting to unload debris. At times, this process clogged street traffic around the sports complex as it required time for each small truck or car to discard debris brought to the site.

Ground Failure and Differential Settlement

We were not able to observe the large landslide near Minami-Aso, but there was considerable evidence of ground failure in and near Mashiki Town. Although the Mashiki Sports Complex did not have structural damage, there was evidence of slumping around the building's foundation and utility structures on the property (See Photo 6). Ground failure along the highway separated the guardrail from the roadbed (See photo 7).

Photo 7: Ground failure along this road in Mashiki Town separated the guardrail from the roadbed

Photo 8: Yellow tagged house in southeaster Kumamoto City, April 30,

Photo 9 Partial collapse of older two-story house in southeastern area of Kumamoto City

Structural Damage

Houses

Photo 10: Collapsed houses in Mashiki Town, note ground failure, May 1, 2016

Damage to houses in the areas we observed, southeastern Kumamoto City and Mashiki Town, ranged from no damage in areas of lighter shaking or houses of recent construction to complete collapse of older houses and those in JMA intensity 6+ or 7. The most common form of damage was to tile roofs, which we observed nearly everywhere we traveled. Blue tarps covering damaged tile roofs were a common sight in the impact area. It also appears that ground failure contributed to the severe damage to houses, particularly in Mashiki (See Photos 8 to 10).

Businesses

Photo 11: The complete collapse of this hair salon in southeastern Kumamoto City, April 30, 2016.

Damage to business facilities was a frequent topic of news reports, particularly the disruption of business among large corporations including Toyota, Sony, Honda and others. But damage to mid-size and small businesses was also severe (See Photo 11).

Tokyo Cathode Laboratory's facility in Nishihara was severely damaged in the earthquakes. Both structural and nonstructural damage were observed. Per Bloomberg profile, Tokyo Cathode Laboratory was established in 1950 and has 444 employees. The company engages in the manufacture and sale of probe cards and related devices for semiconductor applications in Japan and internationally.

Temples and Shrines

Buddhist temples and Shinto shrines tend to be older and more vulnerable to strong ground motion. We observed severe damage and the collapse of several temples and shrines in southeastern Kumamoto City and Mashiki Town (See photos 12 and 13).

Photo 12: The Konkokyo Shinto Shrine in Mashiki Town is red tagged and portions of the building collapsed, April 29, 2016.

Photos 13: Side views of Konkokyo Shrine, Mashiki Town, April 29, 2016

Public Buildings and Critical Facilities

News articles and editorials were highly critical of the performance of public buildings that were important for the coordination of emergency response or were to serve as evacuation centers in disaster (See photo 14). A total of 243 public buildings were damaged in the earthquakes.

Photo 14: Mashiki Town administrative building (town hall) sustained structural and non-structural damage and was evacuated. April 29, 2016.

Transportation

The earthquakes caused considerable damage to roads, highways and rail transportation. Although the most serious disruptions to the Kyushu Expressway and Shinkansen had been repaired and were functional at the time of our reconnaissance trip to the impact area, there were road and street closures due to collapsed houses and damaged bridges. The photos below reveal the damage we observed (See Photo 15).

Photo 15: Column failure at highway bridge, Mashiki Town, May 1, 2016

Concrete Retaining Walls

Many masonry walls were severely damaged in the earthquakes, both small residential walls and larger retaining walls. Some observed damage from our reconnaissance appear in photos 16 and 17.

Photo 16: Damaged residential concrete walls, Mashiki May 1, 2016

Photo 17: Another view of damaged and partially collapsed stairway and retaining wall Mashiki Town, May 1, 2016.

Volunteers

Large numbers of volunteers converged on Kyushu following the earthquakes and our arrival on April 29th marked the beginning of Golden Week, a time when many people travel in Japan and significant numbers of people, particularly students, spent their time off volunteering at centers around Kumamoto Prefecture. These centers were typically located in open spaces provided by municipal governments or private sector entities. In most cases, the volunteer centers were managed by members of local welfare councils, which in Japan, are quasi-public organizations funded by local government and operate much like NGOs. About half the volunteers were local people and the other half were from outside Kumamoto Prefecture. During our reconnaissance, we visited several centers, where volunteers were registered, received identification as volunteers, were briefed on daily assignments, divided into small teams, then were driven to locations where they assisted in debris clearance, checking on those still in their damaged homes and assisting at one of the many evacuation centers (See Photo 18).

Photo 18: Volunteers line up to register at a Nishihara volunteer center in front of the Tokyo Cathode Laboratory, Nishihara Town, April 30, 2016

This article was contributed by Prof. James Goltz, Visiting Research Professor, Disaster Prevention Research Institute (DPRI), Kyoto University.

Facts and Observations from the Kaohsiung Earthquake on 6 February 2016 in Taiwan

By Prof. Wei-Sen Li, Dr. Hongey Chen

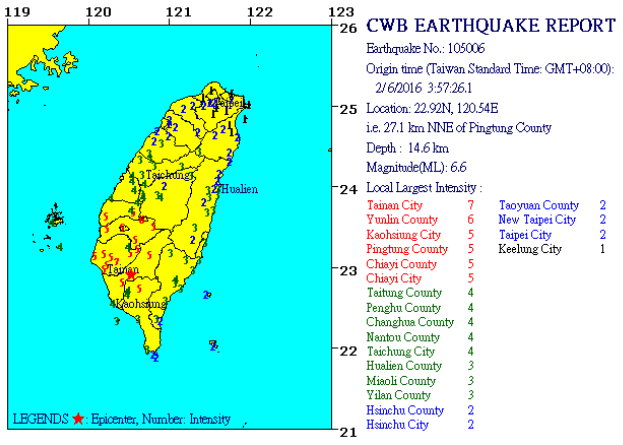
National Science and Technology Center for Disaster Reduction (NCDR)

Abstract

On February 6, 2016 at 03:57 am local time, a magnitude-6.6 in-land and shallow earthquake hit the southern part Taiwan and caused life casualties (117 died and 551 wounded), and damages to buildings (249 recognized as severely damaged level), lifeline systems and infrastructures. The epicenter is located at Meinong District, Kaohsiung City and with a focal depth of 16.6 Kilometers. According to the shake records, the strongest intensity reached scale 7 (334.1 gal in PGA).

One totally collapsed building in Tainan City, the Weiguan Jinlong Building, killed 115 people due to poor construction details and irregular structural configurations. Thought the quake brought interruptions to public services like water, power and telecommunications, most of the services had been restored within 28~48 hours. The whole on-site emergency operation continued 180 hours since Feb. 6 and motivated 20,000 plus emergency responders to help for search-and-rescue, emergency relief, mental intervention, traffic control, law consultation and etc.

About economic losses, besides direct costs by structural damages, impacts to the Southern Taiwan Science Park, 38 km from the epicenter, caused business interruptions to IC manufacturing industry and billions of losses. The limited and temporary disturbances had been overcome in a very short period of time, because of implementations of business continuity plan to mitigate possible production losses and resume product delivery to global supply chain.



Quick earthquake report
Source: Central Weather Bureau

Summarized casualties and damages

Soon after the earthquake, both Tainan City and central governments had activated emergency response from 04:03 am and 04:15 am respectively. Within an hour, Tainan City Government identified one totally collapsed building was the most severely devastating site. The whole search-and-rescue operation called an end in the afternoon of Feb. 14 lasting over 180 hours. In total, 33,343 people including emergency responders, police officers, military personnel and volunteers, ever joined the operations. According to the official report the numbers of casualties and damages are listed a table below.

Items	Descriptions
Casualties	117 dead*, 551wounded * 115 found dead in the Weiguan Jinlong Building,
Interruptions to lifeline systems	Power supply: 173,000 households Water supply: 400,300 households Land-line telephone: 1,248 households Mobile phone station: 143 Natural gas supply: 1,304 households
Damaged building	After quick assessment: Red-tagged 249, Yellow-tagged 336
Damages or suspension to transportation systems	Highway: 2 sections High-speed rail: a temporary suspension to south-bound operation from Taichung soon after the quake
Damaged school	469
Mobilized personnel	33,343

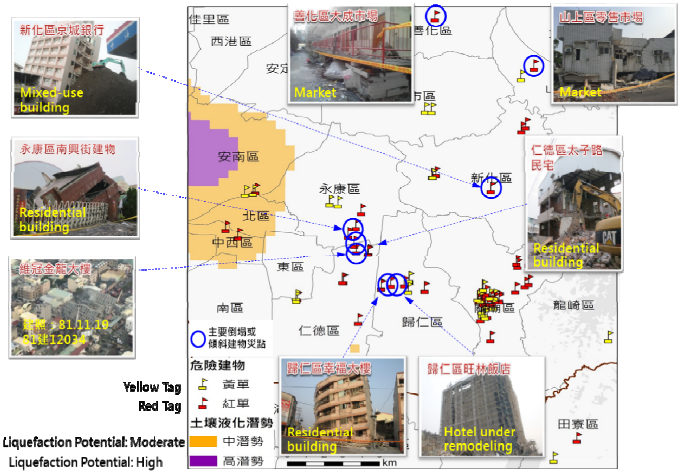
Data source：The Central Emergency Operation Center

Among 115 of 117 deaths, the total collapse of the Weiguan Jinlong Building, located at No.6, Guoguang 5th St., Yongkang Dist., Tainan City, is the direct cause leading to main casualty. The building was completed in 1995, a mixed-use reinforced-concrete complex for both residential and commercial use, and it survived the shaking brought by the 1999 Chi-Chi Earthquake. Lacking of sufficient shear force capacity, shear walls, at lower floors and ill structural configuration are the chief defects at design stage and construction phase. These defects possibly led to a pan-cake failure to the building and because of that it was a challenging job to find survivors and remains of the deceased buried deeply under smashed concrete debris.

The collapsed Weiguan Jinlong Building

Source: Tainan City Government

After the quake, eight buildings were reportedly severely damaged and two of them were markets. Luckily, the quake hit one day ahead of Chinese New Year Eve in the very early morning and there was no crowd in markets. If it had attacked two markets at 8:00 am, more casualties could be expected because of crowds buying foods for celebrate new year. Except the Weiguan Jinlong Building, no death was reported from other seven buildings. The locations of eight severely damaged buildings are shown below.



Locations of eight severely damaged buildings Source: NCDR

Learned lessons and observations

Seismic safety management on existing mixed-use complexes

Mixed-use complex for both residency and commerce is a common building type in Taiwan, because of convenience to attract customers. However wide-and-open space for commerce could bring defects to seismic structural behavior, if there is no strict safety requirement and examination. Major concerns to the mixed-use buildings include: shear capacity, weak story, seismic design codes, construction details and maintenance. Lack of shear wall to form weak story is one of major problem of structural behavior. The case of the Weiguan Jinlong Building is an example to identify problems. And difficulties to manage risk are private ownership of the buildings, frequent remodeling due to commercial operations and control on crowd flow. All the factors listed above could add vulnerabilities when an earthquake strikes.

A provisionary water pipe reconnecting broken sections in Tainan City

Better use of social media to disseminate information

After the quake hitting in the early morning, the official website of Tainan City Government was totally overwhelmed by a huge surge of accesses by citizens or reporters requiring situations updates. Since it is impossible to allocate sufficient Internet bandwidth and servers in advance of or immediately after the quake, Tainan City Major and staff utilized Facebook and LINE to keep people informed of situations, casualties, operations of search-and-rescue and relevant services for affected families. For examples, there were LINE individual groups designated for emergency responders, reporters, affected families and decision makers to shorten information gaps and accelerate process time. All surveys on citizens showed high satisfactions on quick responses conducted by Tainan City Government.

Impacts on livelihoods by interrupted lifeline systems

Interrupted lifeline systems by the earthquake did bring inconvenience to citizens' livelihoods, especially interruptions of electricity, water, telecommunications and transportation. Except water supply, all other services had been restored within 48 hours. Because of one main underground water supply pipe smashed by collapse off the Weiguan Jinlong Building that brought difficulties for restoring tap water service. A provisionary pipe was installed to reconnect broken sessions for resuming water supply. In order to provide wireless Internet access on the affected site of the Weiguan Jinlong Building for coordinating on-site operations, five mobile phone service provider set up temporary equipment to meet the demands. Through rapid restoration of the Internet access to keep information transparency, websites set by crowd-sourcing helped full coverages about affected situations and also collected donated resources to meet urgent demands.

Challenges to implement business continuity plan at times of disaster

The Southern Taiwan Science Park, suited closely to epicenter at a distance of 38 KMs, is an essential manufacturing base of ICT industry cluster producing products for global supply chain. According to reports of individual manufactures, though there was no structural damage to IC fab, but non-structural damages, like pipeline breakages or excessive vibrations to equipment of production lines, caused business interruptions and required contingency operation to jumpstart production. Based on news reports, direct loses of ICT estimated by insurance industry showed that compensation claim could reach NTD 20 billion (USD 0.63 billion). That number exceeds the annual amount of premiums in 2015 at business sector. In 1991, the Hsinchu Science Park, located in the northern part of Taiwan, had received damages to production lines because of the Chi-Chi Earthquake. Since then, some manufactures have been investing resources to develop contingency plan or adopt ISO22301 introducing business continuity management in recent years. However, one challenge raised by the recent quake is how to find sufficient rooms to accommodate external engineers who helped for quick recovery. This is potential space to complete business continuity plan based on learned lessons this time.

Public awareness and preparedness on future disasters

Soil liquefaction is another focal issue after the quick in Feb. Numbers of residential builds suffered tilting or settlements due to liquefied sand layer at foundations. Cases of soil liquefaction had been reported from previous earthquakes in Taiwan. But soil liquefaction seemed to be new to lots of citizens in Feb, because seldom was it covered by news reports. To respond to the general public request of clear risk and ease anxiety of soil liquefaction, potential risk maps of soil liquefaction have been soon open for on-line inquiry based on home address. Transparent risk map is an ideal basis for risk communication among individual stakeholders such like government officials, researches and citizens under a correct and understandable risk interpretation. With common consensus on disaster risk reduction in general, promotion of the whole society resilience could be enhanced gradually.

Soil liquefaction site
Source: Tainan City Government

This article was contributed by Prof. Wei-Sen Li and his colleague Dr. Hongey Chen from the National Science and Technology Center for Disaster Reduction (NCDR), Taipei City, Taiwan. Prof. Li is the Secretary-General, NCDR.

Workshop on Bridging Strong-motion and Earthquake Damage

By: Prof. Jim Mori, Disaster Prevention Research Institute (DPRI), Kyoto University

The Earthquake and Volcano Hazards Research group organized a workshop on Bridging Strong-motion and Earthquake Damage at the Disaster Prevention Research Institute (DPRI), Kyoto University, Japan on 25 February 2016.

The objective of the workshop was to discuss future projects for the group, especially related to earthquake strong-motions and the associated damage to buildings. Current the actual performance of different types of structures is not well quantified and needs to be determined by detailed field studies following destructive earthquakes. Using the building classifications recently developed by EERI and GEM, survey reports on building damage caused by large earthquakes can be used to study the earthquake effects on structures. In order to take full advantage of existing information, studies could also be initiated with already collected data from recent events such as the 2011 Tohoku earthquake. GADRI could play a key role in coordinating efforts by the international community for such studies following large earthquakes.

After a brief welcome, the workshop was opened with an introduction and scope of GADRI by Prof. Hirokazu Tatano, Secretary-General followed by Prof. Jim Mori, organizer of the workshop.

The invited participants from Italy, Taiwan, US and Japan presented brief and focused research findings, potential research areas/countries/regions, and perspectives from their field experiences. Among the presentations were damage and casualty reports from recent earthquakes - Factors affecting human casualty distribution in the 2015 Gorkha Nepal Earthquake presented by Dr. Hitomi Murakami, Yamaguchi University, Japan, and The 6 February 2016 Earthquake at Meinong District, Kaoshiung City, Taiwan presented by Dr. Lap-Loi Chung, National Center for Research on Earthquake Engineering, Taiwan. Other topics included a range of subjects – Source models and ground motions of the 2011 Tohoku Earthquake by Prof. Hiroe Miyake (Earthquake Research Institute, The University of Tokyo, Japan), Simulations of strong ground motions by Dr. Takahiro Maeda (National Research Institute for Earth Science and Disaster Prevention, Japan), GEM Building Taxonomy by Dr. Catalina Yepes Estrada (GEM Foundation, Italy), GEM Earthquake Consequences Database by Prof. Maki Koyama (Gifu University, Japan), and the Possible development of a new GADRI multi-hazard database presented by Prof. Charles Scawthorn (PEER, UC Berkely).

During the wrap-up discussion session led by Prof. Mori, participants discussed about the possible future activities for the group towards a project to study effects of strong-motion earthquake damage on buildings.

Recommendations from the Workshop:

1. The group supports the database efforts, such as the GEM Earthquake Consequences database. It was suggested that GADRI could provide an application to facilitate use of the database.

2. The group supports development of a GADRI multi-hazard database. There are currently several useful databases for earthquake studies, however a comprehensive database is needed that consistently cover many natural disasters such as earthquakes, volcanoes, landslides, floods, and storms. Improvements can be made to current earthquake databases by including information on lifelines.

3. GADRI should help coordinate field investigations of important seismic and volcanic events. As an alliance of research institutes, GADRI could provide advanced planning and facilitate international efforts. The field investigations should provide consistent reports, such as using the GEM building taxonomy system.

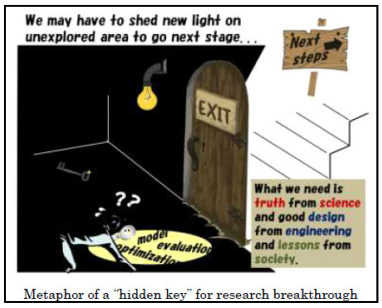
4. GADRI could provide a platform for research institutes to voice opinions on important disaster-related policies and activities.

Workshop on New Generation of Geohazard Mapping and Strategy for Its Social Application

By: Dr. Yuki Matsushi, Disaster Prevention Research Institute (DPRI), Kyoto University

The GADRI Geohazard group workshop on New General of Geohazard Mapping and Strategy for its Social Application provided a unique opportunity to discuss present status and future tasks for GEMINI* implementation. See the chart below. One of the most important common strategies for geo-disaster mitigation is hazard mapping, thus the discussion started on the methodology of geohazard mapping and scope of social application of geohazard maps. Susceptible areas to geohazards are time varying due to the long-term phenomena such as regional tectonics and climate change, and also short-term processes such as precipitation and earthquake shaking. In other words, hazard mapping in the next generation could be made in conjunction with spatial and temporal prediction of geo-disaster.

A total of 14 topics were presented by 6 invited researchers with one keynote lecture from a standpoint of scientific reviews and reports, introduction to engineering tools and applications, and social aspects of risk management and risk communication of geohazards. Attendancees actively engaged in discussions about strategy of mapping, monitoring, and prediction of geohazards. Gaps between science, engineering, and social implementation were also debated, as well as direction of GEMINI project (Geohazard mitigation on the new innovation in science and engineering, a project being proposed by GADRI Geohazard Group).



Metaphor of a "hidden key" for research breakthrough

Points discussed at the Meeting

- Gaps between science, engineering and society (or local community).
- How can we fill the gaps and make bridges for geo-disaster mitigation?
- Role of scientific, engineering and social researches.
- Toward risk map from hazard map.
- Application to developing regions.
- Direction and next steps of GEMINI.

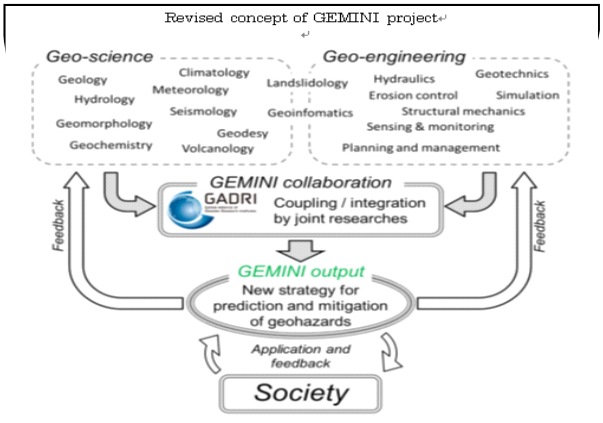
Conclusions from the Workshop:

- Necessity, at first to confirm present status of our scientific knowledge and engineering tools for common understanding of potential, limit, and uncertainties of geohazard modeling. Information interchange on this task would help find a clue to make a collaborative research breakthrough by coupling of scientific and engineering fields.
- As already ascertained, at least partly, detailed knowledge of mechanisms of earth surface processes and also well-designed software for calculation of geohazards. However, there remain significant gaps in using them for accurate risk evaluation of geo-disaster in the complex actual social communities.
- Prescriptive implementation of the outcome from GEMINI requires lessons from society in addition to truth from science, and good design from engineering.

GEMINI

Geohazard **mi**tigation on the **n**ew **i**nnovation in science and engineering (see Fig for the concept)

GEMINI is a project proposed by the GADRI Geohazard Group for developing, sharing, and generalizing the strategy for geohazard mitigation. The project unites updated scientific understanding of earth surface processes and latest technology in geotechnical engineering. In this approach, the inseparable *twins* of science and engineering collaborate tightly to create comprehensive way for spatial and temporal prediction of geohazards, risk assessment in potential sites of geo-disaster, and countermeasures against human, social and economic damages. Since geohazards have various aspects with varying phenomena, such as landslides, debris flow, soil erosion, liquefaction, settlement, in both natural and artificial geomaterials, their research approaches also varies in many scientific and engineering fields. This project searches new coupling of existing knowledge and techniques, and also explores implementation of new methodology for Geohazard mitigation. Workshops through GADRI framework would help host occasion for discussion, establish the connection between researches and institutes, and promote joint research opportunities for GEMINI collaboration.



GADRI Represented at the UNISDR Science and Technology Conference, Geneva

GADRI was represented at the UN Office for Disaster Risk Reduction Science and Technology Conference on the Implementation of the Sendai Framework for Disaster Risk Reduction 2015 -2030 was held at the Geneva International Conference Center from 27 to 29 January 2016., Geneva, Switzerland.

Prof. Hirokazu Tatano, Secretary-General, GADRI was a speaker at the Work Stream 4: Leveraging Science Through Capacity Development and Research – WG 3: Research Gaps. Prof. Tatano presented the GADRI projects with emphasis on capacity development and research which was in line with the fourth work stream.

Prof. Kaoru Takara, Director, Disaster Prevention Research Institute (DPRI), Kyoto University, Japan; and Adviser to GADRI was a speaker at the Work Stream 2: Understanding Disaster Risk, Risk Assessment and Early Warning – WG 2: Exposure and Vulnerability.

「GADRI is recognized by international organizations and constantly called for various conferences。」

UNISDR Science and Technology Conference

The UNISDR Science and Technology Conference on the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030 was held on 27-29 January 2016 at the Geneva International Conference Center. UNISDR invites organizations, institutions, networks and platforms working on disaster risk reduction to join the Science and Technology Partnership and contribute to the implementation of the Road Map.

Integrated Research on Disaster Risk (IRDR) Scientific Committee

IRDR is a decade-long, interdisciplinary research programme sponsored by ICSU in partnership with the International Social Science Council (ISSC), and the United Nations International Strategy for Disaster Reduction (UN-ISDR). It is a global initiative seeking to address the challenges brought by natural hazard events, mitigate their impacts, and improve related policy-making mechanisms.

GADRI Represented at the IRDR Scientific Committee Meeting, Paris

By Prof. Andrew Collins,

The Integrated Research on Disaster Risk (IRDR) Scientific Committee Meeting was held in Paris, France on 4-6 May 2016. Prof. Andrew Collins, Chair of GADRI Board of Directors; and Leader, Disaster and Development Network (DDN), Northumbria University, UK represented GADRI at the IRDR Scientific Committee Meeting.

The aims of GADRI were presented including reference to some of its projects and the Global Summit series http://www.dpri.kyoto-u.ac.jp/SpecialHP/second/15.html the next of which is planned for March 2017 at the Disaster Prevention Research Institute (DPRI), Kyoto University, Japan.

The GADRI presentation was concluded with an invitation to IRDR to join GADRI.

A few comments and discussions from the session include the following:

- The IRDR Director responded briefly and supportively that the link should be pursued though without any commitment being made at this meeting. This item will need follow up as IRDR enters its new phase following the meeting.
- During questions at this meeting it was clarified that GADRI would be able to badge new projects (i.e. drive or associate with projects including through its capacity to peer review)
- As GADRI is an alliance of institutions across the world a question was raised as to how GADRI might accept individual applications for membership, such as for example esteemed academics, who do not have an institute, centre or significant network in this field, but could be regarded as an institution in themselves? This item is being taken back to the GADRI Board for discussion.
- Dr. Virginia Murray continued to support the GADRI development, as she had done at Kyoto last year. Whilst clarifying that she was not able to speak for UNISDR at this meeting she could represent STAG/UNISDR in encouraging that GADRI can present to STAG/UNISDR what GADRI would like STAG/UNISDR to do for GADRI.
- Dr. Akiyuki Kawasaki (The University of Tokyo) offered news on the intention to host the next STAG in Japan, as also indicated by Dr. Virginia Murray. This could be used to develop the GADRI - IRDR relationship further.

Ms. Hiromi Otsuka, Director, Interntional Cooperation Division, Disaster Management Bureau, Cabinet Office; and Prof. Hirokazu Tatano

Disaster Management Bureau, Cabinet Office, Government of Japan

On 26 April 2016, Prof. Hirokazu Tatano paid a courtesy visit to the new Director Hiromi Otsuka, Disaster International Cooperation Division, Disaster Management Bureau, Cabinet Office, Government of Japan and shared information about GADRI and its current activities. As well as touching upon the recent Open Discussion Forum: GADRI Projects and Activities held on 23 March 2016 where her predecessor Mr. Kaoru Saito delivered a keynote lecture, Prof. Tatano informed her of the willingness expressed by the panelists of the Open Discussion Forum to support and cooperate with GADRI activities and the plans to hold the next Global Summit on Disaster Risk Reduction in March 2017. Ms. Otsuka reiterated their willingness to support GADRI activities and requested Prof. Tatano to keep her Office informed of GADRI activities and the progress for the 3rd Global Summit.

The World Bank, Tokyo Office

Prof. Hirokazu Tatano met with Dr. James Newman at The World Bank, Disaster Risk Management Hub (DRM Hub), Tokyo. After briefly explaining how GADRI was formed, the current projects and activities were presented in a portfolio. The planned Global Summit for Disk Risk Reduction in March 2017 where GADRI would convene a General Assembly and the BOD of highlighted. , The World Bank was invited to become a supporter of GADRI and if possible to co-sponsor the events planned for March 2017.

The Objective of DRM Hub (http://www.worldbank.org/en/news/feature/2014/02/03/drmhubtokyo-mission), Tokyo is to support developing countries in mainstreaming DRM in national development planning and investment projects including World Bank country strategies and operations through the Program. DRM Hub, Tokyo also strive to connect Japanese and global expertise in DRM with developing countries.

3rd Global Summit of Research Institutes for Disaster Risk Reduction

The 3rd Global Summit of Research Institutes for Disaster Risk reduction is planned to take place in March 2017.

The 1st Global Summit was held in Kyoto on 24-25 November 2011 with the participation of representatives from 25 research institutes from 11 countries to reflect on the challenges posed by disaster risks, explore new paradigms for DRR, and discuss new approaches to disaster mitigation and risk management.

2nd Global Summit on Disaster Risk Reduction, discussed the research goals and contribution that the disaster research institutes could make to disaster risk reduction in the next decade. Many challenges remain as the continued large-scale disasters and losses from around the world show.

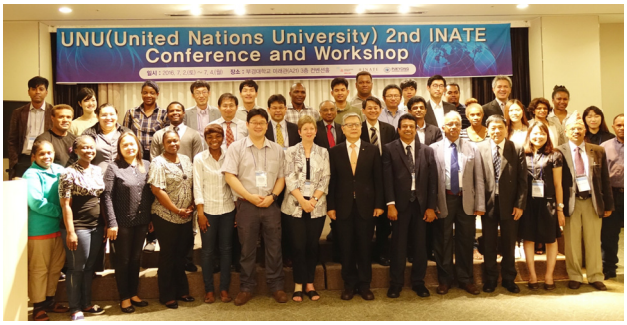
The Summit was very successful with the participation of 83 (51 from outside of Japan) research organizations and 21 countries/areas. There were two important outcomes of the Summit as follows.

First, the drafting of a Resolution by all the participating organizations with the purpose of sharing knowledge and promoting collaboration on topics related to disaster risk reduction (DRR) and resilience to disasters, as well as to provide support to the UNISDR Sendai Framework and its goals towards DRR. The Resolution was approved by all the participants in the Second Global Summit on March 20, 2015.

Second, the “Global Alliance of Disaster Research Institutes (GADRI)” has

GADRI Represented at the Annual Conference of the International Network for Advancing Transdisciplinary Education (INATE), Pukyong National University (PKNU), Busan, South Korea from 2 to 4 July 2016

At the Second Annual Conference of INATE – Managing Global Changes for Sustainability held at the Pukyong National University (PKNU), Busan, South Korea, GADRI was represented under the session "Disaster Risk Management". Prof. Hirokazu Tatano presented the GADRI framework, vision and roadmap for the coming years, and Dr. Subhajyoti Samaddar presented the GADRI project on Capacity Building. Many participating institutes at the INATE Conference indicated their willingness to join and work together with GADRI.



International Network for Advancing Transdisciplinary Education (INATE) :

The highly complex problems of today spawned by rapid global changes evolve too fast for us to adapt to such changes effectively. Their inter-connectedness requires a holistic transdisciplinary approach that brings all stakeholders together, including the academe, local government units, NGOs and communities, to foster rapid feed backs and effective exchange of knowledge and experiences that will enable efficient formulation of sustainable solutions. Transforming conventional project planning to transdisciplinary project design and implementation requires new research on collective solution identification, program design and implementation. This calls for a new type of education and training that promotes transdisciplinary actions. The International Network for Advancing Transdisciplinary Education (INATE) was established in 15th March 2015 during the World Disaster Risk Reduction Conference to address these issues collectively.

UPCOMING EVENTS

National Science and Technology Center for Disaster Reduction

Training Courses

- International Training Workshop on Natural Disasters: Risk Modeling and Its Application to be held at National Science and Technology Center for Disaster Reduction (NCDR), Taiwan from 26 to 30 September 2016

  The NCDR has extended an invitation to sponsor 4 students from south east and east Asian countries engaged in master's or post-doctoral studies/research at the Disaster Prevention Research Institute (DPRI), Kyoto University. Upon advertising the course within DPRI, nine students have elected to attend the training workshop. NCDR shall sponsor 4 students and the other five students will be sponsored by DPRI.

Conferences

- INATE Annual Conference (International Network for Advancing Transdisciplinary Education), Pukyong National University (PKNU), Busan, South Korea from 2-4 July 2016

- 6th International Disaster and Risk Conference IDRC Davos 2016, Davos, Switzerland 28 August to 1 September 2016

- Second International Symposium on Flash Floods in Wadi Systems (ISFF), planned to be held at El Gouna, Egypt from October 25 to 27, 2016

- THA 2017 Water Management and Climate Change towards Asia's Water-Energy-Food Nexus 25 to 27 January 2017, Bangkok, Thailand

NEXT ISSUE:

Dear GADRI Member Institutes,

Thank you for your contributions to the GADRI Actions. If you would like to submit an article or share news through GADRI Actions, please send those directly to:

Attn: Ms. Wilma James

E-mail: secretariat-gadri@dpri.kyoto-u.ac.jp

Global Alliance of Disaster Research Institutes (GADRI)

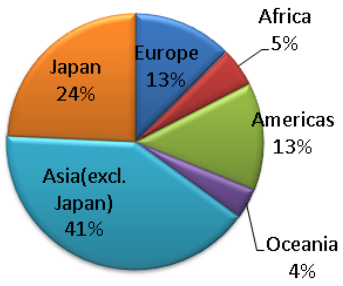
At the commendation of the Second Global Summit of Research Institutes held in March 2015 at the Kyoto University Disaster Prevention Research Institute, Kyoto, Japan, the Global Alliance of Disaster Research Institutes (GADRI) was established to support the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) and the work of the Scientific and Technical Advisory Group of the United Nations Office for Disaster Risk Reduction (UNISDR). One of the recommendations was to form a research roadmap for the next decade.

To further realize these goals, GADRI join hands with research institutes around the world. Since March 2015, GADRI's membership has expanded to nearly 100 member institutions around the globe.

GADRI Secretariat is currently hosted by the Disaster Prevention Research Institute (DPRI), Kyoto University, Uji Campus, Kyoto, Japan.

Area	Members
Europe	13
Africa	5
Americas	14
Oceania	4
Asia(excl. Japan)	42
Japan	25
TOTAL	103 (31 States)

Regional Distribution



To Join GADRI:

Write to the GADRI Secretariat—secretariat-gadri@dpri.kyoto-u.ac.jp.

Membership is Free; and completely voluntary and non-binding.

GADRI
Global Alliance of Disaster Research Institutes

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