TOHOKU UNIVERSITY

Report of the

APRU-IRIDeS
Multi-Hazards Program
2017 Summer School

IRIDeS International Research Institute of Disaster Science

APRU

Report of the APRU-IRIDeS Multi-Hazards Program 2017 Summer School

18-21 July 2017

Tohoku University

Sendai, Japan

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Background

The 5th APRU Multi-Hazards Summer School was held at Tohoku University on 18-21 July 2017. Nearly 40 participants from 10 countries participated in the event to learn the lessons-learnt and experience from the 2011 Great East Japan Earthquake and Tsunami, the recovery efforts in the affected areas and discuss the contribution of academia in the implementation of the Sendai Framework for Disaster Risk Reduction (SFDRR).

The Association of Pacific Rim Universities (APRU) is a network of 49 premier research universities from 16 economies around the Pacific Rim. The International Research Institute of Disaster Science (IRIDeS) in Tohoku University was established in April 2012 as a new integrated interdisciplinary research team aiming at conducting world leading research on natural disaster science and disaster mitigation leaning from and building upon past lessons in disaster management from Japan and around the world. IRIDeS also provides secretariat services as the regional program hub to the MH Program.

The APRU-IRIDeS Multi-Hazards (MH) Program was established in April 2013. The Pacific Rim region has high risks to natural disasters and the universities and research institutes in the region are expected to contribute to reducing disaster vulnerability and risks and strengthening disaster management capacity to tackle these challenges. The Program aims to harness the collective capabilities of APRU universities for cutting-edge research on disaster risk reduction (DRR) as well as contribute to international policy making processes on DRR. The Summer School is one of the key activities under the MH Program.

The key activities of the MH Program include:

- Organization of the annual summer school
- Organization of the annual APRU MH Symposium
- Foster collaboration in disaster research and information/data sharing between APRU universities
- Contribute to DRR discussions at international and regional levels and to a policy making process.

The Sendai Framework for Disaster Risk Reduction (SFDRR) adopted at the UN World Conference on Disaster Risk Reduction held in Sendai, Japan in March 2015 emphasized the importance of the role of academia in focusing on the disaster risk factors, increase research for regional, natural and local application, support action by local communities and support the interface between policy and science for decision-making. It is extremely important for academia to work with different stakeholders to play such key roles. This summer school is designed to learn from the experience of local government, NGO as well as academia and include the lectures not only from the natural science aspect but also the social science

aspect to enable the participants to understand the diversified elements of DRR. The IRIDeS continues to host the MH program and contribute to strengthening the disaster science research and contribute to discussions at international and regional levels to make an influence on DRR strategy and policy in the region.

ACKNOWLEDGEMENT

IRIDeS as the main organizer of this summer school would like to extend a sincere appreciation to the participants and speakers from different sectors who shared wonderful experiences and knowledge regarding DRR issues from different perspectives. Their involvement and participation made a great contribution to the success of this event. In addition, IRIDeS received tremendous support from the APRU secretariat based in Hong Kong as well as Tohoku University. The organizer is also grateful for valuable suggestions and advices provided by the faculty members of IRIDeS on the program development and planning.

Lastly but not least, this summer school was never implemented without hard works and considerable support by the International Exchange Division of Tohoku University, the Administrative Office of IRIDeS, and the International and Domestic Liaison Office of IRIDeS.

OPENING REMARKS

Prof. Susumu Satomi

President of Tohoku University

It is a great pleasure for me to welcome you to Tohoku University for "APRU-IRIDeS Multi-Hazards Summer School Program".

It has been already 6 years since the Great East Japan Earthquake and Tsunami happened on March 11, 2011. Due to the warm support from all over the world, the recovery efforts have greatly progressed. Tohoku University has been also playing an important role in the recovery process. You will visit Onagawa town on 20 July as a field trip and can see their recovery efforts. I hope this summer school will give you an opportunity to consider and discuss what we can do to strengthen the disaster risk reduction capacity.

The establishment of the International Research Institute of Disaster Science (IRIDeS) under Tohoku University is one of our commitments to share our knowledge and experiences globally. IRIDeS also launched the Multi-Hazards Program together with APRU in April 2013. Since then, IRIDeS became the program hub and coordinates the program activities. This summer school is one of the major events under the Multi-Hazards Program.

In March 2015, the UN World Conference on Disaster Risk Reduction was held in Sendai. More than 10,000 (ten thousand) people participated in this event. Tohoku University made significant contributions to this Conference by participating in its preparation and organizing many events. At the end of the Conference, "the Sendai Framework for Disaster Risk Reduction" was adopted. It will be a guideline for the implementation of disaster risk reduction in the next 15 years. I expect that you will discuss universities' role and contribution in its implementation process during this Summer School.

After the World Conference, Tohoku University established the Global Center for Disaster Statistics in collaboration with the United Nations Development Program (UNDP). The objectives of the Center include: developing national systems of disaster statistics and monitoring disaster reduction targets and indicators of the Sendai Framework for Disaster Risk Reduction. Also, the World Bosai Forum will be organized in November 2017 in Sendai to share good practices and knowledge on disaster risk reduction and to discuss the implementation of the Sendai Framework for Disaster Risk Reduction with various stakeholders.

To conclude, I would like to thank the APRU secretariat for their kind support and cooperation. I wish you every success for this summer school program. Thank you.

Prof. Fumihiko Imamura

Director, Prof. of Tsunami Engineering, IRIDeS, Tohoku University

Good Morning distinguished guests, President Satomi, Christina from the APRU International Secretariat, dear speakers, and participants. I am Fumihiko Imamura, the Director of IRIDeS and a professor of Tsunami Engineering. As you know, in 2011, the Great East Japan Earthquake and Tsunami caused huge damages in the Tohoku region. In addition to that, after that tsunami, fires and the nuclear accident in Fukushima occurred. It was a series of disasters that nobody had experienced before. The experience and lessons learnt from the 2011 disaster have to be shared widely in order to contribute to preventing future disaster damage.

Just one year after 2011, Tohoku University established a new research institute and named it International Research Institute of Disaster Sciences (IRIDeS). After the new IRIDeS building was established, various events were organized such as the APRU multi-hazards summer schools and other workshops, inviting many researchers and professors to strengthen international collaborations.

Two years ago, in 2015, the United Nations World Conference on Disaster Risk Reduction was held in Sendai. It brought more than 150,000 participants, including the public. At the conference, disaster issues as well as development and climate change issues were discussed. These three phenomena are very serious threats and are important issues in the global agenda under the strategy of United Nations. As a result of this conference, the Sendai Framework for DRR was adopted, becoming the international DRR strategy for the next 15 years.

This year, our summer school celebrates its fifth year. The summer school has been an opportunity to share experiences from the 2011 disaster and discuss what we can do to mitigate future disaster risks. We should have in-depth knowledge and experience in DRR to prevent disaster damage. Nevertheless, in the beginning of this month, the Kyushu region, in the southern part of Japan, was hit by heavy rains that caused landslides. As a consequence, approximately 30 people were killed. This damage was caused by unpredictable weather and also a lack of risk management. Including such experience, the lessons we have learnt need to be shared with different stakeholders such as local government, the private sector, NGOs, and academia. In the summer school, speakers and lecturers are invited from these different sectors.

I wish you will have a good experience with us, learn various things, and gain opportunities to think about future disaster mitigation through this summer school. Thank you very much for your participation and I hope this will lead to further collaborations.

Ms. Christina Schönleber

Director (Policy & Programs), International Secretariat, Association of Pacific Rim Universities (APRU)

Dear President Satomi, EVP Ueki, Professor Imamura, distinguished speakers, colleagues and participants.

It truly is a pleasure for me on behalf of Secretary General Chris Tremewan and the APRU International Secretariat to welcome researchers, students, government officials and practitioners from Japan and across the Asia Pacific region to this 5th Annual MH Summer School hosted by Tohoku University's International Research Institute of Disaster Science, IRIDeS here at Sendai.

Sendai has been subject to several major earthquakes, most recently the Great East Japan Earthquake. Following this devastation Sendai has stood out for its resilience and expertise in rapid restoration of utilities, roads and homes.

APRU are thus very proud that the International Research Institute of Disaster Science here at Tohoku University, is the host and convener of the APRU Multi Hazard Program Hub and as part of this organizes and hosts this annual Summer School. The aim of the APRU MH Hub is to harness the research capabilities in DRR of APRU member universities around the Pacific Rim with the aim to address the shared threats of earthquakes, tsunamis, typhoons and other natural disasters that threaten this region. Over the past 4 years our colleagues from the Multi Hazard Program Hub, led by Fumihiko Imamura, coordinated by Associate Professor Takao Izumi and supported by its international Advisory Group have greatly contribute to shaping the international decision and policy making process for DRR.

APRU consider Capacity building a key objective of this process including informing future leaders about key challenges of the Asia-Pacific region to guide their thinking how to address these through research, policy development and on the ground impact. This MH Summer School, is a very important activity for doing just that; informing and guiding you the future leaders of the region by sharing latest knowledge and insights from the perspective of all stakeholders engaged in DRR. For this reason, I am really happy to see so many participants coming together from all over the region to engage and learn from this Summer School.

To conclude I would like to thank Tohoku University and IRIDeS for their dedication and expertise in continuing to develop the MH Program and achieving such far reaching impact.

I wish you all a successful and highly engaging week.

PRESENTATIONS

International DRR Policy Making at the United Nations

Yuichi Ono

Professor, IRIDeS, Tohoku University

In 2005, Japan hosted the United Nations World Conference on DRR (WCDRR) where the Hyogo Framework for Action (HFA) was adopted by 168 countries. After 10 years, in 2015, another WCDRR was held in Sendai, Japan, and the Sendai Framework for DRR (SFDRR) was adopted by 187 countries. The SFDRR includes four priorities for action:

Priority 1. Understanding disaster risk

Priority 2. Strengthening disaster risk governance to manage disaster risk

Priority 3. Investing in DRR for resilience

Priority 4. Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.

In addition, the new elements were included in the SFDRR as global targets.

a. Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortalities between 2020-2030 compared to 2005-2015.
b. Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared to 2005-2015.
c. Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.
d. Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030.
e. Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.
f. Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030.
g. Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030.

To measure the progress of the SFDRR implementation, it is crucial to set targets and to have an accurate estimate of disaster damage and loss data. In the current situation, some of the participating countries do not have a disaster data-collection system to collect, archive, analyze, and use the disaster damage and loss data and, therefore, might not be equipped with the same for a long period. Therefore, there are many policies that have not been developed based on accurate disaster data. Specifically, data on small-scale disasters are missing. In the SFDRR, the member countries are expected to report the progress of the SFDRR implementation to the UN; the government requires the disaster damage and loss data and its system to be developed in order to compile a report. In the process, the academia, science, and technology communities can also provide the government with support for analyzing the data and developing recommendations.

1. Global initiatives related to DRR

World Conference on Disaster Risk Reduction

- WCDRR is a UN conference to establish a strategy to reduce disaster risks
  - Disaster: Disaster caused by natural hazards
- Major update in the 3rd Conference was the "7 Global Targets"

1994 1st Conference at Yokohama
Yokohama Strategy
"6 Plan for action"

2005 2nd Conference at Kobe
Hyogo Framework for Action
"3 Strategic goals"
"5 Priorities for Action"

2015 3rd Conference Sendai
Sendai Framework for Disaster Risk Reduction
"7 Global Targets"
"4 Priorities for Action"

1. Global initiatives related to DRR

Sendai Framework for Disaster Risk Reduction

- Adopted 7 "Global targets"

(a) Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020–2030 compared to the period 2005– 2015;

(b) Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 in the decade 2020–2030 compared to the period 2005–2015

(c) Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030

(d) Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030

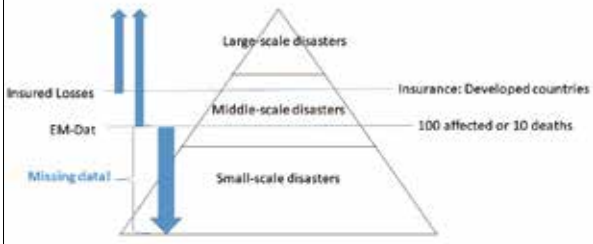
(e) Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;

(f) Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of the present Framework by 2030

(g) Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030

Fact:

Larger-scale disasters are well reported while smaller-scale ones are not



Conclusions

- Sendai Framework for Disaster Risk Reduction, 2015-2013 made further steps to promote pre-action, emphasizing importance of investment
- Countries are to set up a system to monitor progress on disaster risk reduction (disaster damage and loss data) based on the indicators and terminology by 2020, but many are not ready and seeking assistance
- Science and Technology community should provide analytical inputs to policy making in DRR, but the linkage is weak in many countries
- Global Centre for Disaster Statistics provides support in archiving and analyzing national disaster damage and loss data to develop policy in DRR

Social and media interests on basic properties of tsunami andremaining issues on tsunami warning and evacuation

Anawat Suppasuri

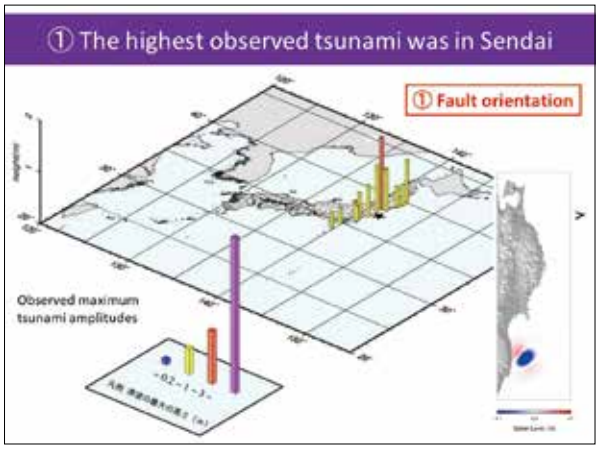
Associate Professor, IRIDeS, Tohoku University

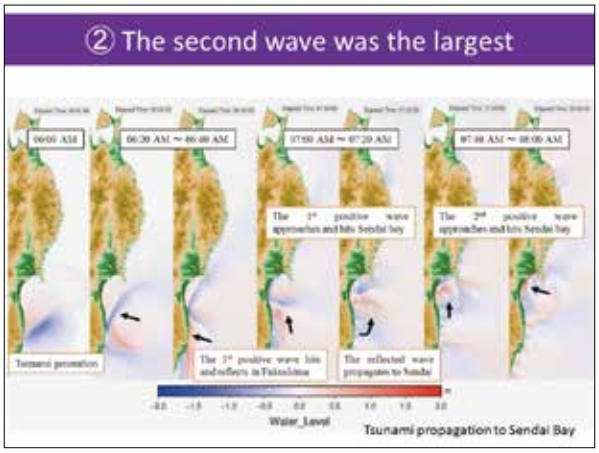
There were many improvements after the 2011 Great East Japan Earthquake and Tsunami such as new ideas of tsunami classification (Level 1 & 2), new design guideline for coastal defense structures and evacuation buildings, new observation technologies and new warning contents and expressions. However, the 2016 Fukushima earthquake and tsunami was the highest tsunami event since 2011. This tsunami only caused some damage to marine properties, no damage in inland areas but presented several new issues of tsunami generation mechanism and propagation, as well as of organizational responses such as evacuation procedures and tsunami dissemination. Several issues related to this tsunami are being explained and discussed below.

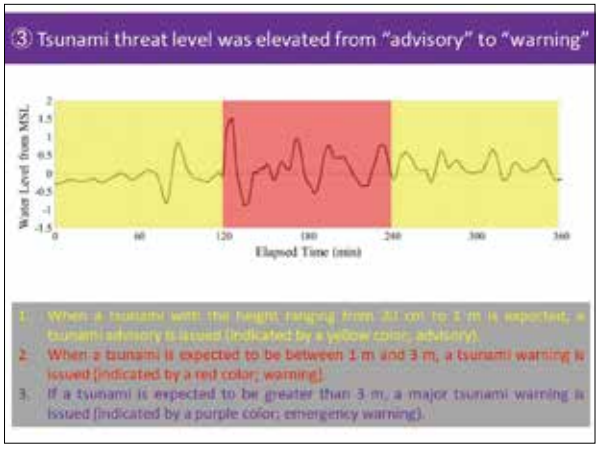
(1) Despite the earthquake's epicenter located in Fukushima Prefecture, the highest observed tsunami was in Sendai, Miyagi Prefecture. One main reason for this was because of the fault orientation that was facing to Sendai. In other words, the tsunami wave energy was spread directly towards coastal areas near Sendai including wave refraction into Sendai bay. (2) It is commonly understood for ordinary persons that the first wave of a tsunami is the largest wave, however, the second wave observed at Sendai Port was the largest wave. In addition to the fault orientation, which focused the tsunami into Sendai Bay, wave reflection and refraction were other contributors. Sendai Bay is a very shallow and wide bay. Due to this coastal topography, the waves are amplified due to wave shoaling and refraction inside the bay. Also, superposition of the incoming and reflected waves from the Fukushima coast played a role. (3) A threshold value of tsunami height for tsunami advisory and tsunami warning is 1 m. In Miyagi Prefecture, the tsunami threat level was then elevated from “advisory” to “warning” two hours after the earthquake occurrence because the observed 1.4 m of the second wave. This caused some difficulties to local residents for such sudden change of the tsunami treat level as well as decision-making due to controversial evacuation suggestions from the local authorities. This issue raised attention towards revising the evacuation guideline in the future. (4) In general, the tsunami height can be amplified or enlarged up to 2–4 times during the runup process. Based on our preliminary survey, tsunami runup higher than the observed tsunami wave amplitude of 1.4 m at Sendai Port was measured at several sites. The reasons for such high runup are the shape of the port trapping the first wave before the arrival of the second wave, the tsunami occurred during a flood-tide stage that help pushing the wave inside the port and the existing gentle sloop that assisted wave runup.

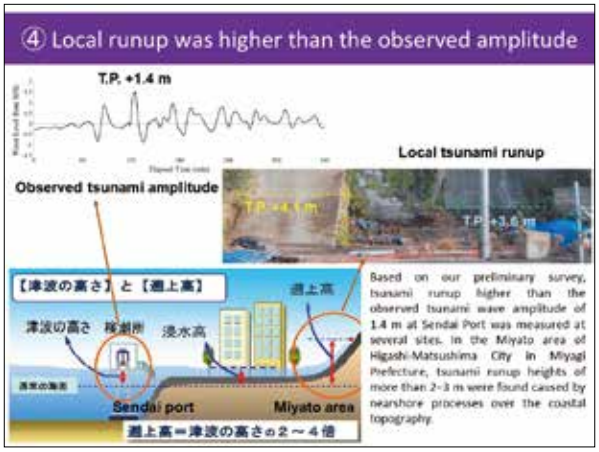
As stated above, although these four issues are basic properties of tsunami that are commonly known to all tsunami or disaster experts, much attentions were paid by social and media which all issues might not commonly known for them. Especially the last issue, many people do not understand the difference between the two types of tsunami measurements, (a) tsunami wave amplitude measured at a tide station and (b) tsunami runup measured on land. These two types of measurements should not be confused or directly compared because their definitions are different. Nevertheless, this can be a lesson as the tsunami runup is higher than the observed tsunami amplitude. Therefore, people should keep this fact in mind and

should act or evacuate accordingly. Role of medias is very important to also convey such measurement definition together with other warning related information for safer action against future tsunamis.









Housing Recovery Six Years after the 2011 Great East Japan Earthquake

Elizabeth Maly

Associate Professor, IRIDeS, Tohoku University

The 3.11 Great East Japan Earthquake and Tsunami was a triple disaster—earthquake, tsunami, and nuclear meltdown—causing devastation in the Tohoku region. The disaster struck and recovery is occurring within the multiple contexts of society, geography, and disaster history in Japan and the affected region. 6 years after the disaster, community and housing recovery is underway, but challenges remain.

Ongoing Town and Housing Recovery

Vulnerable to many and frequent disasters, Japan also has established laws, policies and precedents for disaster recovery. However, the scale of GEJE, and the corresponding recovery was unprecedented, and the national government created a Reconstruction Agency, and a menu of 40 recovery projects fully funded by the national government. Municipal governments are responsible for making the recovery plans for their towns, choosing from these projects. Most municipal governments' recovery plans include collective relocation for disaster mitigation (which includes providing lots for private housing reconstruction as well as public housing) (Figure 1) and construction of disaster recovery public housing (Figure 2).

More complicated recovery in Fukushima

Because of the nuclear meltdown at Fukushima Daiichi Nuclear Power Plant, radioactive contamination has led to long term displacement for evacuees. Compared to Iwate and Miyagi Prefectures, which suffered the most severe tsunami damage, the situation and challenges faced by evacuees in Fukushima is complex. In the first few years after the nuclear meltdown, two of the differences that show additional challenges for Fukushima evacuees are shown in Figure 3.

1) The higher number of "indirect deaths" compared to direct tsunami deaths, reflecting the stress and negative impact of multiple, prolonged, and uncertain evacuation. 2) The large number of people who evacuated outside their home prefecture. This leads to more complications to provide and access support. In addition, since the Japanese government makes a distinction between "official" evacuees (who are from areas with official evacuation orders) and "voluntary" evacuees (who decided to evacuate away from their hometowns although these areas have been designated "safe"). As the evacuation zones are revised, people from these areas will lose their access to government support.

Fukushima Prefecture is in the process of constructing public housing as follows: 2,807 units for earthquake/ tsunami evacuees (95% done as of 2.2017); and 4,890 units for nuclear evacuees (66% done as of 2.2017) (Source: Fukushima Pref. as of 2.2017)

Overall Characteristics and Challenges for Tohoku Recovery

- Recovery in coastal areas of Tohoku faces various challenges, including the fact that the disaster area is not uniform, but rather made up of large cities and small towns, areas that have merged with other municipalities. Adapting standard recovery policies to local conditions was/is difficult.

- Socially, the Tohoku region was also facing the situation of population aging even more rapidly than Japan overall; in some places, disaster is speeding up the process, as young people may not move back to former hometowns.
- Before the GEJE, many households in the disaster area traditionally lived in large single family detached homes. It is difficult to rebuild in a similar way on their own, or by using government supported housing recovery programs. The resulting change in living environments could be especially difficult for elderly residents to adjust to.
- The reliance on relocation to high land areas is difficult for many reasons, including the fact that housing relocation programs do not include any other uses, making it impossible to recreate mixed use pre-tsunami communities with integrated housing, businesses, and shops.
- Large scale investment in infrastructure relocation (mountaintop cutting, land preparation) is disproportionate to future residential population, the futures of new residential areas may not be sustainable in the future.
- Finally, nuclear contamination means long-term relocation, a globally unprecedented situation with no easy solution.

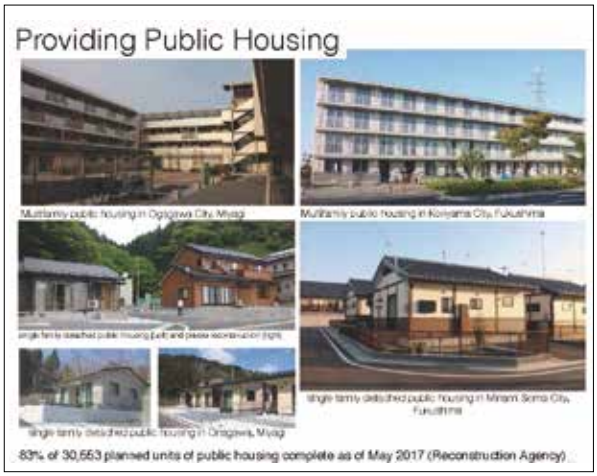


Figure 1. (left) Recovery planning, which relocates residential uses to highland areas. Residential lots for private rebuilding by homeowners are provided for sale or rent, as well as Disaster Recovery Public Housing.

Figure 2. (Right). Public Housing is provided in multi-family apartment style buildings, as will as single family detached houses in more rural areas such as fishing villages.

Figure 3. Additional challenges for Fukushima evacuees compared to those from Iwate and Miyagi prefecture are reflected by the higher number of “indirect deaths” compared to direct tsunami deaths, and the large number of people who evacuated outside their home prefecture.

Eight Personal Characteristics Associated with the Power to Live with Disasters as Indicated by Survivors of the 2011 Great East Japan Earthquake Disaster

Motoaki Sugiura

Professor, IDAC/IRIDeS, Tohoku University

People perceive, judge, and behave differently in disasters and in a wide range of other difficult situations depending on their personal characteristics. The power to live, as captured by characteristics that are advantageous for survival in such situations, has thus far been modeled in arbitrary ways. Conceptualizing such characteristics in more objective ways may be helpful for systematic preparations for future disasters and life difficulties. Here, we attempted to identify the major factors of the power to live by summarizing the opinions of survivors of the 2011 Great East Japan Earthquake disaster. We conducted personal interviews with 78 survivors about their survival experiences and elicited their opinions about the power to live as relevant to those experiences. We then incorporated these opinions into a questionnaire that was completed by 1400 survivors. Factor analysis identified eight factors related to the power to live: leadership, problem solving, altruism, stubbornness, etiquette, emotional regulation, self-transcendence, and active well-being. All factors showed significant associations with one or more measures of survival success in the disaster.

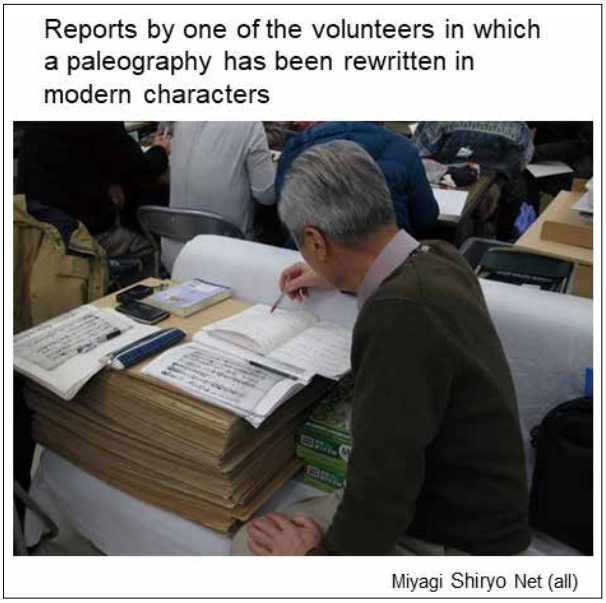
Based on this eight-factor framework and using the obtained inventory, we are currently advancing three frontiers in the science of disaster mitigation and recovery. First, we are pursuing the possibility of using the inventory as a novel tool for disaster education, exploiting the fact that the framework is the ultimate summary of the survival experience. Second, expecting the potential of the inventory as a tool for measuring personal resources in disaster survival, the relationships between the factor scores and survival-relevant behavior are under validation in behavioral experiments. Finally, we are conducting functional neuroimaging studies on each factor to obtain its process-level understanding, hoping for its inspiring innovative technologies to enhance and utilize these factors.

Building Resilience and Social Capital in Disaster-affected Communities

Daisuke Sato

Associate Professor, IRIDeS, Tohoku University

In Japan, there are many old historical documents held by local residents in each local community. Estimated 200 billion records is one of the historical and cultural characteristic of Japan. Now modern social changes have destroyed these old networks, mega-disasters like 3.11 make things worse. Sato's lecture showed the rescue activities of historical document in the 3.11 disaster area, and the meaning of this, not only rescue materials themselves, but also as psychosocial support for people.



Meeting of the rescue mission for Honma's warehouse

Sato Toshihiro

Role of various stakeholders in disaster risk reduction

Takako Izumi

Associate Professor, IRIDeS, Tohoku University

The implementation of DRR requires the collaboration of various stakeholders such as governments, UN agencies, international and regional organizations, the private sector, academia, and communities. Each stakeholder has an important role to play in its contribution to DRR. The role of academia is stated in the SFDRR:

1) Focus on the disaster risk factors and scenarios.
2) Increase research for regional, national, and local applications.
3) Support action by local communities and authorities.
4) Support the interface between policy and science for decision making.

In particular, the third and fourth roles could be challenging for academia. A survey was conducted in 2016 by the UNISDR Asia, Science, Technology, and Academia Advisory Group (ASTAAG) across 11 countries on the degree of application of science and technology, particularly in the following three areas:

1. Science and technology in decision making.
2. Investment in science and technology.
3. Link of science and technology to people.

The lowest score was in the third area, "Link of science and technology to people." The results, hence, implied that science and technology did not have a sufficient link to people and had not been used. To improve this situation, the International Research Institute of Disaster Science (IRIDeS), Tohoku University, has been making efforts especially on the following:

1) Education, research, and social contribution.
2) Making the best use of research results for practical actions.
3) Strengthening collaboration with local governments and communities.

It is crucial to remind people that science and technology cannot solve everything as it has limitations. It is also necessary to address DRR issues as social problems and to develop solutions with a social approach. This requires academia and universities to reform their thinking while considering their roles.

- To understand the current status of S&T involvement in 11 countries

Science and Technology Application: Japan

1. S&T in decision making: 85 (out of 100)
2. Investment in S&T: 73
3. Link of S&T to people: 69

- DRR measures in Japan focus on major cities not local areas – *where the population of elderly people is high is one of future challenges.*
- Detailed DRR strategy is not yet applied or developed. Compared to earthquake countermeasures, *any DRR technology to reduce landslides risks have not been developed yet.*
- It is critical to link technical and human society together. It is challenging to deliver science to elderly people in a user-friendly manner. *It is necessary to address the issue as a social and welfare matter* not only just as a disaster-related issue.
- It is important to address DRR issues as social problems and to develop solutions with social approach. It requires *the reform of the way of thinking among academia and universities regarding their roles.*

Lessons from past major disasters

- **From building safety to human safety:** *How to save human lives, not to save buildings*
- **Multi-disciplinary research:** *incorporation of social and cultural studies to be linked to engineering and science based research*
- **System resilience approach:** *to investigate the most weak or vulnerable point of a system*
- **Understanding limitation of science:** *it is also a lessons-learnt from the Great East Japan Earthquake and Tsunami*

Challenges and Needs in Science and Technology

(from the UNISDR Science and Technology Conference on DRR)

1. Scientific findings should be framed and presented in a concise and understandable fashion;
2. Assumptions and uncertainties need to be better clarified and communicated;
3. There is a need for translating scientific findings into concrete actionable steps and tools for science-based decision-making;
4. There is a need for enhancing the role of social science to better understand the governance of disaster risks.

Disaster Prevention Learning in Elementary School after the Great East Japan Earthquake and Tsunami

Kiyoshi Araake

Principal, Takaya Elementary School in Watari town

After the Great East Japan Earthquake and tsunami, the elementary schools in Miyagi prefecture have been educating students about DRR from a new perspective.

The basic idea of this education is to teach young children what disaster is, what kind of damages are caused, and what we can do to mitigate the risks through events and topics familiar to them. The students also learned about the recent major earthquake in Kumamoto, Japan.

In addition, the students learned about the Great East Japan Earthquake and tsunami; however, many of the current elementary school students did not remember the disaster because they were too young when it occurred. Therefore, it is important to provide DRR education as a part of other regular subjects. This will help students learn both the subject and DRR education in a correlated manner.

For example, a tsunami is called "tsunami" in English, too. Therefore, the students in the fifth and sixth grades learn about tsunamis in their English class, facts such as a tsunami covers a distance of 100 meters in 10 seconds, which is as fast as Olympic runners. It teaches the students that they cannot win the race against a tsunami, just as they cannot win against a famous Olympic runner. In this way, the students can realize that once a tsunami hits, they will get caught in it. In math class, the students compare 30-centimeter rulers to their own bodies to understand how high a 30-centimeter wave is. Even a small tsunami of 30 centimeters can wash people away. Simultaneously, the students can feel how strong the water pressure is in their swimming classes during the summer.

In this way, the DRR education can be introduced in regular subjects such as English, math (recognizing quantity), science (action of water), and social studies (geography and Japanese constitution). Furthermore, besides DRR education, some emotionally stirring stories regarding the disaster are shared with the students so as to affect their feelings. For example, a sad experience was shared where a digital camera with priceless memories was lost when it was washed away by the tsunami. Moreover, appreciative statements, like expressing gratitude for the relief aid and for the volunteers after the 2011 disaster, were shared in the class. It is important to encourage the children's initiative to support others in the disaster and to offer a helping hand to their friends when they are in trouble. Although the objective of our DRR education is "protecting lives," it also aims to materialize the healthy growth of children's minds through education.

In the Great East Japan Earthquake and tsunami, great amount of private property was lost and people were forced to live under difficult conditions; however, simultaneously, people tried to get creative to survive under these inconvenient and difficult circumstances. In the class for the students who have not experienced the 2011 disaster, it is taught that tremendous recovery efforts were made possible for people to get back to living their life, which is extremely precious.

Memories of the disaster（Mar.13）

First supplies delivered on the 3rd day

●Bread　　Evacuees

145 ÷ 870

（How much can each person eat ?）

Memories of the disaster（Mar.13）

First supplies delivered on the 3rd day

This is the amount one person could eat each day.

The school had protected us from the big earthquakes.

It finished resistance construction in 2010.

But, it couldn't beat Tsumami

Lesson <3>

learnt from the Great East Japan Earthquake and tsunami

- *The elderly*
- *The disabled*
- *Infants*
- *The sick and injured*

…are vulnerable to a disaster and distressed.

Towards disaster risk reduction city – Tagajo ~Disaster-resilient city~

Takumi Fujimura

Bureau of Reconstruction Promotion, Office of Mayor, Tagajo City

Tagajo City is located in the eastern region of Miyagi Prefecture near Sendai City, about 12 kilometers away from central Sendai, with a population of 62,000. Tagajo City was greatly damaged by the Great East Japan Earthquake and Tsunami in 2011. The tsunami hit the city approximately one hour after the earthquake. The highest wave reached 4.6 meters. One-third (662 ha) of the city was inundated by water, and about 12,000 people fled to evacuation sites such as schools.

A severe and inconvenient evacuation life started. As a result of the tsunami, a total of 188 precious lives were lost, and over 11,000 houses were destroyed in the city. Factories and offices in the industrial area were almost totally destroyed. Before the Great East Japan Earthquake and Tsunami, it was estimated that there was a 99% probability of an earthquake within 30 years off the coast of Miyagi Prefecture. Therefore, citizens were relatively prepared for earthquakes, and most were aware of how terrifying tsunamis were. At the same time, however, most people knew that Tagajo City was never affected by tsunamis in the past, and thus adopted the mentality that Tagajo would be unaffected even after the large-scale tsunami warning was issued. As a result, some people did not evacuate quickly, and others who evacuated by cars were caught in traffic jams, causing many injuries and loss of lives.

There are four major points in the DRR city strategy.

1. "Developing a disaster-resilient city." Four strategies have been drawn up, centering on the construction of infrastructure.
2. "Increasing DRR capability based on self-help and mutual help." Two strategies have been implemented so that citizens and local communities can cope with disasters by themselves, rather than depending fully on local administrations.
3. "Sharing disaster experience." The aim of this strategy is to pass on the experience of disasters accurately to future generations so that they are not forgotten.
4. "DRR technology." This is a strategy that enables companies to maximize their strength and be involved in projects that only regions damaged by the disaster can engage in, enabling these areas to turn the disaster experience into something productive and positive.

Under the four goals, eight implementation strategies were established.

Strategy 1: "Building multiple barriers for tsunami."

Although sea walls will be constructed along the coast as a result of the damages seen in the 2011 disaster, these are only sufficient to cope with tsunamis that will strike once in 100 years. Therefore, when a huge tsunami that occurs once in 1,000 years strikes, overflow and flooding will result. This strategy aims to overcome this situation by considering evacuation as the basic policy, even though multiple barriers will be built. Specifically, main projects include the development of evacuation announcement facilities to send information accurately and swiftly, the construction of evacuation roads, the designation of temporary

escape buildings to rescue people who are unable to evacuate, and the building of barriers to reduce the force and speed of tsunamis.

Strategy 2: “Developing earthquake-resilient city.”

This strategy aims to increase earthquake-resistant roads and bridges, and to promote the retrofit of wooden buildings to make them earthquake-resistant.

Strategy 3: “Minimizing flood damage.”

There is a higher risk of flooding due to the fact that the ground has sunk after the Great East Japan Earthquake and Tsunami, and due to a recent trend of heavy rain in a short period of time. To overcome this problem, projects such as the development of a rainwater draining system and the construction of new rainwater drain pumps have been planned.

Strategy 4: “Developing a disaster response system.”

During the Great East Japan Earthquake and Tsunami, the number of people who evacuated was far greater than previously estimated. Thus, evacuation support was insufficient. By reflecting on that experience, we have reviewed our disaster response system.

Strategy 5: “Enhancing self-help ability.”

The aim of this strategy is to enable citizens themselves to prepare for disasters. Paired with Tohoku University’s International Research Institute of Disaster Science, we have developed the DRR handbook that outlines measures on how to cope with and prepare for disasters. We have been holding classes for citizens making use of this handbook.

Strategy 6: “Strengthening community DRR capacity.”

This strategy aims for the improvement of DRR capacity, as well as mitigation of local communities by such tactics as voluntary emergency drills.

Strategy 7: “Sharing disaster experience.”

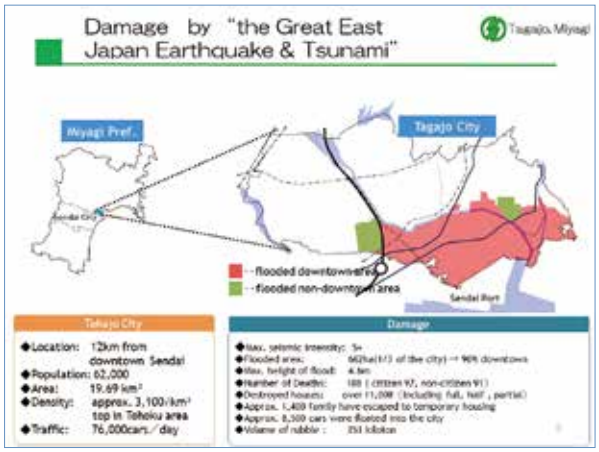
Many pictures of the 2011 disaster were taken, and it is crucial to preserve and compile those records carefully, and to share it with future generations.

Strategy 8: “DRR Research Park Program.”

This strategy seeks to promote DRR technology development as well as the accumulation and creation of industries using DRR technology by utilizing space created from factories damaged by the earthquake.

As well as to promote the DRR city strategy, the city felt the need to enhance urban development to accomplish recovery and reconstruction. For this reason, the Tagajo City Library was built, combining restaurants, a book store, childcare center and a parents' support center. The aim is to create the best cultural hub in the Tohoku region.

Tagajo City experienced tremendous loss due to the tsunami. To change the way of thinking from negative to positive to promote urban development, the city will go on with strong determination to carry out DRR measures and reconstruction.



The Power of Localization

Takeshi Komino

General Secretary, Church World Service (CWS) Japan

The Christian World Service (CWS) started its operation in 1945. CWS Japan has three operation pillars: humanitarian development assistance, advocacy and capacity building. In addition, it has been contributing to the implementation of the Sendai Framework for Disaster Risk Reduction (SFDRR).

The recent disaster trend shows the death toll decreases and economic loss increases. No sufficient attention is given to the capacity and investment to address underlying risk drivers. At the World Humanitarian Summit (WHS) held in 2016, it was emphasized that nearly 70 million people have been forced from their homes due to conflict and violence. In the last two decades, 218 million people each year were affected by disasters. In order to change these situation, innovation and changes are necessary. Business as usual is not going to address humanitarian needs.

In this sense, "localization" could be a key. Charter of Change and Grand Bargain resulted from the WHF indicated that 20-25% of humanitarian funding should be allocated to local agencies. Currently, the budget goes to local stakeholders less than 0.1 %. Since the financial resources for humanitarian sectors is not increasing, the limited funding needs to be mobilized efficiently and effectively. Locals understand the contents and context as well as tradition and culture, therefore, they could know better how to mobilize and use the resources. In addition, localization requires multi-sectoral collaboration to develop a new idea for solution together.

There are many case studies that highlight the value of these partnerships: Combining DRR awareness and peace building in Afghanistan, Cross-boundary flood risk sensitization in Nepal/India, National NGOs as part of country's disaster management mechanism in the Philippines etc.

However only a single NGO or organization cannot do everything, but there are many things that a network can do. It can be a platform for knowledge, provide a support mechanism and facilitate innovation. The ultimate goal and role of NGOs will solve the unsolved. For that purpose, multi-sectoral collaboration including academia and the private sector is indispensable.

World Humanitarian Summit Consultations

- Nearly **72 million people**, half of them children, have been forced from their homes due to conflict and violence.
- In the last two decades, **218 million people** each year were affected by disasters; at an annual cost to the global economy that now exceeds **$300 billion**.
- Build hope and solutions by investing in preparedness, **managing and mitigating risk**, reducing vulnerability, finding durable solutions for protracted displacement, and **adapting to new threats**.

- *Business as usual is not going to address humanitarian needs.*
- *Increase in disasters →More risks to industrial sites.*
- *As local as possible, as international as necessary→(Agenda for Humanity – SG Report)*

Localization in our Landscape

- 'Localization' as a hot agenda: Localization mentioned 10 times within SDGs document, 48 times in SFDRR, 9 times in Paris declaration, and 9 times in WHS outcome document.
- Charter for Change and Grand Bargain discussion indicated that 20-25% of humanitarian funding should be allocated to local agencies.
- Communities are ultimately the ones who will face disasters first-hand.
- The legal backbone of disaster management at the central level has quite advanced during Hyogo Framework for Action (2005-2015), but implementation of the law at the local level still remains a challenge.
- In a meantime, disaster losses are increasing everyday in Asia.

The Role of NGO Networks

- **Knowledge – A platform that…**
  - One can feel at home for meaningful participation
  - Can learn from each other
  - Think about and act on collaboration
- **Resources – Support mechanism that…**
  - Allows more programmatic funding towards local organizations
  - Integrate capacity support for those elements that are not strong
  - Intentionally involve from preparedness stage
- **Innovation facilitation that…**
  - Captures innovative elements
  - Amplify best practices to regional/global learning
  - Fosters cross/mutual learning for enhancing capacity

Conclusion

- NGO as a catalyst to **solve the unsolved.**
- NGO as a catalyst for **multi-sectoral collaboration.**
- Partnership based on trust with implementation of **Principles of Partnership.**


Principles of Partnership

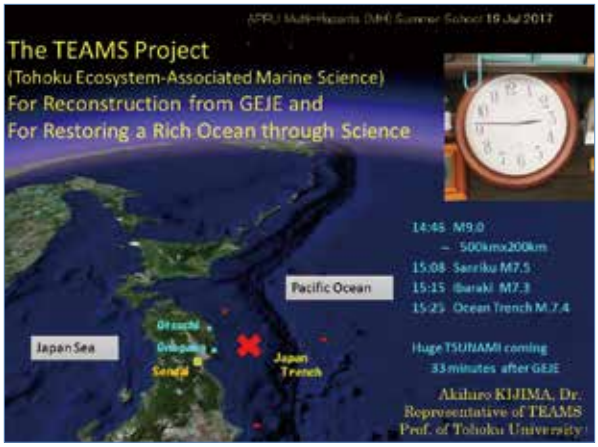
The TEAMS Project (Tohoku Ecosystem-Associated Marine Science) - For Reconstruction from GEJE and For Restoring a Rich Ocean Through Science -

Akihiro Kijima

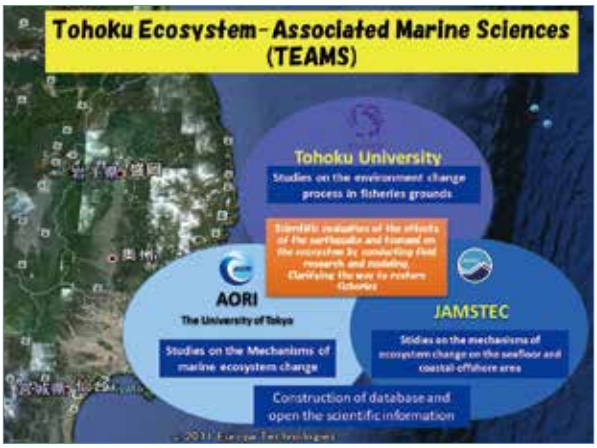
Representative of TEAMS / Professor, Graduate School of Agricultural Science, Tohoku University

The Great East Japan Earthquake on March 11, 2011 (GEJE) caused immense damage to marine ecosystems, both nearshore and offshore, on the Pacific coast of northeastern Japan (Tohoku area). The Tohoku Ecosystem-Associated Marine Sciences (TEAMS) project is the decade-long project to monitor and aid the restoration of marine products in the area by conducting scientific research to clarify the means by which marine bio-resources can be efficiently but sustainably exploited. It is funded by the Ministry of Education, Culture, Sports, Science and Technology in Japan (MEXT). Tohoku University is the central representative member, in collaboration with the Atmosphere and Ocean Research Institute, the University of Tokyo (AORI) and the "Japan Agency for Marine-Earth Science and Technology (JAMSTEC). Over 200 marine researchers from all over Japan are involved. The marine environments and ecosystems are being continuously investigated from coastline to far offshore and from surface to bottom throughout the water column along the Pacific coast of the Tohoku area. The results obtained are open to fishery-related organizations, local governments, and ordinary citizens through regular series of public lectures and symposia.

The TEAMS Project includes the construction of a database contributing to the coordination, management and research to future large-scale disasters within the global community. In the presentation, we would like to explain what happened in marine environment and ecosystem by GEJE, and how to restore from the disaster through TEAMS Project activities.




1.May.2011


Tohoku Ecosystem-Associated Marine Sciences
(TEAMS)
Tohoku University
Studies on the environment change process in fisheries grounds
AORI
The University of Tokyo
JAMSTEC
Studies on the Mechanisms of marine ecosystem change
Construction of database and open the scientific information

Forecasting and Nowcasting Major Earthquakes : An Automated Cloud-Based Approach

John Rundle

Distinguished Professor and Senior Advisor to APRU MH Program, Departments of Physics and Geology, University of California Davis

Great natural disasters are increasing in their impacts primarily because of the movement of growing populations into at-risk regions. In addition, the rising expense of coping with these problems is falling more and more on the public rather than on governments, which are often overwhelmed by the expense and complexity of the problem. The most obvious case of this is Haiti, whose recovery from the 12 January 2010 M7.0 Port-au-Prince earthquake remains problematic.

The World Wide Web offers many new and unique opportunities to address problems and challenges associated with great natural disasters. These examples of complex natural dynamics often occur as cascading events, such as the failure of the Fukushima reactors following the March 11, 2011 M9.1 Tohoku earthquake. Great destructive events typically involve four phases: Anticipation, Mitigation, Response and Recovery. Each of these phases has time scales associated with them, and each requires distinct approaches and technologies to address them. The Anticipation phase involves forecasting the disaster over a variety of time periods. Intermediate term earthquake forecasting involves time scales of months to decades. Real-time early warning for earthquakes is a special case of Anticipation, but has time scales of only seconds. Real-time warning for hurricane and typhoon landfalls is another special case with time scales of hours. Mitigation occurs over days to years, Response over time scales of hours to weeks, and Recovery over time scales of weeks to years. Solutions associated with these phases utilize special knowledge from a variety of fields in physical science, engineering, social and medical science, and economics and finance.

Modern information technologies have the potential to unify many of these tasks within a common organizational framework. Forecasts are computed using automated computational approaches via data mining and simulations, and are disseminated using IT portal technologies. Planning involves communication and scenario analysis, which can use approaches as diverse as spreadsheet analysis and video gaming. Response involves real-world practice and simulation using first responders and their equipment. And Recovery involves novel financial approaches, financial analyses and market-based approaches.

Overshadowing all of these areas is the availability of modern IT, and in particular, social networking technologies. These played an important role in responding to the disaster of the March 11, 2011 Tohoku earthquake (e.g., http://arxiv.org/abs/1109.1618). Other technologies such as Facebook, Google+, and Instagram illustrate the potential for IT to contribute to solutions in the unfolding cascading processes of major disasters. Yet most of these technologies, designed for the public, are often not well suited to the distinct needs of the disaster management communities.

In this lecture, I discuss new approaches to these problems. These approaches, grounded in a variety of modern IT, involve the computation and global dissemination of data from data-driven forecasts, data-mining, and simulation methods. Development and use of portal technologies, collaboration and social interaction websites, will be critical. Computational methodologies are only useful in a modern context if they are implemented with accessible User Interfaces (UIs). Here we discuss the development and use of these methods as exemplified by four websites, www.openhazards.com, www.quakesim.org, and http://social.openhazards.com.

University Capacity Building to help local government setup Resilience Community

Yi Chi Tan

Professor, National Taiwan University / Director, Center for Weather Climate and Disaster Research

Global warming impacts of climate and environment changes and it increased frequency of extremely weather. It causes not only high frequency of disaster, but raising the high intensity of hazard. For examples, Taiwan 921 earthquake in 1999, South Asia tsunami in 2004, Hurricane Katrina in 2005, United State of Indiana hail stone in 2006, China Sichuan earthquake in 2008, Typhoon Morakot at Taiwan in 2009, Haiti earthquake in 2010, Tohoku earthquake and tsunami in 2011, Eastern Australia in 2012, Typhoon Haiyan at Philippines in 2013, and Bosnia, Serbia and Croatia encountered the most serious floods in past 120 years in 2014. South Asia floods in 2015. Natural hazards threat people's lives and properties are getting more serious. The most serious disaster caused by improper human operations and developments.

Taiwan is also facing the same situation. People are threatened by all kinds of disasters. However, disasters to be completely dependent on government or outside assistance are difficult to relieve. Resilience community awareness of disaster prevention and self-help can reduce disaster losses and enhance the effectiveness of rehabilitation reconstruction. In recent years, governments focus on dealing with resilience communities in Taiwan as well as called academic institutes and non-government organizations together. Therefore, this study presented a practice of cooperation between the local government and universities to promote the resilience community in Taiwan. This practice could bring three advantages as followed: strengthen local government connection to districts and communities, the university could put its non-structural methods into practice and the communities could learn to deal with catastrophic disasters by helping themselves before the government can further assist them.

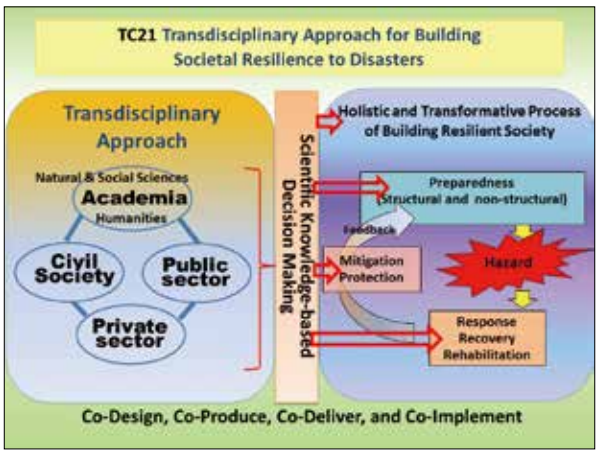
Transdisciplinary approach for building societal resilience to disasters

Kuniyoshi Takeuchi

Professor Emeritus, University of Yamanashi, Kofu, Japan

ACECC TC21 (Asian Civil Engineering Coordination Council Technical Committee 21)" Transdisciplinary approach for building societal resilience to disasters" was established in October 2015 co-chaired by Kuniyoshi Takeuchi, JSCE, Prof emeritus of UY and Romeo S. Momo, PICE, USec DPWH. Members are from Japan, Philippines, Vietnam, Indonesia, Nepal, Pakistan, Korea, USA etc.

TC21 aims to promote the transdisciplinary approach for scientific knowledge based decision-making for building societal resilience to disasters at national and local levels. Scientific knowledge-based decision making is a process in which scientific knowledge is systematically used in designing and assessing alternative courses of action and selecting one, considering political, socio-economic, environmental and risk impacts when the plan is implemented. Transdisciplinary approach is a methodology of achieving a common goal by all related players and stakeholders at all levels of all disciplines and sectors working together, going beyond the limit of disciplinary knowledge and sectoral capacities by creating innovative means, and making holistic and transformative solutions possible.



Why transdisciplinary? Gaps between science and practice can only be filled by an integration of disciplinary knowledge and sectoral capacities where real integration is possible only during implementation to achieve a common goal. Such synergy of integration of all disciplines and sectors can only be possible by a transparent decision making process, and vice versa, such transparency is possible only where many players from different disciplines and sectors work together.

TC21 Case Studies examining recovery processes of selected cases from TC21 points of view:

Ormoc Flood 1991, Philippines triggered by Typhoon Thelma (Uring) hit on 5 November 1991 when there were dead and missing about 8000. JICA assistance with slit dams and river improvement. Solved informal residents issue by protecting fence along the river dikes and tested by the similar Tyhoon Koni in 2003. Maintenance is successful local transdisciplinary cooperation.

Gorkha Earthquake 2015, Nepal 7.8Mw hit at 11:56 NST on April 25, 2015, killed nearly 9,000 people and damaged $10 Billion (50% of Nepal GNP). Reconstruction was led by Dept. of Urban Development and Building Construction (DUDBC) and National Reconstruction Authority (NRA) by a sill and lintel band method supported by institutional arrangements including 300k Rupee grants subsidy, training of 306 inspection engineers etc. It has been implemented by the transdisciplinary approach involving many people at national to local levels.

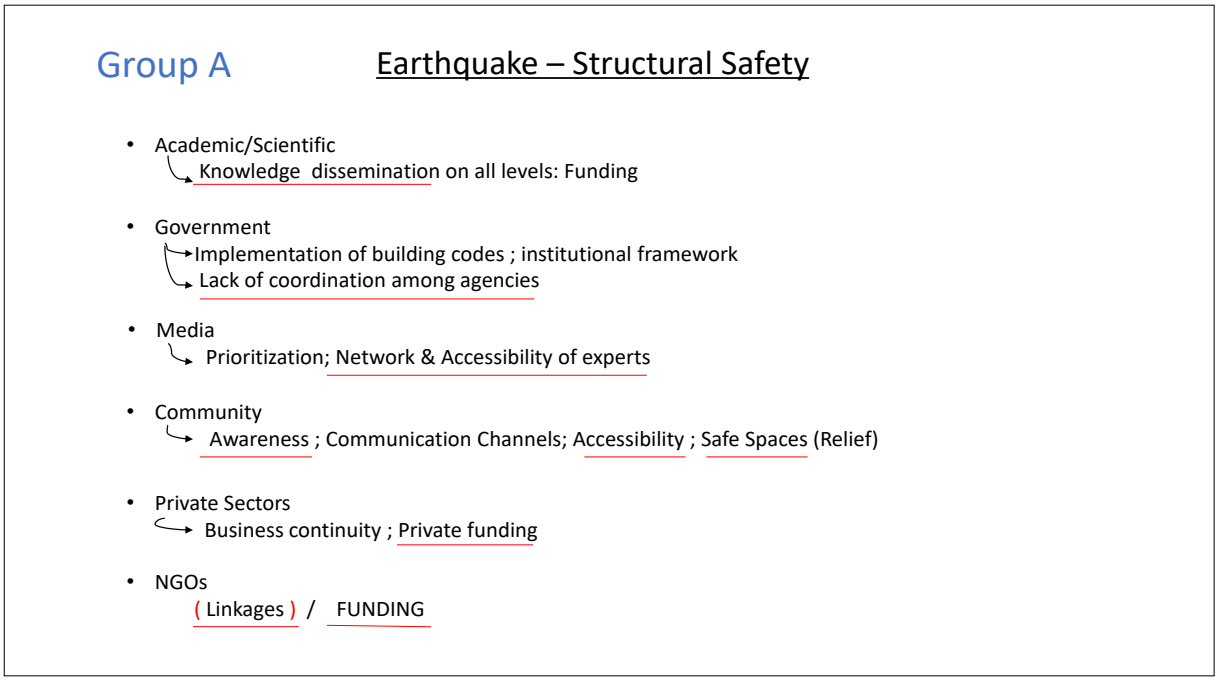
GROUP WORK DISCUSSION

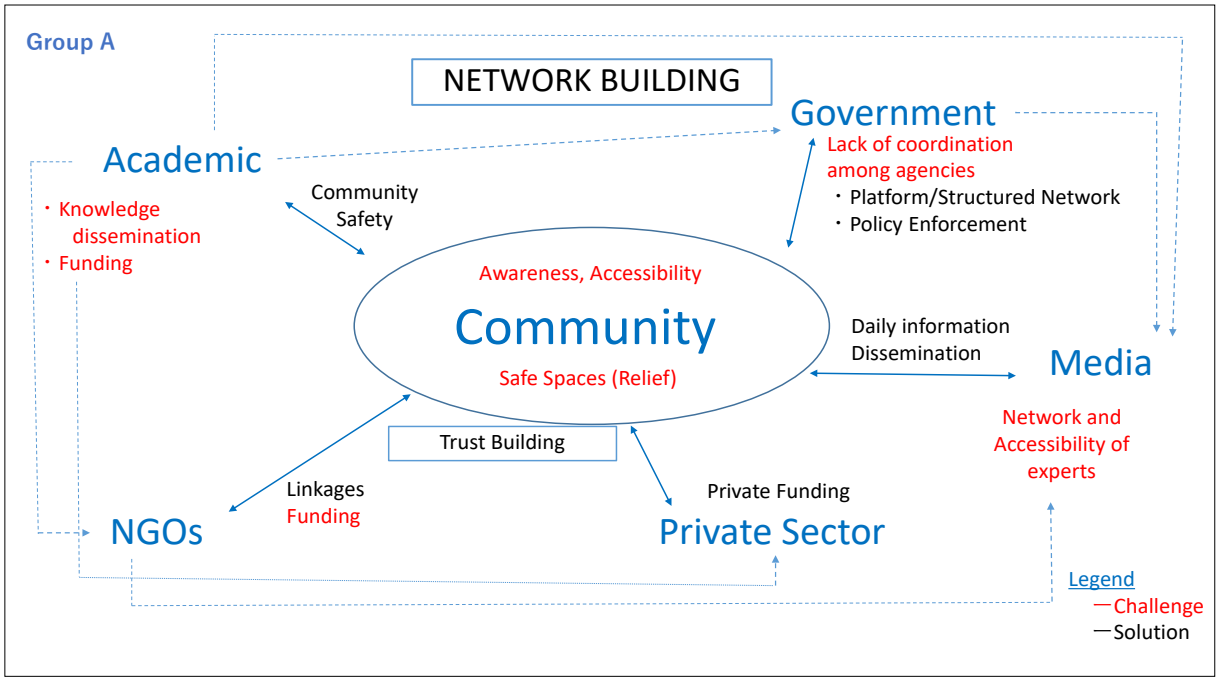
GROUP WORK

Two groups were asked to develop a project proposal regarding the disaster risk reduction (DRR) for Earthquakes and Floods.

Group A: Project proposal for Earthquake: Multi-stakeholder network for structural safety

Group A first analyzed the challenges of each stakeholder: academia, government, media, community, the private sector, and NGOs. They eventually identified a key issue of network building to achieve structural safety. It was determined that the community needed to be at the center as the target group of the project, with all the stakeholders somehow playing a role in providing information, knowledge, coordination, and funding. Among all the stakeholders, NGOs will be the chair for neutral coordination. The first year of the project should be devoted to developing a network and building trust. Then, the second year will be allocated to establishing an engagement plan. From the third year to the fifth, there will be implementations such as information dissemination, capacity building, and developing safe shelters.





Group A: Earthquake

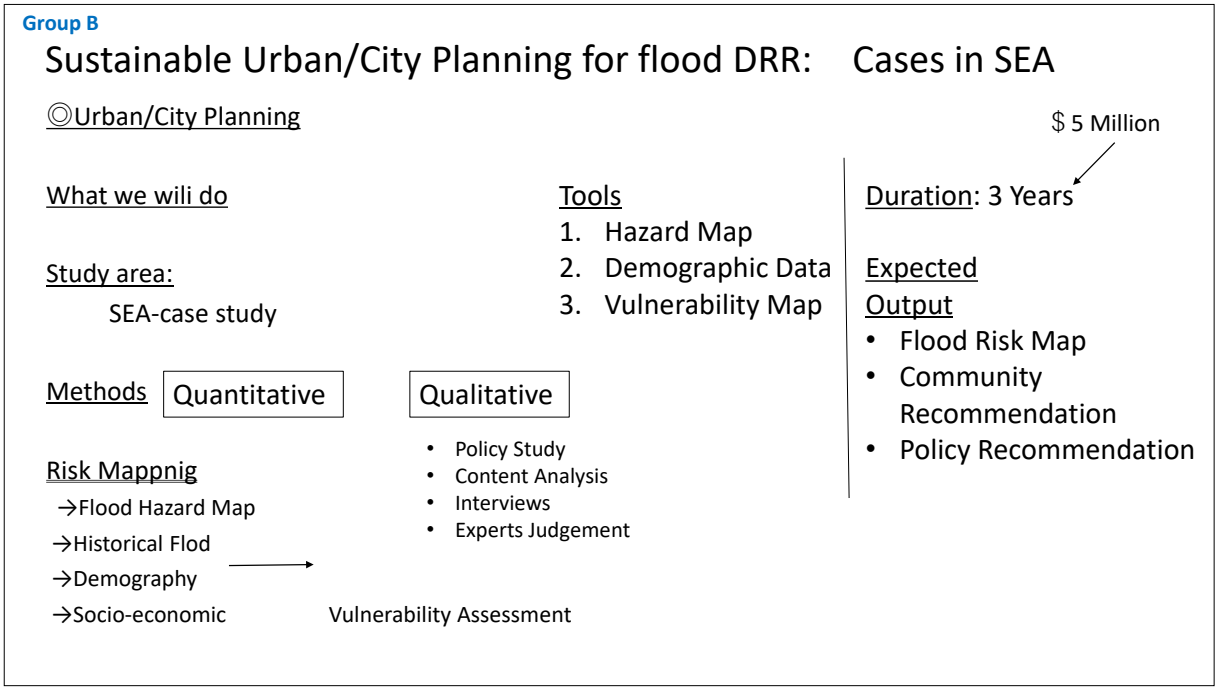
Multi-Stakeholder Network for Structural Safety

- Members:
  1. NGOs (CHAIR)
  2. Academic
  3. Government
  4. Media
  5. Private Sectors
  6. Community
- Goals:
  1. Increase Awareness and Accessibility
  2. Proactive Implementation
  3. Capacity Building & Resource Mobilization
- Action Plan (5 Year Plan):
  1. Develop Network and Collaboration (Year 1)
  2. Establishing Engagement Plan (Year 2: 6 months)
     - Data Collection
     - Budget
  3. Implementation (Year 2-5)
     - Information Dissemination
     - Capacity Building
     - Safe Shelter
  4. Monitoring and Evaluation

Group B: Sustainable Urban/City Planning for Flood DRR in Southeast Asia

This proposed project aimed to develop a flood-resilient community with proper urban planning through various kinds of information, including risk and hazard mapping. It should be useful information for communities as well as urban planners. There are two steps: short-term and long-term activities. The short-term activities include the development of evacuation and communication plans as well as of infrastructure and logistics. The long-term activities include development of hazard and probability mapping and an analysis of demographic data.

The project duration will be three years. The initial outcome includes a flood-risk map that will enable both government and communities to clearly understand the flood risks. Based on an understanding of risk, the community will come up with a recommendation for preparedness, and the plan will then be submitted to the government as a policy recommendation.



Group B

Sustainable Urban/City Planning for flood DRR in SEA

X Less education

Approach

*Evacuate implementation Plan
*Communication Plan
*Logistics
*Infrastructure

Short Term
Updates + Revisions

Long Term:
- A floodable Housing
- Land Use Planning
  desegregation
-Community Disaster Education Drills

Capacity Building

FIELD TRIP

Field trip to Higashi-Matsushima city and Onagawa town on 20 July 2017

The participants joined the field trip to the areas affected by the Great East Japan Earthquake and Tsunami. The places include the old Nobiru Station in Higashi-Matsushima, the Onagawa Town Hospital, Onagawa Station and Tohoku University Onagawa Field Center in Onagawa.

Ms. Shuang Guan
Undergraduate Student, Swarthmore College
(Intern, National Taiwan University)

As an undergraduate of a liberal arts school in a relatively disaster-safe area of the United States, I came into the APRU Multi-Hazard Summer School nervous, curious, and ready to learn. The Summer School did not disappoint; from engaging lectures by researchers and practitioners to time spent getting to know other participants and their work from all over the world, the whole experience was professionally delivered and impactful. One of the best parts of the program was the field trip to Onagawa, where we were able to see some of the problems and events discussed in the lectures at the actual sites of the 2011 Great East Japan Earthquake and Tsunami.

Most memorable for me was the Higashi-Matsushima Earthquake Memorial Museum, located next to the former Nobiru station destroyed on 3.11. Our visit started with a short film in which there was a heartbreaking story of how an elderly couple had successfully reached the rescue shelter, but the wife decided to go back to their home because they had forgotten their child's dog. Because of that dangerous journey, the man was never reunited with his wife. Then we began exploring the exhibition, full of pictures of the damage done, but also the relief efforts. One museum employee began explaining a map to us that made her think of her own experience in 2011, when she became separated from her three daughters and was not able to see one of them for two weeks. After days in a classroom, finally, we were forced to confront these stories while standing in the area where they happened; the atmosphere was something like a time and space warp. I felt this again when we trekked up the stairs to the former Onagawa Town Hospital, and saw the shocking pillar markings for just how high the waters had reached. The field trip helped cultivate my awareness of disaster history and how research, story history, and land are all connected. While (re-)building an area to become more disaster friendly, when constructing dikes, installing warning systems, or planning evacuation routes, I hope we will not forget to ask what has this land and its community witnessed.

Thank you to the summer school for reminding us that we must learn from history, and learn deeply through compassion, so that we can work to reduce future tragedies. Thank you so much to all of the organizers of the summer school for being helpful and patient, and most importantly, for giving us snacks and coffee to keep us going!

Old Nobiru Station

Mr. Rodolfo L. Arias

Master Student, Philippine School of Business Administration

At the start of our bus ride for our field trip, I got a text message from my wife, who was staying at the APA Villa Hotel in Sendai with our two daughters, saying that they felt the building shaking. She said not to worry; the quake was very brief and that they are alright. I guess I didn't feel the quake because our bus was moving at that time. Before our trip to Japan, a friend told me that slight tremors are normal occurrences in Japan and that one gets used to it. This was somewhat comforting but still, I shuddered at the thought that the quake could have been much stronger and could have been as destructive as the 2011 Great Earthquake and Tsunami that we have been talking about for the past two days. This thought made me a bit anxious but I somewhat relaxed when I turned my attention to what Prof. Akihiro Kijima of Tohoku University was saying on the bus microphone. Prof. Kijima acted as our tour guide during the trip. He had a reassuring voice and it helped calm down my nerves. Prof. Kijima told us how Sendai City was inundated by the 2011 tsunami. He drew our attention to lines on the façades of some buildings along Route 45 that marked the height of the tsunami wave that hit them. Images of the 2011 destruction shown to us during the sessions at the APRU-IRIDeS institute flashed back in my mind. I scanned the sceneries on both sides of the road and looked for traces of the disaster but did not see any. What I saw were well paved roads, clear waterways, building and houses of fine architecture, wide lush green fields planted to rice and other crops, and scenic seascapes. Indeed, Japan has done a remarkable job in its recovery and reconstruction efforts since the Great Earthquake and Tsunami 6 years ago.

Our first stop was the Nobiru Station in the City of Higashimatsushima. The terminal building of the station, used to be part of the Senseki line, now serves as a memorial museum. A ticket dispensing machine salvaged from the 2011 ruins serves as a museum piece at the 2nd floor. A grim reminder of the disaster are the lines displayed inside and outside the museum building marking the 3.7 meter height of the tsunami

wave that struck the area. I took a quick look at the railroad track and passenger loading ramp at the back of the museum. I imagined that on a busy day before March 11, 2011, the station would have been full of people going about their business oblivious of the disaster that would forever change their lives. The before and after images that came to my mind were unnerving.

The next stop was the coastal town of Onagawa. Prof. Kijima took us to the stone memorial marking the height of the 18-meter tsunami wave. I tried imagining myself trying to survive from that monstrous wall of water. I know how to swim but the only thing that I thought doing, if I were by myself, was to run away and climb to higher ground as fast as I could. I found it difficult to imagine that Onagawa with its scenic verdant hills and magnificent seascape had been a picture of destruction and sorrow 6 years ago. Truly, munificent nature can be a raging beast at times. Now, after extensive reconstruction efforts, Onagawa seemed to have bounced back to its old glory. I was pleasantly surprised at results of the redevelopment of the town center. It now sits on higher ground and affords an exquisite view of the bay.

The last stop was the newly rebuilt Tohoku University Integrated Marine Field Station, also in Onagawa, managed by a group of scientists that includes Prof. Kijima. The station's goals include efforts to monitor and restore marine life in the area through scientific research under the Tohoku Ecosystem-Associated Marine Science (TEAMS) project. I'm quite impressed that Japan's recovery efforts also gives importance to the marine environment which plays a crucial role in sustaining livelihood in the area that depends heavily on the fishing industry.

The field trip was an experience I will never forget. It gave me a rare opportunity to see with my own eyes and feel with my heart Japan's determination to rise up with strength and pride from the ruins of the 2011 Great Earthquake and Tsunami. It considerably raised my level of knowledge and awareness on Disaster Risk Reduction Management. The Philippines lies along the same Pacific Rim as Japan. There is a great possibility that my country would experience a similar catastrophe as the 2011 Great Earthquake and Tsunami. It is only a matter of time. I hope that armed with what I learned in Japan, I would be able to significantly contribute to my country's efforts in disaster preparedness, disaster risk reduction and disaster recovery efforts.

Onagawa Town

Tohoku University Onagawa Field Center

ANNEX I: APRU-IRIDeS Summer School Program

18-19 and 21 July: Seminar at the IRIDeS building on the Aobayama New Campus, Tohoku University
20 July: Field trip to Higashi-matsushima city and Onagawa town

July 18

Lessons learnt from the 2011 Great East Japan Earthquake and Tsunami

09：00 — 09：20 Opening
Opening remarks by President Susumu Satomi (Tohoku University)
Opening remarks by Ms. Christina Schönleber (APRU Secretariat)
Welcoming address by Prof. Fumihiko Imamura (IRIDeS)

09：20 — 09：30 Group photo

09：30 — 10：10 Movie [Great Tsunami]

10：10 — 10：25 Coffee break / moving to the Seminar room

10：25 — 10：35 Introduction of the summer school

10：35 — 10：45 Introduction of APRU

10：45 — 11：45 *"International DRR Policy Making at the United Nations"* by Prof. Yuichi Ono (IRIDeS)

11：45 — 13：00 Lunch / self-introduction

13：00 — 14：00 "Social and media interests on basic properties of tsunami and remaining issues on tsunami warning and evacuation" by Dr. Anawat Suppasuri (IRIDeS)

14：00 — 15：00 *"Housing Recovery Six Years after the 2011 Great East Japan Earthquake"* by Dr. Elizabeth Maly (IRIDeS)

15：00 — 15：15 Coffee break

15：15 — 16：15 *"Eight Personal Characteristics Associated with the Power to Live with Disasters as Indicated by Survivors of the 2011 Great East Japan Earthquake Disaster"* by Prof. Motoaki Sugiura (IRIDeS)

16：15 — 17：15 *"Building Resilience and Social Capital in Disaster-affected Communities"* by Dr. Daisuke Sato (IRIDeS)

18：30 — Reception

July 19

Role of different stakeholders: Local governments, Academia, and NGO

09：00 — 10：00 *"Role of various stakeholders in disaster risk reduction"* by Dr. Takako Izumi (IRIDeS)

10：00 — 11：10 *"Disaster Prevention Learning in Elementary School after the Great East*

Japan Earthquake" by Mr. Kiyoshi Araake (Takaya Elementary School, Watari town)

11：10 — 11：30 Coffee break

11：30 — 12：30 *"Towards disaster risk reduction city – Tagajo ~Disaster-resilient city~"* by Mr. Takumi Fujimura (Tagajo City)

12：30 — 13：30 Lunch

13：30 — 14：30 *"The Power of Localization"* by Mr. Takeshi Komino (Church World Service)

14：30 — 15：30 *"The TEAMS Project (Tohoku Ecosystem-Associated Marine Science) For Reconstruction from GEJE and For Restoring a Rich Ocean Through Science"* by Prof. Akihiro Kijima (Tohoku University)

15：30 — 15：45 Coffee break

15：45 — 16：45 Group work 1: Poster presentation

16：45 — 17：15 Group presentation

July 20: Field trip

Higashi-Matsushima city and Onagawa town

July 21

09：00 — 10：00 *"Forecasting and Nowcasting Major Earthquakes - An Automated Cloud-Based Approach"* by Prof. John Rundle (University of California Davis)

10：00 — 11：00 *"University Capacity Building to help local government setup Resilience Community"* by Prof. Yi Chi Tan (National Taiwan University)

11：00 — 11：15 Coffee break

11：15 — 12：15 *"Transdisciplinary approach for building societal resilience to disasters"* by Prof. Kuniyoshi Takeuchi

12：15 — 13：15 Lunch

13：15 — 15：15 Group work 2: Development of a project proposal

15：15 — 15：30 Coffee break

15：30 — 16：30 Group presentation

16：30 — 16：45 Closing

ANNEX II : List of Participants

	Name	Status	Country	University
1	Yu Zhu	Ph.D. Student	China	Tsinghua University
2	Cheng LIU	Ph.D. Student	China	Tsinghua University
3	Jing Qian	Assistant Research Fellow	China	Tsinghua University
4	Fajar Shidiq	Researcher	Indonesia	Indonesia Defense University
5	Bismark Adu Gyamfi	Master Student	Japan	Keio University
6	Runa Inoue	Master Student	Japan	Miyagi Gakuin Women's University
7	Mayu Terada	Undergraduate Student	Japan	Miyagi Gakuin Women's University
8	Hina Suzuki	Undergraduate Student	Japan	Miyagi Gakuin Women's University
9	Hina Kumagai	Undergraduate Student	Japan	Miyagi Gakuin Women's University
10	Terri R. Norton	Visiting Scholar	Japan	Tohoku University
11	Meshal Jamal Abdullah	Master Student	Japan	Tohoku University
12	Mohammad Imam Hasan Reza	Senior Lecturer and Fellow	Malaysia	Universiti Kebangsaan Malaysia
13	Khamarrul Azahari Razak	Faculty	Malaysia	Universiti Teknologi Malaysia (UTM)
14	Mohd Muhaimin Ridwan Wong	Ph.D. Student	Malaysia	National Defence University of Malaysia
15	Noriza R. Tibon	Instructor	Philippines	University of the Philippines Diliman
16	Lualhati S. Macapagal	Faculty and Editor	Philippines	Philippine School of Business Administration
17	Rodolfo L. Arias	Master Student	Philippines	Philippine School of Business Administration
18	Alfredo B. Santiano III	Master Student	Philippines	Philippine School of Business Administration
19	Wilven John C. Gadian	Master Student	Philippines	Philippine School of Business Administration
20	Christos Gouramanis	Assistant Professor	Singapore	National University of Singapore
21	Queen Suraajini Rajendran	Research Fellow	Singapore	Nanyang Technological University
22	Yong-jun Lin	Assistant Research Fellow	Taiwan	National Taiwan University
23	Hali Han	Intern (Undergraduate Student)	Taiwan(USA)	National Taiwan University (Swarthmore College)
24	Shuang Guan	Intern (Undergraduate Student)	Taiwan(USA)	National Taiwan University(Swarthmore College)
25	Teraphan Ornthammarath	Assistant Professor	Thailand	Mahidol University
26	Patricia Anne C. Vega	Master Student	UK	University of Reading
27	Alexis Giguere	Ph.D. Student	USA	University of California Davis
28	Molly Luginbuhl	Ph.D. Student	USA	University of California Davis
29	Suwan Shen	Assistant Professor	USA	University of Hawaii
30	Christina Schönleber	Director(Policy & Programs)	Hong Kong	APRU Secretariat
31	Takeshi Komino	General Secretary	Japan	Church World Service (CWS) Japan

	Name	Status	Country	University
32	Yi Chi Tan	Professor	Taiwan	National Taiwan University
33	Kiyoshi Araake	Principal	Japan	Takaya Elementary School, Watari Town
34	Takumi Fujimura		Japan	Tagajo City
35	Fumihiko Imamura	Director/Professor	Japan	Tohoku University (IRIDeS)
36	Yuichi Ono	Professor	Japan	Tohoku University (IRIDeS)
37	Takako Izumi	Associate Professor	Japan	Tohoku University (IRIDeS)
38	Anawat Suppasri	Associate Professor	Japan	Tohoku University (IRIDeS)
39	Elizabeth Maly	Associate Professor	Japan	Tohoku University (IRIDeS)
40	Motoaki Sugiura	Professor	Japan	Tohoku University (IRIDeS)
41	Daisuke Sato	Professor	Japan	Tohoku University (IRIDeS)
42	Akihiro Kijima	Professor	Japan	Tohoku University (Graduate School of Agricultural Science)
43	Kuniyoshi Takeuchi	Professor Emeritus	Japan	University of Yamanashi
44	John B. Rundle	Professor	USA	University of California Davis

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