TOHOKU UNIVERSITY

Report of the

APRU-IRIDeS Multi-Hazards Program Virtual Summer School

2020

IRIDeS International Research Institute of Disaster Science

APRU Multi-Hazards

Report of the APRU-IRIDeS Multi-Hazards Program
2020 Virtual Summer School

15, 22 and 29 July 2020

[JST]

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Background

Since the start of this year, the entire world has been battling an unprecedented challenge that is COVID-19. The pandemic has also had a serious impact on higher education, necessitating a shift to online education and virtual classes. While both students and faculty have had to tackle complex challenges in this transformation, it has also provided an opportunity to reach out to students from all over the world, share lectures, and exchange thoughts and research findings widely.

APRU is a network of 55 premier research universities from 18 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 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 MH Program has organized the summer school since 2013, and this is its 8th year. Due to the impact of COVID-19, the 8th edition of the summer school had to be conducted virtually. It was unfortunate to not be able to meet the participants in person, but it made it possible to connect with 842 people worldwide.

One of the major activities under the MH Program, the virtual summer school this year had 3 sessions, and the topic of each was as follows:

1) Lessons learned from the Great East Japan Earthquake and Tsunami (July 15, 2020 JST) (Attendance: 263)

2) Roles of various stakeholders in disaster risk reduction (July 22, 2020 JST) (299)
3) Latest research in disaster science (July 29, 2020 JST) (280)

It is designed in a way that facilitates learning from the experience of local governments, NGOs, and academia, and includes lectures covering not only the natural sciences but also the social sciences to enable the participants to understand the diverse elements of DRR.

It is hoped that the next summer school can be held in Sendai. The regular summer school includes a one-day field trip to the site affected by the Great East Japan Earthquake and Tsunami of 2011. It provides an opportunity to understand the actual recovery efforts and how the experience and lessons learned are shared, especially for future generations. At the same time, this pandemic has provided a new insight into disaster risk management beyond natural hazards, and it will be an important topic for discussion at the 2021 summer school.

Acknowledgement

This year's virtual summer school was operated by the APRU secretariat in Hong Kong using the Zoom video platform. I would like to express my sincere appreciation for their excellent work and support; without their knowledge, skills, and hard work, it would not have been possible. In addition, I would like to convey my appreciation for the audience worldwide, who participated in the sessions despite the different time zones. Last but not the least, I am grateful for the continuous and wonderful support provided by the staff of the International Strategy for Disaster Mitigation Division of IRIDeS and the Global Engagement Division, Tohoku University.

OPENING REMARKS

Prof. Toshiya Ueki

Executive Vice President for General Affairs, Financial Affairs and International Relations, Tohoku University

It is a great pleasure for me to welcome you to "the APRU-IRIDeS Multi-Hazards Virtual Summer School." Unfortunately, due to the ongoing COVID-19 pandemic, I was unable to meet you in person and extend my welcome remarks. Despite the difficulties involved, I hope the situation will be resolved in the near future.

Natural disasters have been serious concerns for many years, especially in Asia. We have already observed an increase in the number and scale of natural disasters, especially due to climate change, urbanization, population density, and environmental degradation. Even recently, several areas in Japan were severely affected by heavy rains and floods. Every year, we witness such devastating floods everywhere in the country. This undeniable fact emphasizes the importance of an early warning, understanding of a hazard map, and an immediate decision to evacuate to protect lives and assets.

To tackle these global challenges, three important international agreements were adopted in 2015—the Sustainable Development Goals (SDGs), the Paris agreement, and the Sendai Framework for Disaster Risk Reduction. In particular, the Sendai Framework was adopted at the UN World Conference on Disaster Risk Reduction held in Sendai in 2015. The support and contribution by universities and academia are essential to implement the Sendai Framework, which is based on several interdisciplinary studies and the application of science and technology. We are expected to support action by local communities and authorities as well as the interface between policy and science for decision-making.

On March 11, next year, it will be ten years since the occurrence of the Great East Japan Earthquake and tsunami. To contribute to the recovery efforts and provide technical support to the process, Tohoku University established the International Research Institute of Disaster Science (IRIDeS) in 2013. Through this, we have always aimed to share our globally gained knowledge and experience from several interdisciplinary studies and contribute to building a society resilient to natural disasters. IRIDeS also launched the Multi-Hazards Program together with the Association of Pacific Rim Universities (APRU) in April 2013. Since then, IRIDeS has become the hub and coordinator of the program activities. This summer school is one of the major events under the Multi-Hazards Program. The regular summer school includes a field trip to the site affected by the tsunami in 2011, where one can learn the recovery process and lessons acquired from the experience of local people. Though we cannot take you to these places because of the current pandemic, hopefully, we will be able to organize the summer school in Sendai next year, in which you can participate.

The experience of COVID-19 reminded us that disaster risks are not only natural but also biological, chemical, and industrial, to which we are vulnerable. The Sendai Framework also emphasizes that "it applies to the risk caused by natural or man-made hazards as well as related environmental, technological and biological hazards and risks. It aims to guide the

multi-hazard management of disaster risk in development at all levels as well as within and across all sectors." We need to make further efforts to tackle and reduce the risks of these different types of disasters. The responsibilities and tasks assigned to us are now much more difficult and complicated, and further collaboration among different sectors is necessary. I look forward to engaging in collaborative research and activities with you in the future.

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

Prof. Fumihiko Imamura

Professor and Director, IRIDeS, Tohoku University

I would like to welcome all of you to the APRU-IRIDeS Multi-Hazards (MH) virtual summer school, organized by the Association of Pacific Rim Universities (APRU) and the International Research Institute of Disaster Science (IRIDeS), Tohoku University. The MH Program was established in April 2013, and IRIDeS has played a crucial role as its secretariat, providing coordination and administrative services.

As you know, the Great East Japan Earthquake and Tsunami of 2011 caused serious damage, especially in the Tohoku region. To share the experience with universities globally and maximize it for further disaster risk reduction research and practical implementation, Tohoku University discussed the possibility of establishing a program with the APRU secretariat—this gave birth to the MH Program in 2013. Immediately after, the core group under it was formed with 12 members from the University of California Davis, University of Hawaii, University of Chile, Chulalongkorn University, Tsinghua University, University of Philippines, University of Tokyo, and Tohoku University. They are all very active and work as decision-making bodies.

The MH Program has two main objectives. The first one is to harness the collective capabilities of APRU universities, especially for cutting-edge research on disaster risk reduction. The program comprises a group of experts with different backgrounds such as engineering, natural sciences, social and human sciences, and medical. It is important for researchers from such diverse backgrounds to conduct joint research to identify and develop innovative tools, products, and approaches in DRR. The second one is to contribute to international and regional discussions to influence DRR policymaking processes. I believe this is possible through our activities such as the campus safety program, collaborative research, data sharing, and sharing the research findings at international and regional conferences and events. For instance, IRIDeS and the MH Program actively contributed to the UN World Conference on Disaster Risk Reduction held in Sendai in 2015, where the Sendai Framework for Disaster Risk Reduction was adopted.

Though this year's summer school had to be virtual due to COVID-19, we were able to share knowledge, experiences, and lessons learned from the 2011 disaster, and it is IRIDeS's responsibility. You can also learn from the various experiences of different sectors such as the government and NGOs, as well as researchers from Asia and the US. This is the second session from a webinar series of 3. We have 3 excellent speakers: Dr. Takako Izumi from IRIDeS, Mr. Takeshi Komino, CWS Japan, and Dr. Mikio Ishiwatari from the University of Tokyo and the Japan International Cooperation Agency.

Most of us live in the ring of fire in the Pacific Ocean, and it is not possible to control or avoid natural disasters, including earthquakes, volcanoes, tsunamis, and floods. However,

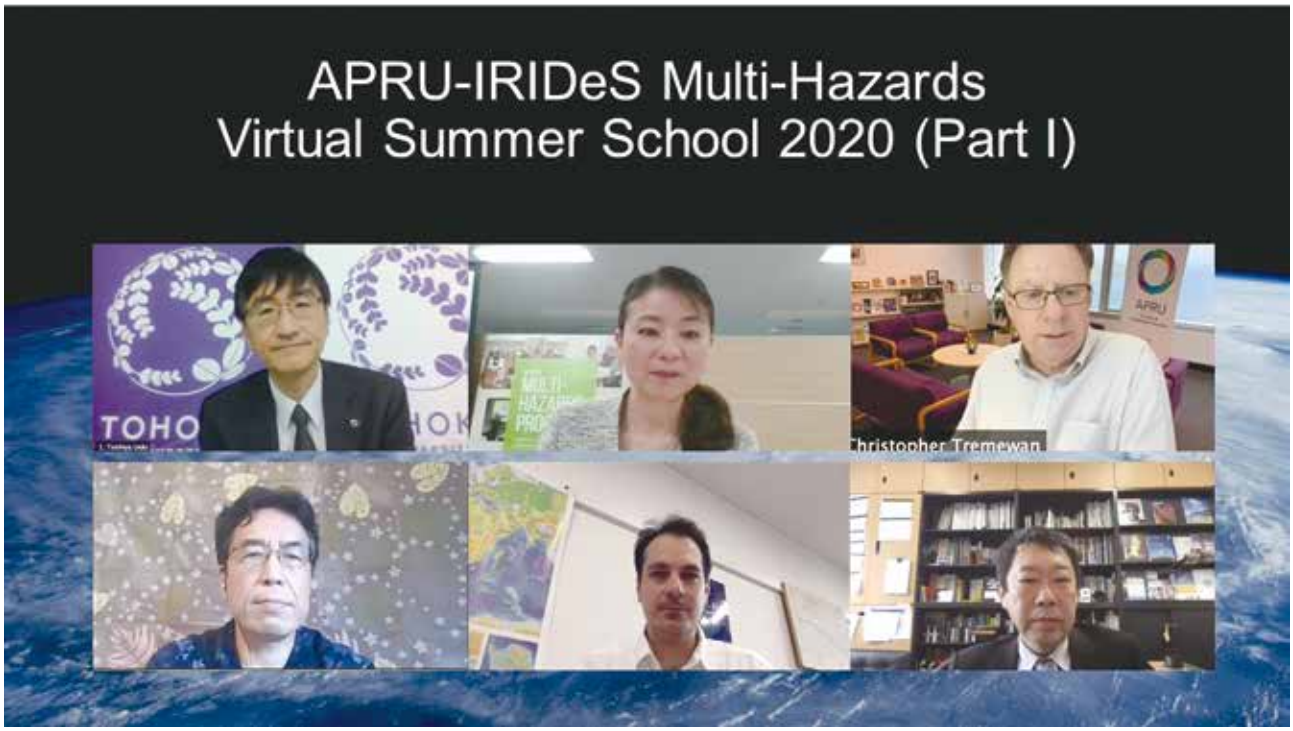
the idea and concept of building back better after the destruction left behind by a serious calamity can reduce future disaster risks and damage. We should consider living in harmony with nature.

Thank you very much for your attention. I hope you will learn something from today's excellent speakers.

PRESENTATIONS

Session I

Lessons learned from the Great East Japan Earthquake and Tsunami



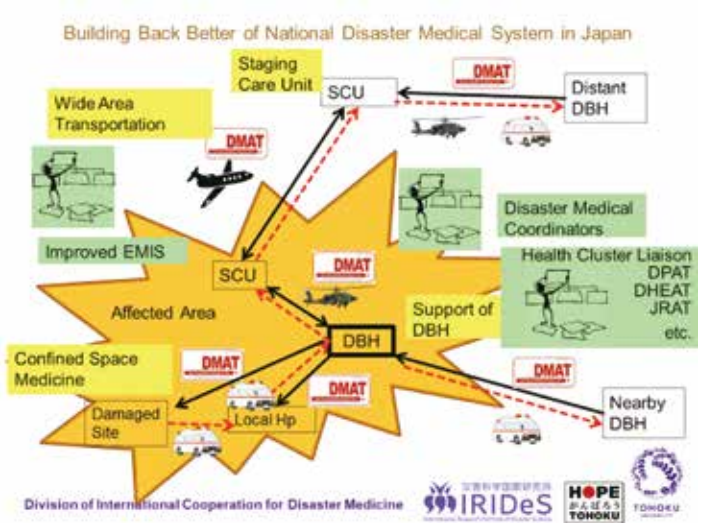
Medical and Public Health Resilience

Shinichi Egawa

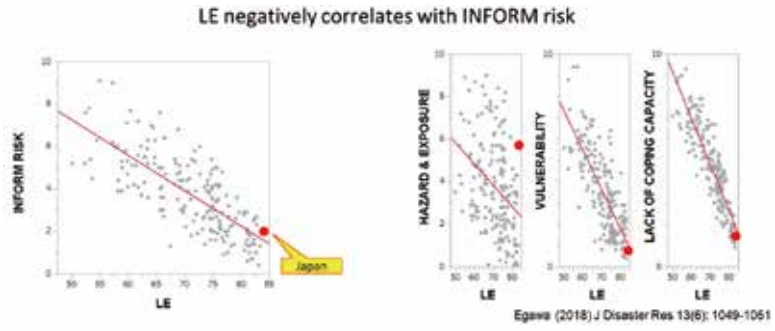
Professor, IRIDeS, Tohoku University

Sendai Framework for Disaster Risk Reduction (DRR) described for the first time as a DRR framework that disaster affects health. Sendai Framework aims to reduce a) mortality, b) affected people, c) direct economic loss by implementations of d) infrastructure, e) national and local strategies, f) international cooperation, and g) multi-hazard early warning system. Sendai Framework targets to reduce the damage to critical infrastructures, especially hospitals and schools. These movements are because of the imperative of health as a fundamental human right. Heath cluster is one of the DRR clusters to improve preparedness and efficient response.

After 1995 Great Hanshin Awaji Earthquake, Japan has established national disaster medical system including Disaster Base Hospitals, Disaster Medical Assistance Team (DMAT), Staging Care Unit and Transportation System, Emergency Medical Information System (EMIS) and Disaster Medical Coordinators. This system helped many lives in 2011 Great East Japan Earthquake (GEJE) and following disasters. However, every disaster has difference in medical and public health needs. Especially after GEJE, the change of medical needs in non-communicable diseases and mental health were more remarkable rather than trauma (Suda 2019). This was because of change of human community itself including resilient buildings, aging of the community, urbanization and technological improvement and focusing more on mental health. Additional improvements of the national disaster medical system include the nation-wide implementation of disaster medical coordinators (Egawa 2017), improvement of EMIS function and various liaisons for children, hemodialysis patients, Disaster Psychiatry Assistance Team (DPAT), Japan Rehabilitation Assistance Team (JRAT), Disaster Health Emergency Assistance Team (DHEAT) and so on. Those teams join the medical coordination sector in the prefectural disaster headquarters in the periodical disaster drills co-organized by Cabinet Office of Japan assuming South Trough Earthquake in near future. Thus, flexibility and preparedness of medical and public health response is mandatory. Academia can contribute by research and development to improve disaster medicine.



There is a negative correlation between life expectancy (LE) and the INFORM disaster risk index that validates the hypothesis "healthy society is a resilient society against disaster" (Egawa 2018). Japan is a country with high risk of natural hazards, but Japan has high LE, less vulnerability and more coping capacity. The effort to make the LE high is not the task of health sector alone. Economical development, resilient and functional infrastructure, good road and communications assuring the accessibility to the health system and human development totally makes the LE high and INFORM risk low. Several health-related risk indices in INFORM risk correlates with the LE negatively suggesting that social determinants of health also correlates with disaster risk.



In conclusion, DRR should be people-centered and the collaboration of health and all other DRR clusters is the best way to protect people's physical and mental health understanding the change of health risks in disaster.

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Mitigating People and Disasters: Approaches of Social Sciences

Sébastien P. Boret

Associate Professor, IRIDeS, Tohoku University

During his lecture "Mitigating People and Disasters: Approaches of Social Sciences", Dr. Boret offered an introduction to some of the fundamental concepts used to explain the socio-cultural processes that are associated with disasters. They include ideas of risk, vulnerability, and resilience. His discussion drew from a broad range of case studies that span from disasters induced by natural hazards to those human-driven catastrophes.

The first part of the lecture considered the basic assumption that disasters are not events but the products of social and cultural developments that may begin long before and end long after the events. Using the metaphor of a car accident, Dr. Boret explained that the collective behaviors that precedes (humanenvironment relation, development, preparedness, social inequality) and follow (reconstruction, solidarity, spiritual care, financial aids, political leadership) a catastrophe contribute respectfully to the cause and the impact of a disaster.

In the second part, Dr. Boret introduced the ideas of risk associated with the set of opportunities that produces our environment. Using the example of an Indonesian people living by an active volcanic mountain, he explained that risk is not be an objective fact but depends on people's perception that in turns dictates their disaster mitigation through socio-ecological adaptation. However, he also explained that for social scientists the perception and adaptation to risk are themselves dependent on political, economic, and social forces. As such, social scientists believe that people are more often than not the cause of their exposition to risk.

The third part engaged with the central notion of vulnerability. In disaster science, vulnerability is the degree to which people are exposed to risks. Social research shows that this exposure is rooted in ethnicity, class, gender, disability, age, poverty, education and other socio-cultural factors, and therefore varies among and within communities. Using examples such the shipwreck of the Titanic and the 2004 Indian Ocean Tsunami, Dr. Boret examplified how particular factors such as gender and social class can explain the preponderance of a category of victims over another. He then argued that the identification of these causes via forensic research should be an integral part of disaster mitigation in order to reduce inequalities in the face of disasters.

Relating to vulnerability, the fourth concept introduced in this lecture was resilience. Originally used in civil engineering, this term came to refer by social analogy, to the capacity of a group of people to resist and adapt to disasters. Referring to recent studies in Indonesia and the Pacific region, Dr. Boret introduced elements of social resilience including oral tradition as well as more complex economic and political adaptations. Taking the example of global warming, however, he noted that the increased resilience of some people could create the vulnerability of others.

To conclude, Dr. Boret proposed that the approaches of social sciences provide a comprehensive albeit complex perspective of disaster mitigation. He advised against the recent trends that favour the study of resilience over vulnerability. His assertion echoed the view that the concept of vulnerability should not be conceived as a "negative" and the direct opposite of resilience but as its complementary approach. Putting this vision in a nutshell, he stated that "disaster mitigation must uproot the causes of vulnerability and innovate the solutions for resilience."

Urban Disaster Risk Reduction: Japan as a disaster-prone country and learning from past disasters

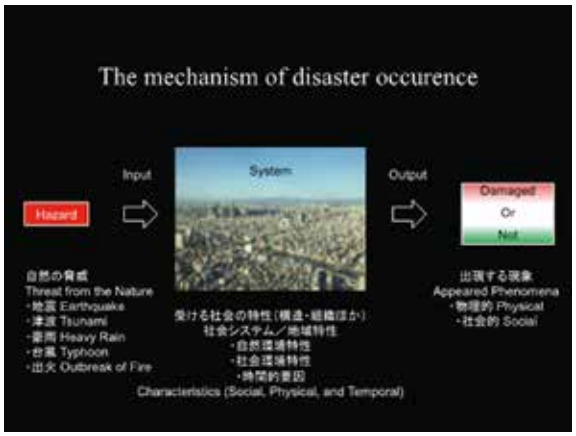
Osamu Murao

Professor, IRIDeS, Tohoku University

Japan is one of the disaster-prone counties, having earthquakes, tsunamis, volcanic eruptions, typhoons, heavy rains, or floods. The presentation given by Prof. Murao at the Multi-Hazards Summer School 2018 was about Japanese disaster risk reduction experiences, consisted of the following five topics:

1) How do you evaluate urban disaster risk?
2) Disaster Life Cycle
3) Sendai Framework and "Build Back Better"
4) 1934 Hakodate Great Fire
5) Japan as a Disaster-prone Country and Learning from the Past Disasters

The presentation started with a question, "How do you evaluate urban disaster risk?" and explained urban disaster risk with definitions of "hazard," "vulnerability," and "exposed value." The second topic focused on "Disaster Life Cycle," an idea to deal with disaster management with sequential phases, "emergency response," "recovery," "mitigation," and "preparedness." Then Sendai Framework for Disaster Risk Reduction, which was adopted at the third World Conference on Disaster Risk Reduction 2015, was explained, with Build Back Better concept as the third topic. Japanese people have learnt many things from those disastrous experiences to make societies safer. The presentation introduced the 1934 Hakodate Great Fire and how the disaster changed the urban fabric in the process of post-disaster recovery, followed by other important recovery cases in Japanese history.



Session II

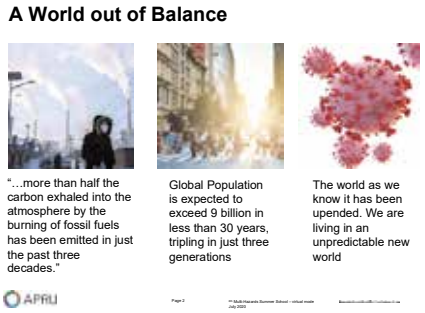
Role of various stakeholders in disaster risk reduction

Association of Pacific Rim Universities (APRU) Acting Together in a World Out of Balance on solutions to Asia-Pacific challenges

Christina Schönleber

Senior Director (Policy & Programs), APRU

The Association of Pacific Rim Universities (APRU) is not a university but a network of leading research universities in the Asia-Pacific. This network provides a platform for partnerships with international organizations, governments, business and local communities on global issues impacting the Asia-Pacific region, a region that is home to almost half of the world's population, the most dynamic economies and the most natural disasters.

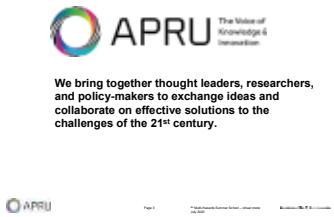


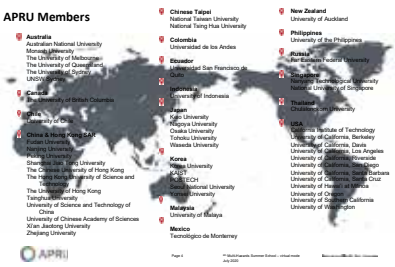
We all know that we are in unprecedented crisis! Our scientists have told us very clearly and for some time already that we must address the climate crisis and that this is accelerating faster than expected. In the past four decades we have done as much damage knowingly to our planet and its ability to sustain human life and civilization as we ever managed in ignorance prior to this.

While we have, for a long time, lived with issues of economic growth, inequality, access to essential resources such as water and food we also have to face the challenge of predicted population growth to over 9 billion people in the next 30 years.

This means global consumption will continue to expand and the consumption of water and natural resources will grow relentlessly. This is why global demand for freshwater has grown fourfold in the past 60 years, a trend that cannot be sustained with the current population of just of 7 billion nor the expected 9 billion by 2015.

Covid-19 is the latest crisis all of us a living through at the moment. It is a public health crisis without precedent in living memory which is testing the collective capacity of nations and individuals to respond. We now live in an unpredictable new world! This is where Universities, acting together can make a significant difference.





APRU draws on the extensive and diverse research capacity of its 55 members across the region to collaborate across 8 program areas including:

- Asia Pacific Women on Leadership
- Digital Economy
- Global Health
- Multi-Hazards
- Pacific Ocean
- Population Aging
- Sustainable Cities and Landscapes
- Sustainable Waste Management

Collaboration within these expert networks and with external partners will for example improve the sustainability of life in today's cities, respond to the need to create more resilient communities by promoting and driving forward collaborative risk reduction research to inform policy makers or will provide better understanding how AI will transform the future of labour and allow for these insights to be share with policy makers in the region. APRU programs and their engaging member institutions bridge gaps in capacity and support and connect emerging researchers to their peers and external partners from industry, governments and foundations around the Pacific Rim to shape a more sustainable and inclusive future.

The APRU Multi-Hazards Program, hosted by the International Research Institute of Disaster Risk Reduction (IRIDeS) at Tohoku University aims to build safer and more resilient societies. Key objectives are to strengthen research capacity in disaster science, foster collaboration across the region and contribute to the international policy process.

Now more than ever with the threat to public health presented by the COVID-19 pandemic, APRU has an important role to play as a facilitator and network in working collectively and proactively in knowledge-sharing and research collaborations.

Download the Full Report at www.apru.org/resources/

Implementation of the Sendai Framework for Disaster Risk Reduction (SFDRR): the role of stakeholders

Takako Izumi

Associate Professor, IRIDeS, Tohoku University

The Sendai Framework for Disaster Risk Reduction (SFDRR) was adopted by 187 countries at the United Nations World Conference on Disaster Risk Reduction held in Sendai city in March 2015. Since then, it has become a global blueprint for disaster risk reduction (DRR) efforts for 2015–2030. It includes 4 priority actions:

Priority 1: Understanding disaster risk

Priority 2: Strengthening disaster risk governance to manage disaster risk

Priority 3: Investing in disaster risk reduction for resilience

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

Prior to this framework, another international document "Hyogo Framework for Action" adopted in 2005 existed. Between 2005 and 2015, there was some progress in DRR, such as increase in awareness of it and the active participation of various stakeholders in DRR activities; however, further efforts were required.

The SFDRR highlights the stakeholders' roles and responsibilities in DRR, and the roles of academia are addressed as follows:

1) Focus on disaster risk factors and scenarios
2) Increase research on 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 addition to research and education, which are the traditional roles of academia, the expectation includes providing support to local communities and authorities and contributing in the decision-making process. Academia may not be familiar with these roles and may struggle with managing different and additional tasks; however, it is crucial to understand these expectations from this community and consider how to carry out these roles.

Furthermore, there is now a greater need for the MH approach. Focusing on not only natural hazards but also the COVID-19 experience has made our future challenges and the need for tackling clear in the framework of disaster risk reduction. The SFDRR also states that *it will apply to the risk of small-scale and large-scale, frequent and infrequent, sudden and slow-onset disasters, caused by natural or manmade hazards as well as related environmental, technological, and biological hazards and risks. It aims to guide the multi-hazard management of disaster risk in development at all levels as well as within and across all sectors*.

It is necessary for us to start discussions and dialogue with experts on these different hazards on how to collaborate to achieve an all-hazards approach to make our communities more resilient.

From Hyogo Framework for Action to Sendai Framework for DRR

IRIDeS

Background of HFA

- The Indian Ocean Tsunami in December 2004 increased the interest in and awareness on DRR.
- The awareness and knowledge on tsunami was no sufficient. Lack of early warning system.
- Five priority of actions:
  (1) Governances ensure that DRR is a national and local priority;
  (2)Risk identifications identify, assess and monitor disaster risks and enhance early warning;
  (3)Knowledge use knowledge, innovation and education to build a culture of safety and resilience;
  (4)Reducing the underlying risk factors;
  (5)Strengthen disaster preparedness for effective response.
- It emphasized "DRR is everyone's business" . All the stakeholders need to get involved in DRR. It is not a task of only governments and other humanitarian organizations.

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Priorities for action in the Sendai Framework for Disaster Risk Reduction

1. Understanding disaster risk;
2. Strengthening disaster risk governance to manage disaster risk;
3. Investing in disaster risk reduction for resilience;
4. Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.

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Role of academia in the Sendai Framework for Disaster Risk Reduction

Academia, scientific and research entities and networks to

1) *focus on the disaster risk factors and scenarios,*
2) *increase research for regional national and local application,*
3) *support action by local communities and authorities, and*
4) *support the interface between policy and science for decision-making*

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Emerging Trends and the Role of NGOs / Civil Society Organizations

Takeshi Komino

General Secretary, CWS Japan

The Asian region, where we, live is heavily affected by natural hazards, which is apparent from various data; Asia accounts for more than half of disaster casualties in the world. We are seeing increasing trend in global warming, and weather pattern has clearly changed. As a result, hydro meteorological disasters and climatological disaster are on the rise. In addition, we are seeing over 30 conflicts in the world on top of natural disaster risks, and average years of emergency appeals currently is 9.3 years, so prolonged crisis becoming regular phenomenon. But resources aren't increasing, and there is a need for innovation so that we can produce more positive impact with existing resources.

When we think of risks, it's not only about one particular hazard risk, but multiple risks have interconnectedness and there are chain reactions. For example, severe weather patterns put stress on agriculture and trigger migration. Migration to cities trigger more construction. More construction trigger more stagnant water, which is breeding space for mosquitoes, and as a consequence, dengue fever increase that could lead to health emergency. Things are connected, and this is the new normal we live in. On top of this, COVID-19 is posing further risks and different age groups or pre-existing health conditions lead to different risks.

During Hyogo Framework for Action implementation, there was significant progress on governance and institution for disaster management. In implementing Sendai Framework for Disaster Risk Reduction, there is more focus on local risk governance. However, in COVID-19 pandemic, risks are personalized, and different actions are required at household level, which cannot be done, and this is significant challenge for Japan too.

In this new normal age, individual actions are required. Policies need to influence people's actions, and this is where CSOs' greatest role is; there are things government can do, and can't do, and personalized solution is often the most difficult. Self-help and mutual-help need to be strengthened, and DRR needs to be embedded in our lives. Different actors have different roles and it is partnership against unprecedented risks we face. Challenges are immense, but they are also opportunity for us to improve and transform.

Specific challenges in Asia

- Rainfall patterns changing – 20th century infrastructure and way of living not coping
- Emergence of wide spread water scarcity and more frequent flood
- Need for early action – but 'when and where to start?'
- Intensified risks in urban areas
- Climate risks leading to political and social risks
- Response vs. Solutions
- Nationalization (vs. Localization) towards shared risks
- Competition vs. Co-existence

Localized risk management landscape

Hyogo Framework for Action (2005-2015)

- High progress on governance and institutional arrangements, and disaster preparedness.
- Focused more on developing countries, but low progress on underlying risk factors.
- Realization that things don't always trickle down

Sendai Framework for DRR (2015-)

- More focus on understanding risks and investment to mitigate the impact.
- Focus on local governance of risks (e.g. Target E) with local governance units.
- Focus both on rich and poor, but in the context of international cooperation

COVID-19 (2019-)

- Different risks for different persons.
- All countries affected with similar risks at the same time.
- **Personalized risks and risk reduction actions at household level.**

Conclusion: the role of NGOs/CSOs

- Individual actions more important than ever – localization of disaster management in each country, locality
- Equal assistance based on fairness (government) vs. Specific assistance based on individual needs (civil society)
- Over-reliance on volunteer – the need for professional agencies (Assistance based on standards (e.g. Sphere, CHS) at times of uncertainty) – but source them locally as much as possible
- DRR awareness: something special vs. nothing new
- Collective responsibility, based on Principles of Partnership (Equality, Transparency, Results-Oriented Approach, Responsibility and Complementarity)

Japanese experience and assistance in flood risk management

Mikio Ishiwatari

Visiting Professor, The University of Tokyo

Japan is fighting against floods throughout its history, and using such experience to support other countries. This presentation covers country's response to recent flood disasters and Japanese assistance in developing countries.

1. Effective countermeasures against Typhoon Hagibis in the Greater Tokyo in 2019

Typhoon Hagibis caused widespread destruction in eastern and northern regions in Japan in October, 2019. Because of heavy rainfall, river embankments were destroyed in 140 places in 71 rivers. Some 100 people died and over 100,000 houses were inundated.

Major part of the Greater Tokyo area was protected from flooding, while limited areas were inundated because of improper operation of drainage gates. This is because the government has invested in constructing flood protection facilities in major river basins for over one century to protect the strategic areas of the country from flooding. Without these facilities, Tokyo would have inundated, and the damage would have been far worse. The flood protection system consists of dams in upstream, reservoirs in middle stream, and diversion channels in downstream.

2. Integrated approach of flood risk management for development assistance

Japan has supported the Philippines to strengthen flood protection systems based on Japanese experience and technology. In Metro Manila, the similar approach with the Greater Tokyo area was taken. River channels were improved, pumping stations were installed, tidal gates and embankments were constructed.

In addition to structural measures, Japanese experience of software measures is used for projects in Vietnam. The project activities cover strengthening capacities of government organizations, enhancing community-based disaster management, and developing nature-based methods of protecting river bank erosion.

Typhoon Hagibis threatened the Greater Tokyo Area

Tidal gate in Metro Manila

Evacuation shelter in Vietnam

Session III

Latest research in disaster science

Reenacting a National Legislation for Buildings: Another Look at Multi-Hazards Resilience in A New Normal

Benito M. Pacheco

Professor, University of the Philippines Diliman

A short review of the history of national building regulation in the Philippines dating back to the 1970s is followed with an overview of the proposed Philippine Building Act of 2020, presently in consideration by the national Congress. There is now an added urgency for reforms as the pandemic has caused all to shelter at home and work from home, highlighting the significance of buildings, structures, and houses.

Shelter is the recommended view of buildings, being the end-user's point of view rather than the view of the architect or engineer. The argument is made that every building is a shelter first, and then more: contemplating all types of use or occupancy. Far from ideal, shelters and the occupants are exposed and vulnerable to multiple hazards, as evidenced by building-related disasters even in the past 40 years when a national building code has been in force.

Example economies have confirmed dramatic reduction of mortality risks from natural hazards through incremental improvements of the regulations for building and land use. With this in mind, a multi-disciplinary team of the University of the Philippines (UP National Engineering Center in cooperation with UP Law Center and professionals from various departments) facilitated a multi-year review of the National Building Code of the Philippines (1977) and its Implementing Rules and Regulations (2005), and one of the recommendations is the reenactment of a new national legislation to replace the 1977 presidential decree: the Philippine Building Act that was first proposed in 2018.

The proposed reforms start with clarifying the hierarchical framework of: (1) Act (by the Congress); (2) Regulations (and Rules, by the executive Departments); (3) and Reference Standards (by mandated agencies and bodies, as promulgated by the lead Department). The Act addresses legal, administrative, and technical or technological aspects. In the framework, much of the operational details of administration are delegated to the Implementing Rules and Regulations, to be reformulated and recommended by the new inter-agency and multi-sector Building Regulations and Standards Council. Much of the technical or technological details are delegated to be to Reference Standards (formerly, referral codes), to updated by competent agencies and bodies, for recommendation by the Council, and for promulgation by the National Building Official.

More specific legal reforms include: (a) streamline the building permit process, mainly by classifying into simple, regular, and special buildings and matching each classification with commensurate regulations and standards; (b) design buildings to be more resilient against multiple hazards, including evacuation buildings; (c) assess old buildings, every 15 years; (d) incentivize the retrofit of old buildings when deemed necessary; and (e) create the Building Regulations and Standards Council to review and update every five (5) years or sooner.

Many more reforms are embodied in the Act, including: mechanisms to harmonize local ordinances with national; venues for appeals or complaints from the local level, to regional, and to national; and incentives for innovation. Emphasizing equal importance of enforcement of and compliance with regulations and standards, the Act provides that many share the responsibility for the resilience of our buildings.

SHELTERS ARE VULNERABLE

ca. 2003

GMMA RAP Study (2014) scenario of M7.2 earthquake: collapsed or completely damaged buildings would cause 37,000 fatalities in Greater Metro Manila Area

Shelters are exposed and vulnerable to multiple hazards. And so are we, the occupants.

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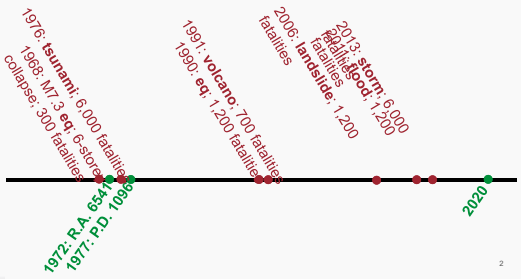
1

SINCE 1968: SELECTED MILESTONES



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2

WE NEED THE REFORM TODAY, IN A NEW NORMAL, AND IN THE FUTURE.

- Philippine Development Plan 2017-2022: Chapter 20…
- Nat'l Econ & Dev't Authority: We agree… to reform the National Building Code [of 1977] in order to improve and update said legal **framework**, and make such more responsive and relevant to **current issues and developments.**
- We: **anticipate the emergent and the emerging.**

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3

FRAMEWORK REFORM: PH

1977		2020
• National Building Code: PD 1096	➡	• Philippine Building **Act** of 2018 …or 2019…or 2020
• Other national legislations such as Fire Code of 2008	➡	• Other national legislations such as Fire Code of 2008
• Implementing Rules and Regulations	➡	• Implementing Rules and **Regulations**
• Referral Codes		• Reference **Standards**

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4

MAJOR LEGAL REFORMS

- Streamline building permit process
- Design buildings to be more resilient against multiple hazards, including evacuation buildings
- Assess old buildings, every 15 years
- Incentivize retrofit of old buildings
- Create inter-agency and multi-sectoral **Building Regulations and Standards Council (BRSC)** to review and update every five (5) years or sooner

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5

MANY WILL SHARE RESPONSIBILITY

1977	2020
• Owner or Developer	• Owner or Developer
	• Professional
	• Contractor
• Official	• Official

Liabilities are proportionate to the size and cost of the building project.

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6

Forecasting and Nowcasting Earthquakes and Tsunamis: Anticipating Great Natural Disasters Using Machine Learning

John B Rundle

Distinguished Professor, University of California, Davis, USA

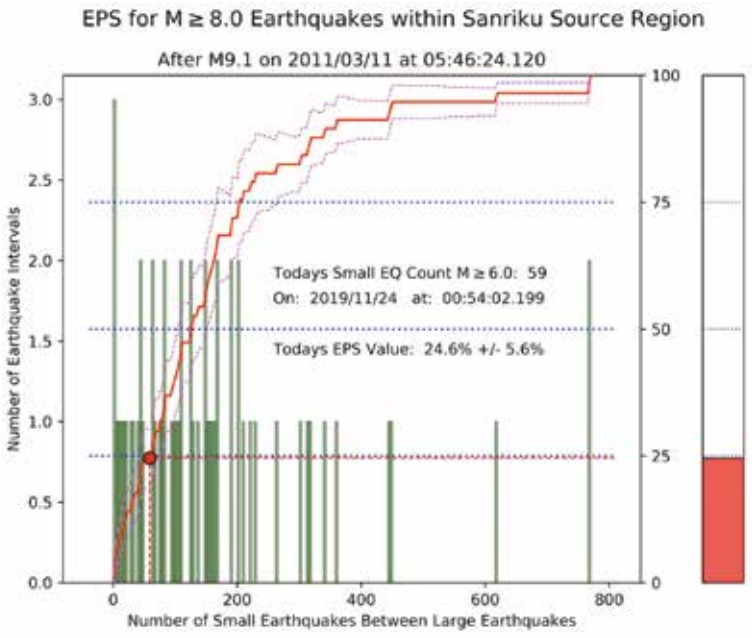
Prediction in the context of earthquakes can be regarded as the precise specification of time, location, and magnitude of an impending earthquake. The process of producing a prediction generally involves a search for hypothesized precursory phenomena. As discussed earlier, many studies have found that reliable earthquake prediction, with associated estimates of successful predictions, false alarms, and failures to predict, is extremely difficult, if not impossible.

On the other hand, forecasting is the specification of the probability of a future earthquake, usually within some level of confidence. To make a forecast, one must assume a probability law governing the system, an assumption that is subject to debate.

By contrast, a nowcast is the computation of the current state of risk of the system, often by proxy data (Rundle et al.). Although a nowcast implies a level of near-future hazard, it is not explicitly stated. In this lecture, we focus on the idea of nowcasting earthquakes.

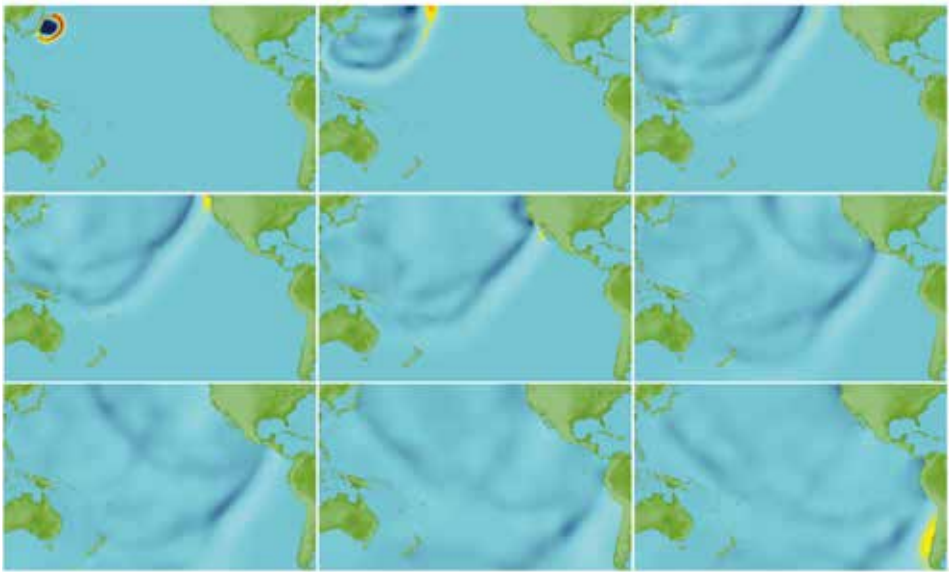
Nowcasting is a term originating from economics and finance. It refers to the process of determining the uncertain state of the economy or markets at the current time by indirect means. By current time is meant the present, the immediate past, and the very near future. The main point of nowcasting is define the current level of risk purely from data, without adopting or assuming any kind of probability distribution function to project this information into the future.

We have applied this idea to seismically active regions, where the goal is to determine the current state of the fault system, and its current level of progress through the earthquake cycle. In the implementation of this idea, we use the global catalog of earthquakes, using "small" earthquakes to determine the level of hazard from "large" earthquakes in the region. An example is shown in the figure below.

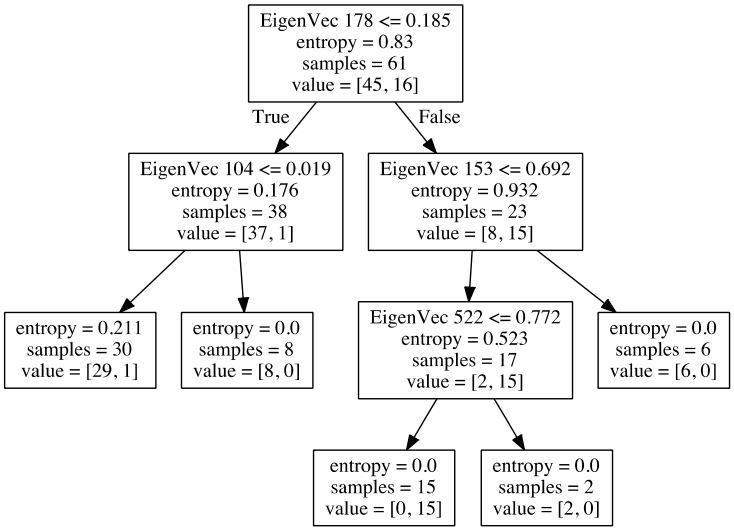


In this example, we show a nowcast for the Sanriku coast region of Japan. Green vertical bars in the histogram represent intervals of small earthquakes between M≥8 earthquakes since 1900. The "small" earthquakes are events having magnitudes 6≤M<8 worldwide The solid red line rising from lower left to upper right is the Cumlative Distribution Function, constructed from the histogram. Dashed magenta lines are the 1σ confidence intervals. The current count of small earthquakes within the Sanriku source region is 59, meaning that this region is at a level of risk of 24.6% of the typical worldwide count between large earthquakes. The "thermometer is a visual representation of the current level of risk.

We have also focused on the development of realistic tsunami simulations using a method known as "Tsunami Squares", which is a cellular automaton approach to the basic hydrodynamic equations that describe tsunamis. In the figure below, we show a simulation of a Pacific basin-wide simulation of the March 11, 2011 Great East Japan Tsunami.



Machine Learning. Machine Learning (ML) is a generic term that includes a variety of supervised and unsupervised methods to extract patterns and other types of information from data (refs). Methods of interest in this area include not only cluster analysis (Unsupervised learning), but also optimization (Supervised learning), a form of regression. We are currently working on a number of methods based in ML that hold promise for improving our ability. One of the important ideas is Decision Tree Analysis, an example of which we show in the figure below.



To build these methods, one first defines a series of labeled feature vectors. Then the classification of these feature vectors allows future unlabeled feature vectors to be assigned labels. In the case of earthquake nowcasts and forecasts, the label might be 0 for no earthquake in the next year, or perhaps 1 if an earthquake is expected in the next year.

ANNEX : Program



15 July

Lessons learned from the Great East Japan Earthquake and Tsunami

11 : 00 — 11 : 25 Opening
Welcome address by Prof. Toshiya Ueki, Executive Vice President for General Affairs, Financial Affairs and International Relations, Tohoku University
Welcome address by Dr. Christopher Tremewan, Secretary General, APRU

11 : 25 — 11 : 55 "Medical and Public Health Resilience" by Prof. Shinichi Egawa (IRIDeS)

11 : 55 — 12 : 25 "Mitigating People and Disasters: Approaches of Social Sciences" by Assoc. Prof. Sébastien P. Boret (IRIDeS)

12 : 25 — 12 : 55 "Urban Disaster Risk Reduction: Japan as a disaster-prone country and learning from past disasters" by Prof. Osamu Murao (IRIDeS)

12 : 55 — 13 : 00 Closing for Day 1

22 July

Role of various stakeholders in disaster risk reduction

11 : 00 — 11 : 15 Welcome & Introduction
Welcome address by Prof. and Director Fumihiko Imamura (IRIDeS)

11 : 15 — 11 : 25 "Acting Together in a World Out of Balance on solutions to Asia-Pacific challenges" by Ms. Christina Schönleber, Senior Director (Policy & Programs), APRU

11 : 25 — 11 : 55 "Implementation of the Sendai Framework for Disaster Risk Reduction (SFDRR): the role of stakeholders" by Assoc. Prof. Takako Izumi (IRIDeS)

11 : 55 — 12 : 25 "Emerging Trends and the Role of NGOs / Civil Society Organizations" by Mr. Takeshi Komino, General Secretary, CWS Japan

12 : 25 — 12 : 55 "Japanese experience and assistance in flood risk management" by Dr. Mikio Ishiwatari, Visiting Professor, The University of Tokyo

12 : 55 — 13 : 00 Closing for Day 2

29 July

Latest research in disaster science

11 : 00 — 11 : 05 Welcome & Introduction

11 : 05 — 11 : 25 “APRU Multi-Hazards Program” by Assoc. Prof. Takako Izumi (IRIDeS)

11 : 25 — 11 : 55 “Reenacting a National Legislation for Buildings: Another Look at Multi-Hazards Resilience in a New Normal” by Prof. Benito M. Pacheco (University of the Philippines Diliman)

11 : 55 — 12 : 25 “Forecasting and Nowcasting Earthquakes and Tsunamis: Anticipating Great Natural Disasters Using Machine Learning” by Prof. John B Rundle (UC Davis)

12 : 25 — 12 : 55 “Global impacts of disasters and climate change and recent advances in DRR Science and Policy” by Dr. Riyanti Djalante (United Nations University)

12 : 55 — 13 : 00 Closing for Day 3

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