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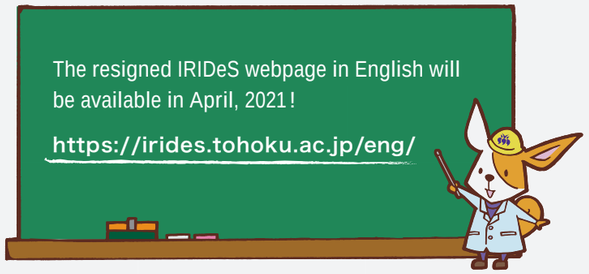

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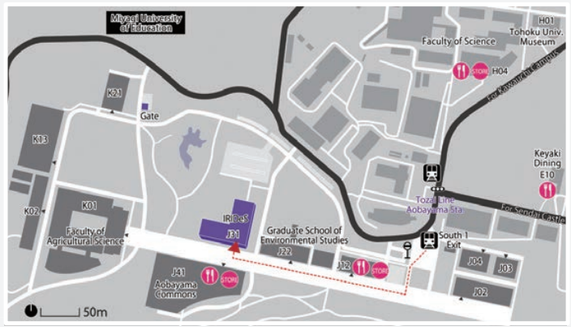

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Editor's Note

The year 2020 was a challenging year due to COVD-19, but we have been working eng/to develop our activities.

(Natsuko Chubachi, IRIDeS Public Relations Office)

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Cover photo: Ruins of the Great East Japan Earthquake, Nakahama Elementary School, Yamamoto-cho, Miyagi Prefecture.
This is a place that asks visitors various questions and makes them think. Dr.Masashige Motoe, an IRIDeS concurrent faculty, was the leader in charge of directing its design. (There is a related article on p.14)

Conveying the results of practical disaster prevention research from TOHOKU to the world

IRIDeS NEWs

International Research Institute of Disaster Science, Tohoku University

2021

Topics

IRIDeS
International Research Institute of Disaster Science

Director's Greeting

March 11, 2021 marked the 10th anniversary of the Great East Japan Earthquake. Now, it is important to review the progress of the last decade and to promote recovery further, while at the same time enhancing preparations for future disasters. Last year marked the 25th anniversary of the 1995 Great Hanshin-Awaji Earthquake. As there is a growing generation who did not experience the disaster, issues such as its fading memories and passing on its lessons are becoming more pertinent. Therefore, we are determined to pass on the experiences of the 2011 disaster, but will face similar challenges as the 1995 earthquake. IRIDeS has a mission to learn lessons from the 2011 disaster and to convey them to those who did not experience it. The role that IRIDeS should play will thus become even more important in the future.

COVID-19 has affected both Japan and the international community. Tohoku University, including IRIDeS, has been making the utmost efforts to stop its spread. IRIDeS researchers of the Disaster Medical Science Division have been contributing to fight infectious diseases both on and off campus. In addition, IRIDeS researchers started diverse new studies on infectious diseases. Contagious diseases have many similarities with disaster caused by natural hazards; for example, both of them can be considered with phases of preventive measures—emergency response in the event of an outbreak—and subsequent recovery and reconstruction. We will continue to contribute to the research on infectious diseases, building on our existing knowledge of disaster science. With you, we will keep working to construct a safer society.

Fumihiko Imamura, Director
International Research Institute of Disaster Science (IRIDeS), Tohoku University

ANNOUNCEMENT

IRIDeS Starts a New Division System

IRIDeS will start a new division system, as detailed below, in April 2021 towards more robust and flexible research and practical activities.

Risk Evaluation and Disaster Mitigation Research Division

Conducts advanced research on disaster evaluation and response, both in Japan and abroad, through the integration of science and engineering. The activities of this division include field surveys of damage, various observations, numerical simulations of natural phenomena and disaster processes, advanced remote sensing, visualization, and development of robot-related technologies. This division also presents concrete proposals that will lead to disaster risk reduction.

Disaster Humanities and Social Science Division

Aims at delivering the lessons of past disasters to future generations and contributing to disaster reduction and post-disaster recovery in each region through research focusing on the human mind and activities, architecture, and social infrastructure. By integrating history, disaster culture and archive studies, regional, urban, and spatial designs, and cognitive sciences, this division will conduct research proposing concrete measures for disaster risk reduction in response to evolving disasters and to construct resilient local communities.

Disaster Medical Science Division

Conducts research on topics of continuous periods from pre-disaster to recovery times through collaboration, aiming at establishing disaster medicine for wide-area and complex disasters, and introducing the latest science and technology to the field. From the standpoint of medicine, this division takes the lead in innovative responses to disasters. The tasks of this division also include comprehensive scientific analysis on and countermeasures against COVID-19.

Practical Research and Collaboration Division

Works on social implementation of research results and on disaster risk reduction activities through regional and international cooperation, in addition to conducting practical studies. This division disseminates IRIDeS research outcomes (both domestically and internationally) at various venues, including the World Bosai Forum, major international conferences and United Nations events, contributing to the implementation of the Sendai Framework for Disaster Risk Reduction.

Besides the above divisions, the part of the IRIDeS organization system that remains the same includes the Endowed Research Division with Earthquake-induced Tsunami Risk Evaluation (Tokio Marine and Nichido Fire Insurance) and Earthquake Disaster Prevention for Urban Areas (OYO Corporation), Global Centre for Disaster Statistics, the Kesennuma Satellite Office, and Public Relations Office.

A complex chain of factors could cause unpredictable damage in the future, such as torrential rains and floods, which are becoming severer due to climate change, the Nankai Trough earthquakes and tsunamis, massive earthquakes directly under the Tokyo metropolitan area, and disasters caused by infectious diseases and radiation. With the new division system, IRIDeS continues to address changing social issues, while promoting further collaboration beyond the framework of existing disciplines.

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Report

Making a copy of a stone monument
(photo provided by Japanese Disaster Culture Lab)

Starting Diverse Research and Practical Activities Related to Infectious Diseases

In order to prevent the spread of COVID-19, IRIDeS cancelled or postponed several events that had been planned for the 10th anniversary of the Great East Japan Earthquake. Field research activities of IRIDeS faculty members have also been severely restricted. On the other hand, IRIDeS members including executive committee members and disaster medicine experts held regular meetings to address infectious disease countermeasures in the research and education environment, while developing online systems of meetings, research activities, and public events.

In addition, researchers with diverse specialities have launched 10 research projects in 2020, seeing infectious diseases as another kind of disaster and utilizing the lessons from the 2011 catastrophe. The themes of the projects include "Historical Changes in the Socio-Cultural Context of Infectious Diseases (Repel Epidemic Project)," "Improvement of Business Continuity Plans for Companies and Organizations Responding to COVID-19," "Visualization and Reduction Measures of COVID-19 Transmission Risk during Flooding under Infectious Disease Epidemics," and "The Power to Live with COVID-19." All of them are characterized by their interdisciplinary nature.

The Repel Epidemic Project [1] conducts research on infectious disease-related stone monuments and traditional customs in order to repel epidemics in various places of the region. The project proceeded in cooperation with the Sendai City Museum of History and Folklore and the citizens. On September 30, 2020, Assoc. Prof. Yuichi Ebina, the project leader, held a press conference in Sendai City to call for cooperation from the public.

In November 2020, Dr. Yasuhiro Miki and his research team members published a paper revealing that behavioral regulations as a countermeasure against COVID-19 have caused motivation loss and anxiety about the future for researchers [2]. In December of the same year, researcher Masashi Sakamoto and his research team members published a review paper to verify evacuation procedures in the event of a disaster caused by natural hazards under pandemic conditions [3].

On August 31, 2020 in Kawasaki City, Professor Fumihiko Imamura conducted a demonstration experiment, together with the Earthquake Research Institute of the University of Tokyo, Fujitsu Limited, and the City of Kawasaki, to run an evacuation center assuming that a natural hazard disaster occurred during COVID-19. The experiment was a practical activity of industry-academia collaboration to reduce the infection risk in an evacuation center, and to ensure a safer evacuation by using human flow simulation technology and AI image analysis solutions.

Since its establishment, IRIDeS has promoted research and practical activities with the mission to "turn misfortune of the Great East Japan Earthquake into construction of a safer society," while keeping a Japanese saying in mind that states, "Turn disaster into fortune." Now, 10 years after the occurrence of the disaster, IRIDeS has added a new goal to its mission, taking advantage of lessons learned from the Great East Japan Earthquake: "Turn the pandemic into building a better society."

1) Repel Epidemic Project website: *https://www.saigaibunka.jp/index.html* (in Japanese).

2) Miki, Y., Chubachi, N., Imamura, F., Yaegashi, N., & Ito, K. (2020). Impact of COVID-19 restrictions on the research environment and motivation of researchers in Japan. *Progress in Disaster Science 8*.

3) Sakamoto, M., Sasaki, D., Ono, Y., Makino, Y., & Kodama, E. (2020). Implementation of evacuation measures during natural disasters under conditions of the novel coronavirus (COVID-19) pandemic based on a review of previous responses to complex disasters in Japan. *Progress in Disaster Science 8*.

Feature

Lessons from the 2011 Great East Japan Earthquake:

IRIDeS researchers talk about recovery and passing on disaster memories to future generations

IRIDeS compiled a book titled *51 Approaches to Disaster Science: Lessons from the 2011 Great East Japan Earthquake,* which was released in March 2021—the 10th anniversary of the Great East Japan Earthquake. In this book, IRIDeS researchers, as well as several other scholars from collaborating organizations, summarized the problems that were revealed by the 2011 disaster, the progress that has been made to date, and the remaining challenges—all from respective fields of expertise. This book is written in Japanese and consists of 51 chapters（one topic per chapter）and four columns under four major themes: "disaster assessment and prevention," "humanity and society," "health," and "domestic and international cooperation."

On January 25, 2021, four of the book chapter authors gathered for an online discussion to talk about recovery and how to pass down disaster lessons for future generations. Deputy Director Prof. Hiroaki Maruya,（specialization in economics）was the moderator; Associate Professors Shosuke Sato（disaster informatics）, Daisuke Sato（history）and Elizabeth Maly（architecture）also participated.

Book title: 51 Approaches to Disaster Science: Lessons from the 2011 Great East Japan Earthquake
Editor: IRIDeS, Tohoku University
Publisher: Tohoku University Press, Sendai
Price: 3,000 yen + tax
ISBN: 978-4-86163-357-7 C3000

The past and future of passing on disaster memories

Deputy Director Maruya (hereafter Maruya): Today, I would like to ask each of you to introduce the chapter you have written and then we can all discuss it together. We will begin with you, Dr. Shosuke Sato. Please start.

Deputy Director **Hiroaki Maruya**

Associate Professor Shosuke Sato (hereafter S Sato): I wrote Chapter 32, "The Science of Passing on Memories." The Sanriku region has repeatedly dealt with tsunami disasters in the past and has tried to pass on their lessons and experiences in various ways. However, even where similar tsunami monuments had been built, there were differences seen in the extent of damage from the Great East Japan Earthquake. For example, both Omoe Aneyoshi, Miyako City and Nakazawahama, Hirota-machi, Rikuzenntakata City, Iwate Prefecture, have a tsunami monument that reads "Don't build a house below here." However in 2011, the damage of the former district was small, whereas the latter district suffered many victims.

I then hypothesized that the extent of the damage could be associated with knowledge about past disasters; and so I proceeded to conduct a study. When comparing Iwate and Miyagi Prefectures, mortality rates tended to be higher in Miyagi Prefecture. In Iwate Prefecture, a large percentage of people recalled a past tsunami when the earthquake occurred. In both Miyagi and Fukushima Prefectures, there was a rather common belief that "Tsunamis do not come to this place."

It is an obviously important matter to pass on the fact that a disaster occurred in the place to future generations. However, I found that, while some areas successfully passed on disaster experiences, others could not; furthermore, while some areas mitigated the tsunami damage with the lessons that have been passed down, others could not.

I have also explored the characteristics and effects of passing down disaster memories quantitatively. Our study found that a disaster is most likely to be remembered when it is told by a person who has personally experienced it; additionally, it is also - to some extent - effective when these memories are just simply conveyed by a human—even if the person in question did not actually experience the disaster first-hand. Lastly, I am assisting in training and informing the young generation who will help pass on these important stories of disaster to future residents.

Dr. **Shosuke Sato**

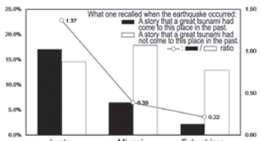


Figure: Recalling past tsunamis at the time of the earthquake occurrence
(Source: Assoc.Prof.Shosuke Sato)

Associate Professor Daisuke Sato (hereafter D Sato): If only one person out of 100 has knowledge and awareness of past disasters, precious lives could be saved—perhaps the entire community does not have to have the knowledge. How these memories are communicated should also be focused on. I consider that a quantitative approach, as well as a qualitative approach should be important in this endeavor.

My specialty covers the Edo period. In this period, people did not have the freedom to move from one place to another. Thus, it was more than likely easier to pass on disaster memories within a community. In modern times, however, it has become far more difficult to pass on personal disaster experiences due to the mobility of the population, as well as the decline of communities in general. Preservation of the "3.11" legacy will be a task of the upmost importance.

S Sato: In the future, I would like to study how the existence of key people and how methods of communication are associated with passing on disaster memories and with actual evacuation behavior. There were cases in the past where passing on disaster experiences was disrupted because of a relocation of the community to higher ground. I would like to carefully consider this while passing on stories and memories of the Great East Japan Earthquake.

Associate Professor Elizabeth Maly (hereafter Maly): It is also becoming important to pass on how disaster areas have been reconstructed, not just stories of the disaster itself. It is necessary to integrate regional reconstruction and disaster storytelling, helping local people to easily share their experiences with people from outside of their communities at a facility that is built to pass on their disaster memories to a broader audience. What do you think about passing on memories of the tsunami risk and evacuation that immediately follows after a disaster; what about the long-term perspective for the future?

S Sato: Facilities for the purposes to convey the disaster began to appear about five years after the 2011 disaster. Related to your question, early facilities tended to focus on earthquakes, tsunamis, and emergency response; while more recently built facilities tend to have more content that is related to reconstruction. How to update the existing content of the initially created facilities will be important in the future. Also, there is an example of the disaster area of the 2004 Chuetsu earthquake, that successfully became a tourist attraction that pulled in many visitors. I hope this will be the case in Tohoku as well.

Maruya: In the past 10 years, we have addressed what information needs to be preserved and how. In the next 10 years, I hope that the younger generation of researchers will develop technology that will allow future generations easy access to the information, especially digital data—including videos. This would not only be found at heritage sites and monuments, but anywhere they need to be. Next, Dr. Daisuke Sato, please start.

Activities to preserve historical materials helps in the recovery of people affected by a disaster and makes their community more disaster-resilient

D Sato: I co-authored Chapter 26, "Rescuing Historical Materials Owned by Private Families" with Dr. Atsushi Kawauchi. It is estimated that Japan has over two billion historical documents—with most of them being privately owned. Since the 1995 Great Hanshin-Awaji Earthquake, networks involving volunteers have been engaged in the rescue of historical materials affected by natural disasters in order to prevent the loss of valuable materials. Such activities were conducted in Miyagi Prefecture for the first time after the earthquakes in July 2003—in which I also participated.

Dr. **Daisuke Sato**

Citizens working on the preservation of historical materials
(photo courtesy of Dr. Daisuke Sato)

Due to the Great East Japan Earthquake, irreplaceable human lives and hometowns were lost, as well as historical materials from many different places. On the other hand, in the 83 cases in which I was involved in, we were able to contact the owners of the materials and successfully rescue them; this was all thanks to the network that was built by the citizenry before the disaster. Furthermore, in the last decade, a total of 5,300 citizen volunteers have been involved in operations to prevent the deterioration of materials suffering water damage.

These rescue and preservation activities have been popular with citizens who wished to do something helpful after the disaster. Furthermore, through these activities, some citizens became more interested in the content of historical documents and even learned how to read old Japanese writing. One person, in particular, even deciphered historical materials and released a publication on them. Activities used to preserve historical materials have a possibility to provide both psychological and social support for disaster victims—beyond just historical research and material rescue. That is a research topic of IRIDeS Visiting Professors, Dr. Kamiyama and Dr. Morris. Through these activities, disaster-affected people, who have once lost everything, can now reconstruct relationships with the past by reconnecting themselves with the history of their ancestors over a period of 200 to 300 years. In a sense, they are finding a way to avoid the historical discontinuation that was created by their own generation.

The disaster areas this time have been repeatedly experiencing major disasters. We also found that the historical documents make people more involved and become more aware of the history of past disasters and of the subsequent recovery from them—encouraging the recovery of the affected areas and people. In the past decade, I have realized that citizens, visitors, and experts that work together on a regular basis to engage in local history and practical activities have a potential to make communities more resilient to disasters.

Maly: It is interesting that historical documents can exert a spiritual influence. By the way, from an international perspective, things such as disaster folklore, disaster-related historical documents, and disaster storytelling all seem to have aspects unique to Japan. Are the methods that people used to pass down disaster stories in the past the same as they are today?

D Sato: There are historical documents that depict a disaster that had just occurred in the region; these documents also reviewed past disaster cases that happened there. The dates of the disasters that were recorded in those documents are accurate. So, I have been wondering about who passed down those disasters and how they had become memorialized in society. At that time, there were many situations where people gathered for their livelihood activities, such as for agriculture, forestry, and fisheries—as well as for other aspects of their daily life. Perhaps those topics on disasters were repeatedly brought up during those occasions. However, such scenes were not recorded and so we, therefore, have no knowledge about the actual situations. The people of the Edo period made a living by trading agricultural, forestry and fishery products. A disaster caused by natural hazards was always a risk factor, but it could also bring forth business opportunities. In any case, the information of disasters should have been directly related to their survival. I will keep thinking about the question about disaster storytellers that you have pointed out for my future study topic.

S Sato: Do you find it significant that your Preservation of Historical Materials Lab is in IRIDeS?

D Sato: I find it very meaningful to have an environment here where I can interact with scholars with different expertise on a daily basis and also introduce our activities to visitors. I have been greatly inspired during my time in IRIDeS; just like the topic on storytellers that was mentioned earlier. I would like to learn more about history even after the Edo period and continue to further develop my research.

Maruya: I suggest that, in the future, it would be worth taking a challenge to link your activities with IRIDeS research on the enhancement of hazard maps, in order to specify areas with higher disaster risks for photographing and digitizing historical materials as a priority in advance of disasters occurring.

D Sato: From 2003 to 2010, we conducted preventative activities; we were digitally photographing every single document with historical value. As a result, in the Great East Japan Earthquake, there are cases in which only photos survived, while the original documents were unfortunately lost. However, the problem is that there are too many historical documents in local areas to be properly digitized and organized. I see that it is also necessary to have a mind to appropriately share regional disaster risks with the owners of these historical materials in advance; this would be in order to protect the historical materials together with their owners and residents within the region.

Considering the housing reconstruction after the Great East Japan Earthquake from an international perspective

Maruya: Now, Dr. Maly, please.

Maly: I wrote Chapter 47 "What is Improved Housing Recovery?-Considered through International Comparisons." After the Great East Japan Earthquake, the number of houses that needed to be reconstructed was extremely large. The affected areas were diverse in scope

Dr. **Elizabeth Maly**

and people affected by the disaster had to live in temporary housing for a long time—all of which made the housing reconstruction difficult. In my opinion, good policy measures that support housing reconstruction for disaster affected people share the following two points worldwide: (1) having a high level of flexibility and providing an expanded number of options, and (2) creating a comfortable living environment with high-quality construction (both in design and in building materials). Some housing reconstruction projects after the 2011 disaster fits into these parameters.

As for the first point regarding increased options for disaster-affected people, not only prefabricated temporary housing, but private rental apartments used as designated temporary housing were also provided on a large scale. No new land is necessary for designated temporary housing, and therefore it may be applicable after a disaster occurs in urban areas in the future. As for the second point regarding the creation of a good living environment with quality construction, there were good examples shown by the provision of wooden temporary housing. Approximately 7,000 units were built in Fukushima Prefecture. In Sumita Town, Iwate Prefecture, local construction companies used group subsidies to build temporary wooden houses with local materials. This is a noteworthy example, not only in terms of building materials, but also in terms of the reconstruction process.

Temporary housing usually falls under the jurisdiction of the prefectural government, whereas disaster recovery public housing falls under the appropriate municipal government. This jurisdictional difference makes it difficult for temporary housing to be converted to permanent disaster recovery housing. However, in Aizuwakamatsu, Fukushima Prefecture, there was a case in where temporary housings were reused as disaster recovery public housing. The U.S. has a similar issue when it comes to silos in government, but a system is being developed to reuse temporary core houses—extending them to build permanent housings. I am interested in the future possibilities for housing conversion.

In the final part of my chapter, I discussed the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) that is the global disaster risk reduction (DRR) guideline. "Building back better," which is one of the important concepts of SFDRR, has been discussed in a variety of ways. The SFDRR states that it is important to include diverse stakeholders and to take an inclusive view of recovery. Many countries still need to make significant improvements in their housing reconstruction policies. In Japan, nuclear evacuees still have not found a way to rebuild their lives. However, the housing reconstruction process has been evolving, both in Japan and overseas, providing more comprehensive supports for the lives of disaster-affected people.

A house that was once built as a temporary housing and was reused as a disaster recovery public housing, in Aizuwakamatsu, Fukushima Prefecture (Photo courtesy by Dr. Maly)

D Sato: What do you think about town relocation? There are many old landscapes found within the coastal areas. From a perspective of a historian, I am very concerned that town relocation to higher ground could destroy the townscape that has been constructed through the interactions between people and the natural environment.

Maly: This is an important question that cannot be answered simply. In the U.S., there are measures in place just to buy up the affected area and provide money. The large-scale high land relocation projects after the Great East Japan Earthquake are very rare worldwide. As a result of the relocation to higher ground, residential areas and stores became separate; this makes things much more difficult for people to live, especially for the elderly. In the Philippines, there are cases where relocation has given people sturdy houses but no employment opportunities. Safety alone is simply not enough.

Maruya: I also agree with the idea of considering temporary housing and disaster public housing as a continuum. However, there is always the real problem of quickly finding available land for temporary housing that is needed after a disaster; disaster recovery public housing cannot be built without first securing land that can be permanently used. Land cannot be easily found; and so temporary housing often ends up being built in a temporary space, such as a schoolyard, where permanent housing cannot be built. This is an issue that lies beyond silos in government. If you could propose solutions by introducing inspiring cases from overseas in the future, government may begin to take a realistic interest. I also would like to point out that there were other factors when it came to wooden temporary housing construction: after the 2011 disaster, the supply of prefabricated housings could not meet the need in time and, in addition, there was also a high demand for reconstruction by local companies. I do not think that this was just a simple matter of wooden housing being satisfactory.

Maly: The biggest obstacle to housing reconstruction is the land issue in any country. I also note that trailer houses were used as temporary housing in the disaster area of Atsuma-cho, Hokkaido. It is good that disaster-affected people have more housing options, but - as you pointed out - it is not that simple of an issue. I will keep considering.

What is "building back better" for Tohoku disaster areas?

Maruya: Finally, let's talk about the concept of "building back better." In the affected areas of developing countries, better social and economic development can be expected if a good level of reconstruction can be achieved. However, for a long time, I have been wondering how the term "build back better" can be understood in the context of the 2011 disaster areas. Apart from the municipalities around Sendai, the population of the affected areas is declining—having a negative impact on economic recovery. In Kesennuma and Ishinomaki, for example, values of shipments of manufactured goods have not yet recovered. Onagawa's population has decreased by half. In this situation, as researchers of IRIDeS that make much account of the SFDRR, how do you think we can build back better within the Tohoku affected areas?

S Sato: At the Miyagi Disaster Prevention and Mitigation Roundtable, we also considered *fukko* (recovery/reconstruction). While the word is often used by the governments and media, it is not familiar enough of a term to disaster-affected people. However, I cannot think of an alternative word. We tend to think "better" in the context of population numbers or in the economy, but there should be other various evaluation topics—including qualitative ones. We need a place where many people can discuss and agree on how to build back better within the Tohoku disaster areas.

D Sato: There is a very severe reality. However, there are people who have moved into affected areas and have managed to successfully restart with new agriculture, forestry, fisheries, and cultural activities. From a historical timeline, I think that the evaluation is still to come. In terms of historical materials, the former Ishinomaki Cultural Center will be rebuilt in the near future. Regional centers for history and culture are gradually being rebuilt. I believe that, through the conservation of historical materials, relationships with people and the past will be reconstructed—including those who left the area after the disaster. From the standpoint of a historian, who takes a bird's eye view of events over a long time axis, I would like to continue paying attention to any transformations seen after the earthquake. At the same time, I would also like to keep reconstructing various relationships with people through the use of activities—such as the preservation of historical materials. I will continue to conduct research engaging with the community and will keep thinking.

Maly: The Japanese word *fukko* has a connotation of making things better than before. There are slight differences in the meaning of "*fukko*," "build back better," and "better *fukko*." Everyone wants to make disaster areas better, and so the phrase "build back better" is used frequently. However, different people use the phrase with different meanings and contexts. In some cases, such as relocation to higher ground - even if it is safer in terms of disaster risk - it may not be overall better due to the critical loss of human ties. Thus, I use the term "people-centered housing reconstruction" instead of "building back better." The phrase "people-centered" is also often used in the SFDRR. Furthermore, the evacuees of the nuclear accident will not be able to return to their hometowns; this is a complex issue that cannot be solved by reconstruction alone and can not be seen as "building back better." Tsunami and nuclear disaster areas need to be considered separately.

Maruya: While it is difficult to restore prosperity and activeness of the affected areas, it would appear that we need to think about affluence and happiness, focusing on other key concepts such as humanity, culture, community, and exchange. Issues within the disaster areas cannot be easily solved with my expertise alone, which includes economics, governments, and organizations. In the next decade, I hope that we make use of the interdisciplinary connections of IRIDeS in order to find perspectives that will better assist in the improvement of these disaster areas.

(The online discussion was held on January 25, 2021)

Public Relations Office Column
Lessons from the 2011 Great East Japan Earthquake

Shinichi Egawa
Head, Public Relations Office
Professor, Disaster Medical Science Division

10 years have passed since the Great East Japan Earthquake. Recently, IRIDeS has published a book titled *51 Approaches to Disaster Science: Lessons from the 2011 Great East Japan Earthquake*. The book, which is written in Japanese by IRIDeS researchers of multiple disciplines, is intended for a broad and diverse readership.

The 2011 disaster was caused by a combination of the greatest earthquake ever recorded in Japan, the subsequent mega tsunami, and the Fukushima Daiichi Nuclear Power Plant meltdown. The immense damage the disaster brought forth shocked the world. Aftershocks of the quake still occur to this day, and various issues that were caused by the disaster have not yet been solved. On the other hand, however, we have learned and improved on many things since then. The lessons of the 2011 disaster have contributed to the Sendai Framework of Disaster Risk Reduction 2015-2030; which is the global disaster risk reduction (DRR) guideline for individual, family, community, national, and international levels.

As a surgeon who specializes on the pancreas, I find strong similarities between both disaster and disease. For starters, both words start with "dis," which means negation. According to the etymology of the words, disaster means "losing sight of stars," whereas disease indicated "losing ease" (and discarding vigorousness further back in history). The word "bosai" in Japanese does not have an exact translation in English and is expressed as "disaster risk reduction." Disaster and disease have something else in common: they both convey a sense of risk. Hazards such as earthquakes, tsunamis, radioactivity, and viruses only become a disaster or disease after attacking a community or the human body. The damage of disasters or diseases depends on what type of hazard attacks us to what extent, on how vulnerable we are, and how effectively we can cope with the resulting consequences.

Bosai is not just a matter of disaster prevention, but of how to minimize the damage, to respond and recover quickly, and to build back better. Researchers of disaster science study hazards, exposure, vulnerability, and coping capacity in various ways; they explore and examine resilience so that human beings can live flexibly and safely on this dynamic, and often times chaotic, planet. I hope the readers of *51 Approaches to Disaster Science: Lessons from the 2011 Great East Japan Earthquake* will gain a multifaceted insight of IRIDeS into both the earth and human beings.

Academic Research 1

Exploration of Fundamental Elements of Hospital Business Continuity Plans (BCPs) Based on Lessons Learned from the Great East Japan Earthquake

Associate Professor **Hiroyuki Sasaki**
Disaster Medical Science Division

Introduction

Business Continuity Plans (BCPs) are plans that are prepared and formulated for a given business in order to minimize damages, to keep the business's core parts operational, and to recover quickly in case of emergencies—such as the occurrence of a disaster caused by a natural hazard. In Japan, companies have been taking the initiative in establishing BCPs since the beginning of the 21st century. However, after the 2011 Great East Japan Earthquake, hospitals also began to take serious consideration and efforts in formulating their own BCPs. Hospital BCPs are important, because hospitals are an invaluable aspect of social infrastructure that protects and sustains human life and health; it would be a major blow to society if they stop functioning in the event of a disaster.

Assoc. Prof. Hiroyuki Sasaki of IRIDeS joined a team to establish multiple Tohoku University Hospital Business Continuity Plans and has also conducted research to explore fundamental elements of hospital BCPs. At the time of the 2011 disaster, however, Sasaki was not specialized in either disaster medicine or in hospital BCPs.

Realized the issue of hospital BCPs through his own experiences of the Great East Japan Earthquake

In the spring of 2011, Assoc. Prof. Sasaki was working as a surgeon for regional health care in Takahagi, Ibaraki Prefecture. The situation completely changed with the megaquake. Despite the disaster, the hospital had to keep operating; even though the health care workers, including Sasaki himself, were also affected. The medical staff faced many extreme difficulties during this time.

A great amount of outside support was provided for the affected hospital. However, Sasaki realized that it was indeed difficult to receive support without causing a burden. Sasaki explains, "It was distressing for affected and stressed-out workers to deal with fully motivated and active supporters who came from outside. It was also hard to arrange how and what supports that were just brought to be incorporated in the affected hospital system. Also, supporters left in a short time. Exhausted hospital staff had to tell the same thing to newly arrived supporters over and over again." The hospital was already in a state of extreme stress, but it was being further overloaded by well-meaning outside supporters, which could become a new disaster all on its own. Through these experiences, Sasaki began to consider how to keep operating a hospital in the face of a disaster—including better methods of sending and receiving support

Joined the team to establish Tohoku University Hospital BCPs

In May 2011, Sasaki was transferred to the Tohoku University Hospital. There, he immediately volunteered for positions in the field of disaster medicine. Sasaki also became a member of IRIDeS, which was established in 2012. He also obtained a license for the Disaster Medical Assistance Team (DMAT) in 2016.

When Tohoku University Hospital decided to establish its BCPs, he joined the team that would formulate it. The team first learned about the general purposes of BCPs through study meetings. They also referred to existing guidelines for BCP formulation that were provided by the Tokyo Metropolitan Government and the Ministry of Health, Labour and Welfare. Tohoku University Hospital BCP were finally established in 2017. Currently, its second edition is available online, alongside the disaster countermeasure manual [Figure]. The third edition will come out in March 2021.

Figure: Tohoku University Hospital BCP (2nd Edition)

What is the most important thing about BCPs?: They are not just about assembled checklists

Tohoku University Hospital BCPs have become a pioneering example among hospital BCPs in Japan. However, while working on the formulation of the BCPs, Assoc. Prof. Sasaki became aware of an issue: BCPs, in general, tended to be a collection of detailed checklists of what was necessary for business continuity.

To address this issue, Assoc. Prof. Sasaki initiated research to explore fundamental elements of hospital BCPs—observing a wide range of existing studies on hospital BCPs[2]. First, his research team examined research trends of hospital BCPs in both Japan and abroad. They pointed out that the number of studies on hospital BCPs has been increasing since the 2000s; especially after Hurricane Katrina, which occurred in 2005. They found that the types of disasters examined varied, reflecting different disasters occurring in different countries and regions. However, they also found that there are common trends in the discussion of hospital BCPs that transcend the differences in regions and disasters. Second, Sasaki's research team verified the Tohoku University Hospital BCPs. Tohoku University Hospital's BCPs contain the following three elements: "priority of operation," "alternative methods and resources," and "resource management." That is, (1) identify priority of operation, (2) ensure that alternative means are available to continue essential hospital functions in the event of a disaster, and (3) manage resources to keep them functioning in the event of a disaster. Sasaki and the research team members found that these three elements correspond to arguments of the existing studies on hospital BCPs. At the end, the team argues that these three elements are indispensable for hospital BCPs in general.

Significance of the study

Assoc. Prof. Sasaki says, "Specific items of BCPs should change as the times and society change. Thus, operation of BCPs needs to be conducted based on understanding of the fundamental principles over those specific items." In the study, his research team examined a wide range of hospital BCPs both in Japan and abroad, but further surveys and examinations will be necessary in order to fully clarify hospital BCPs worldwide and to establish global standards for hospital BCPs. However, Sasaki's research team has provided important clues regarding key fundamental elements of hospital BCPs.

"The most important thing about business continuity activities is not to formulate manuals and checklists but to construct an organization and awareness that can continue managing their business continuity, including updating these documents," Sasaki notes. "What is most important is not plans themselves, but how to build capacity to make those plans and revise them in a flexible manner."

About the Future

In recent years, the Japanese Association for Disaster Medicine has begun to focus on properly receiving support amidst times of disaster and on hospital BCPs as major session themes. The lessons learned from the Great East Japan Earthquake are now widely shared and discussed. Sasaki says, "Japanese medical institutions have steadily become stronger and stronger; learning lessons from past disasters including the 1995 Great Hanshin-Awaji Earthquake, the 2011 Great East Japan Earthquake, the 2016 Kumamoto Earthquake, and the 2018 torrential rains in West Japan." Japan is traditionally efficient at recognizing issues on the ground and then thinking and implementing practical countermeasures. Hospitals are currently facing the challenge of dealing with the new COVID-19 infection, but they have improved many of their operations within a year despite such difficult situations.

There are still issues remaining concerning hospital BCPs; one of them being the fact that many hospitals in Japan still do not have them in place. With disaster rates on the rise, more improvements will become necessary in the area of disaster medicine—including hospital BCPs. The pursuit of human longevity and better health are never-ending challenges. As both a medical professional and a researcher of disaster medicine, Assoc. Prof. Sasaki would like to continue to study and practice hospital BCPs in the context of disaster resilience.

Facility inspection drill as part of Hospital BCP
(Photo provided by Dr. Hiroyuki Sasaki)

1) "Disaster countermeasure manual and hospital BCPs," (in Japanese), http://www.hosp.tohoku.ac.jp/initiative/017.html (accessed on December 30, 2020)

2) Hiroyuki Sasaki, Hiroaki Maruya, Yoshiko Abe, Motoo Fujita, Hajime Furukawa, Mikiko Fuda, Takashi Kamei, Nobuo Yaegashi, Teiji Tominaga and Shinichi Egawa (2020) "Scoping review of hospital business continuity plans to validate the improvement after the 2011 Great East Japan Earthquake and Tsunami," The Tohoku Journal of Experimental Medicine. 251(3): 147-159. doi: 10.1620/tjem.251.147.

Academic Research 2

Revealing Attitudes of Countries Towards Disaster Risk Reduction Through Analysis of Official Statements of the 2018 Asian Ministerial Conference on Disaster Risk Reduction

Assistant Professor **Daisuke Sasaki**
Disaster Information Management and Public Collaboration Division

Introduction

It has been 75 years since the birth of the United Nations (UN) and their aim at promoting world peace and cooperation. The UN convenes its annual General Assembly at its headquarters in New York. In addition, it holds separate meetings as needed in order to resolve specific global issues. The UN reconciles the interests of each country at these meetings; if all attending member states agree, the resolution becomes adopted. Afterwards, the resolution serves as a global guideline for countries to align together and move forward into the future. Existing resolutions adopted at such UN conferences include the Sustainable Development Goals (SDGs) on global development and progress, the Paris Agreement on reducing greenhouse gas emissions and adapting to climate change, and the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) to reduce disaster risks. Since all three resolutions are deeply related to disaster risk reduction (DRR), some experts refer to them as the "three global agendas for DRR—" arguing that they should be closely linked and promoted together.

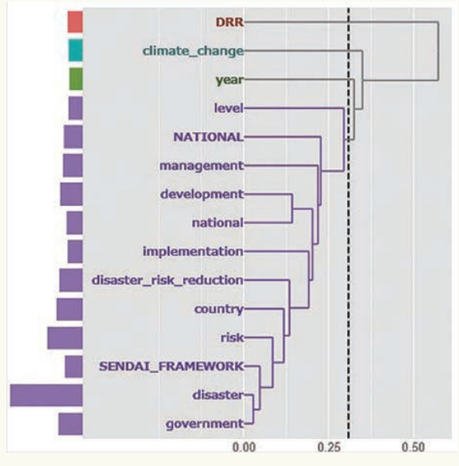
The SFDRR is the outcome document of the Third UN World Conference on Disaster Risk Reduction (WCDRR), which was held in Sendai in 2015. It encourages the mainstreaming of DRR, investment in DRR during normal times, build-back-better strategies, and setting targets for DRR. From an academic standpoint, IRIDeS has contributed to the formulation and implementation of the SFDRR. The contents of the SFDRR are general outlines for DRR. Therefore, each country needs to implement the contents of the SFDRR in a way that suits its own circumstances during the period when the SFDRR is effective from 2015 to 2030. This means that the specific interpretation and implementation of the SFDRR is left up to each country, and should result in a diversity of outcomes to some extent. However, there are some questions that arise: how do countries in the world actually see the SFDRR and how are they working on it? Are there any countries that have similar or different stances on DRR from each other?

Exploration of countries' attitudes towards DRR

Assist. Prof. Daisuke Sasaki of IRIDeS conducted a study to answer the above questions.[1] Specifically, Sasaki examined the official statements that were expressed by representatives (ministers or acting ministers) of 37 countries[2] that attended the 2018 Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR)—which has been three years after the WCDRR.

Why can such statements be regarded as useful research data? It is because a statement made by a country's representative at an international conference does not contain his or her personal views and, instead, reflects the diplomatic position of the state. They provide valuable information on how each country grasps DRR in the context of diplomacy and international relations. Furthermore, each statement is issued on the same situation, and there is no significant difference in length with each other. Comparison of multiple statements makes it possible to reveal both similarities and differences in standpoints of the countries.

In the study, Sasaki first investigated the overall trend of the 37 countries. After extracting frequently appearing words in all the statements and analyzing the relationships among the words, it was found that words such as "government," "Sendai Framework," "disaster risk reduction," and "development" were used in conjunction with each other (see Figure 1). The results implied that governments were linking DRR policies under the SFDRR with development. In other words, it was suggested that those countries might consider DRR from the perspective of SDGs—as well as the SFDRR.



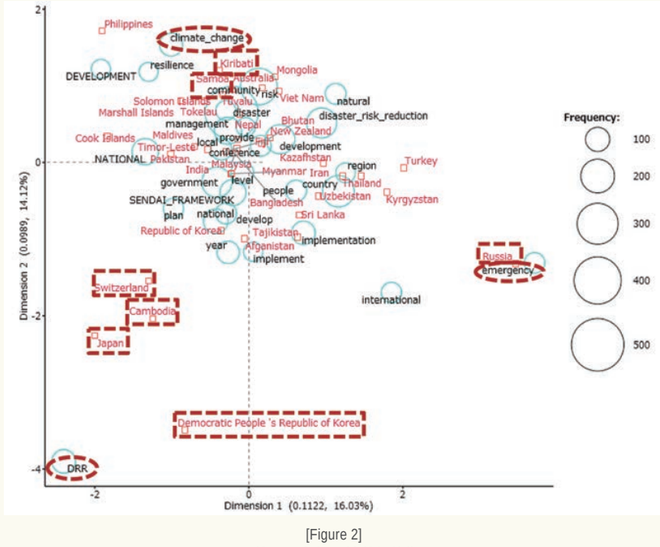
[Figure 1]
(Source) Sasaki (2019) [1]

Second, Sasaki visualized the position of each country towards DRR in two dimensions (see Figure 2). In Figure 2, characteristic words are plotted away from the origin, while the distance between words is not explicitly defined. Additionally, words that are located in the same direction as the country name can be interpreted as being more characteristic of that country. Based on these features, the recognition of DRR of each country was examined by means of identifying similarities and differences that had appeared in Figure 2. For example, the representatives of Kiribati and Samoa focused on climate change, while the representative of Russia grasped DRR in the context of emergency. The statement of Japan was relatively similar to those of Cambodia, Switzerland, and so on.

Significance of the study and the future

We feel that we understand the stances of other countries, to some extent, from the media reports. However, Dr. Sasaki's research is meaningful, as it compared statements of countries on the same criteria and objectively visualized their similarities and differences; providing a clear scientific evidence for global DRR trends.

Regarding this study, Dr. Sasaki points out, "It should be noted that each country's statement is a political one expressed diplomatically and does not necessarily correspond to how the country is actually working on DRR within and outside of the country," and "It is not surprising that Pacific island countries such as Kiribati and Samoa focused on climate change in a meeting on DRR, given that these countries are now exposed to disaster risks due to climate change." On the other hand, Sasaki says, "It seems interesting that Japan did not clearly mention climate change this time. It was out of the scope of this study to examine its background; however, I would like to keep investigating our country's attitude towards DRR to find out how it changes over time." Dr. Sasaki also states that the final goal of the research is to clarify how the world has, so far, been treating DRR as one of the most important global issues, and how it should be addressed from now on in the global arena.



[Figure 2]
(Source) Sasaki (2019) [1]

1) Sasaki, D. (2019). Analysis of the Attitude Within Asia-Pacific Countries Towards Disaster Risk Reduction: Text Mining of the Official Statements of 2018 Asian Ministerial Conference on Disaster Risk Reduction. *Journal of Disaster Research, 14* (8), 1024–1029. doi: 10.20965/jdr.2019.p1024.

2) Afghanistan, Australia, Bangladesh, Bhutan, Cambodia, Cook Islands, Democratic People's Republic of Korea, Fiji, India, Iran, Japan, Kazakhstan, Kiribati, Kyrgyzstan, Malaysia, Maldives, Marshall Islands, Mongolia, Myanmar, Nepal, New Zealand, Pakistan, Philippines, Republic of Korea, Russia, Samoa, Solomon Islands, Sri Lanka, Switzerland, Tajikistan, Thailand, Timor-Leste, Tokelau, Turkey, Tuvalu, Uzbekistan, and Vietnam.

Accurate Dating of Paleotsunamis in Eastern Hokkaido Through High-Precision Sediment Analysis

Assistant Professor **Takashi Ishizawa**
Disaster Science Division

Introduction

The Japanese archipelago has been hit by subduction-zone earthquakes and the tsunamis caused by them many times; these earthquakes and tsunamis had a certain degree of periodicity. The actual mechanism of a subduction-zone earthquake is complex, and thus the interval between earthquakes and tsunamis is calculated only as a rough estimation. However, it is extremely important to learn from the past in order to know the current earthquake and tsunami risks and prepare for the future, based on the major premise that natural hazards occur repeatedly.

Assistant Professor Takashi Ishizawa of IRIDeS has conducted research to measure the age of paleotsunamis as accurately as possible with choronological methods, focusing especially on strata. One of his research topics is the traces of tsunami that occurred along the Kuril Trench.

The reality of the earthquakes and tsunamis that occurred along the Kuril Trench in the past had long been a mystery, as there were no historical documents on these disasters. However, several geological surveys have been conducted since the beginning of the 21st century, proving that tsunamis have occurred many times in the past along the Kuril Trench. They also revealed that the most recent major tsunami that left traces in eastern Hokkaido was caused by an earthquake with an estimated Mw of 8.8, and that it arrived in the 15th to 17th centuries.

Geology has made great strides in unraveling the reality of tsunamis, but the ages of past tsunamis in the existing studies tended to be only rough estimates. Thus, Ishizawa and his research team members took on the challenge to narrow down the estimated time spans through a high-precision sediment analysis.

Obtaining a Cross Section of the Stratum through a Field Survey

The team first conducted a trench survey in Urahoro Town, Hokkaido [Fig. 1], which was one of the affected areas of the paleotsunami. They dug a wetland 400 m inland from the coast, approximately 2 m from the ground surface, and took out sliced strata as thin plate soil. As a result, a cross-sectional view of the soil with a height of 2 m appeared, with alternate layers of peat and sand. The team confirmed a total of eight sand layers within the strata. “Basically, mud accumulates thickly in wetlands. The presence of multiple sand layers in the strata suggests that the sand was transported by water flows with high energy such as tsunamis,” says Ishizawa. For further analyses, the team carefully encased the excavated stratum plate, refrigerated them to prevent mold, and carried them to the laboratory.

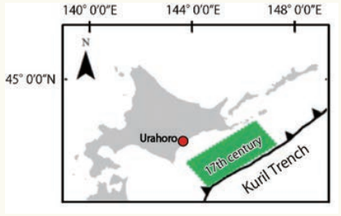


Figure 1

Examining 70 Samples from the Peat Beds of the Obtained Strata

Next, the team collected peat just above and below the sand layers that were assumed to be tsunami deposits to examine their formation ages by carbon-14 dating. “What we want to know is the formation age of tsunami deposits, but the measurement is not of the sand layer, but the peat layer. This is because the sand was transported from another place with mixing and was redeposited there. Since the old and the new should be mixed together in the sand layer, it is not considered to be optimal for dating,” says Ishizawa. Therefore, they explored the age of the tsunami deposits by examining the age of the adjacent peat.

The conventional research method to illuminate the age was to examine only one point above and one point below the tsunami deposit layer. However, the method of Ishizawa’s research team is different. They minutely dated the strata, examining a total of 70 points taken from the oldest to the latest layer in 5 to 7 mm intervals. Before introducing the advantages of their method, this article will explain carbon-14 dating.

What is Carbon-14 Dating?

Organisms on Earth contain a certain amount of carbon 14 (^{14}C), which is a radioactive element. When an organism dies, ^{14}C keeps decaying at a constant rate. Thus, it is possible to estimate when a substance containing ^{14}C was produced by measuring the amount of remaining ^{14}C. Peat layers are made by undecomposed and piled-up plants such as dead leaves. By examining the remaining ^{14}C of plants that were trapped in a peat layer, it is possible to estimate the age when the layer was formed.

The specific steps of carbon-14 dating are as follows: Burn the collected soil into a gas and separate CO_2 from it. Reduce or remove O_2 to provide the individual C, graphite. Then, place a mass of C weighing approximately 1 mg in an accelerator mass spectrometry (AMS). “At this stage, three types of C are mixed together, that is, ^{12}C, ^{13}C, and ^{14}C. When accelerated by an AMS, the orbit changes depending on the mass, and thus the heaviest ^{14}C can be separated and extracted,” explains Ishizawa. The research team set approximately 20 samples at a time, and rotated the accelerator for about three days for each time. Afterward, they counted the number of ^{14}C extracted. “The amount of remaining ^{14}C tends to be about 1,000 to 10,000, though it depends on the strata age,” says Ishizawa.

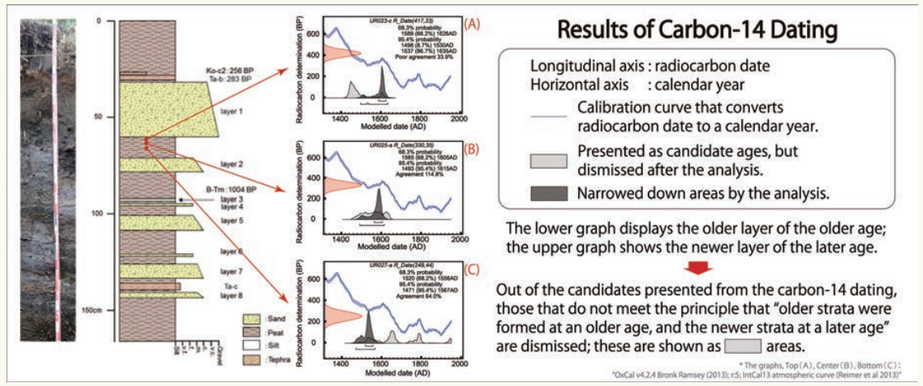


Figure 2

Here, however, a problem occurs. The rate of decrease in ^{14}C is constant, but the concentration of ^{14}C in the Earth’s atmosphere varies from time to time because of events such as past solar activities. In some cases, it is not possible to tell whether the same amount of ^{14}C is from the time when ^{14}C was at a high level or from a more recent period. A calibration curve is used to convert radiocarbon ages into calendar years, but in some cases, for the formation of one stratum, more than one candidate age is presented. For example, we know that terms such as “around 1450” and “around 1600” are confusing when current ^{14}C residues are similar to each other.

The similarity of the residual ^{14}C amount between 1450 and 1600 was one of the reasons why the most recent tsunami that hit eastern Hokkaido had been estimated to be roughly in the 15th to 17th centuries. This has also affected estimations of other paleotsunamis. For example, by employing the conventional carbon-14 dating method, it was difficult to distinguish whether the tsunami deposits collected at a certain location were derived by the 1454 Kyotoku Tsunami or the 1611 Keicho Tsunami. This caused many academic controversies.

Using High-Precision Measurement to Narrow Down a Tsunami’s Age

However, the study of Ishizawa’s team exceeded the conventional limits. They measured all of the 70 samples taken from the strata and compared them with each other, which is the unique characteristic of their method. By analyzing only one point, it is not possible to tell which age range is correct when more than one range is proposed according to the residual amount of ^{14}C. However, if there are many results from several points, and if they are arranged from the oldest to the newest stratum, and if they are considered with the reason that “older strata was formed at an older age, and the newer strata at a later age,” then candidates that do not conform to this principle can be rejected. Thus, the estimated age can be narrowed down.

For example, let us look at Figure 2, Graph (C), where the carbon -14 dating analysis provided four candidates: “1500 -1600,” “1600 -1700,” “1700 -1800,” and “1900 and beyond.” Examining only this graph cannot tell us which candidate is more valid. However, if you align it with Graphs (A) and (B), which show the results of newer strata analysis, the stratum in Graph (C) must naturally be older than those in Graphs (A) and (B). Therefore, we can conclude that out of the original four candidates from Graph (C), “1500 -1600” is correct, and that the rest are incorrect.

Through this study, Dr. Ishizawa and his colleagues successfully narrowed down the ages of all the eight sand layers to about 60% of those estimated in previous studies. Earlier, it was roughly considered that the paleotsunami occurred between 1424 and 1667, based on the analysis of limited samples. However, this study more accurately showed that the tsunami occurred between 1600 and 1667.[1)]

About the Future

Dr. Ishizawa believes that the method used in this study can resolve many “1454 Kyotoku Tsunami or 1611 Keicho Tsunami” disputes. He assumes that the same approach can solve the questions of tsunami deposit ages in the Sendai Plain. Geological surveys and carbon-14 dating are both time-consuming and expensive, but they are also very effective.

As a boy, Ishizawa was attracted to fossils and minerals. The Great East Japan Earthquake occurred when he was a university student, and he decided to study tsunami deposits. As he says, “In this study, we confirmed the age of past tsunamis on the east coast of Hokkaido more accurately. It is considered that no major tsunami has occurred in this area afterwards. It means that with the periodicity of tsunamis, the next major earthquake and tsunami could occur in this area at any time.” Dr. Ishizawa would like to continue to illuminate tsunamis and other disasters towards disaster risk reduction in the future.

1) Ishikawa, T., Goto, K., Yokoyama, Y., Miayiri, Y., Sawada, C., Nishimura, Y., and Sugawara, D., 2017. Sequential radiocarbon measurement of bulk peak for high-precision dating of tsunami deposits. *Quaternary Geochronology, 41*, 202-210, doi: 10.1016 / j.quageo. 2017.05. 003.

Activities

Activity 01

Work on Drive-Through PCR Testing for Screening COVID-19 as a DMAT Member

Assistant Professor **Yohei Inaba**
Disaster Medical Science Division

Assist. Prof. Yohei Inaba of IRIDeS is an expert in the field of radiation disaster medicine. His research interests include how to estimate an individual radiation dose quickly during a radiation disaster. Alongside his research and educational activities, Inaba has also started working as a Disaster Medical Assistance Team (DMAT) member back in December 2018.

DMATs consist of trained doctors, nurses, and operation coordinators with the core task of saving human lives in times of a disaster. In DMAT, Assist. Prof. Inaba is a qualified operation coordinator. DMAT operation coordinators are in charge of logistics, coordinating flows of people and goods, negotiating with other involved organizations, and collecting and analyzing necessary information; all in order to ensure that doctors and nurses can work efficiently and smoothly.

Usually, DMAT focuses on disasters caused by natural hazards, but they are currently making an effort to respond to the spread of COVID-19. Inaba has been working on polymerase chain reaction (PCR) testing, using a drive-through system in Miyagi Prefecture since April 2020. First, Assist. Prof. Inaba established a system for conducting the test safely by collaborating with medical personnel, staff members of municipalities of Miyagi Prefecture and the City of Sendai, and Self-Defense Force personnel. Second, he continues his efforts to ensure that their drive-through PCR testing is done safely and efficiently.

As things currently stand, it takes approximately two minutes per car for their drive-through PCR testing; this entails identification, interview, temperature measurement, and a PCR test. Anomalies that deviate from the initial assumptions also occur on a daily basis, however. For example, when a large number of people come for testing all at once after a large-scale outbreak. In such a case, Inaba reconstructs the flow of people and goods into a more flexible method, all while ensuring safety, to keep testing without any delay. The highest number of tests their station has ever conducted was 99 per day. Inaba is at the stressful front line, while staff members have to face many taxing operations and the constant risk of infection. Working with protective attire is grueling. Furthermore, since they operate testing in an outdoor tent, they have to deal with other issues like heat stroke during the summer, when temperatures can reach 40℃ , and of the bitter cold during the winter.

A part of the number of PCR positive cases we see in the daily news are derived from the steady and persistent efforts of Assist. Prof. Inaba and his team. Their drive-through PCR testing has already become indispensable for society, but they are facing difficulties in this protracted pandemic. Inaba says, "We never know how long we have to keep operating for this infectious disease, which is different from our regular DMAT mission for other natural hazard disasters. Mental health care needs to be considered for medical personnel who have been tense for a long term." Drive-through PCR testing has been carried on by their high motivation. It is now a pressing issue of how society will efficiently and safely outlast this prolonged pandemic while cooperating with healthcare workers.

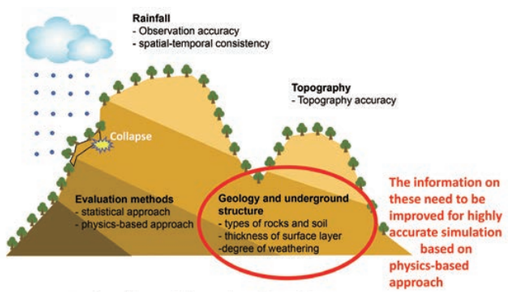
A drive-through test for screening COVID-19
(photo courtesy by Dr.Yohei Inaba)

Activity 02

Final Debriefing Meeting on the 2019 Typhoon Hagibis

The 2019 Typhoon Hagibis (Typhoon No. 19) caused extensive infrastructure damage, with 59 people killed in Iwate, Miyagi, and Fukushima Prefectures. IRIDeS and the Tohoku branches of the Japan Organization of Civil Engineers, the Japanese Geotechnical Society, and the Japan Landslide Society have been working together in order to examine the actual damages caused by the typhoon. On November 20, 2020, the final debriefing meeting on the typhoon disaster was held online.

During the meeting, findings from Iwate, Miyagi, and Fukushima Prefectures were presented from the perspectives of river flooding, landslides, geo-disasters, and disaster response. Presenters exchanged opinions on future DRR, while also considering questions from participants.



Tools and input information of geo-disasters
(Figure: provided by Dr.Shuji Moriguchi)

Director Fumihiko Imamura gave a presentation on IRIDeS researchers' surveys and support activities for disaster-affected local governments—including Marumori Town. In the discussion, he said "One of the keys to prevent the spread of disaster damage should be to avoid a chain of disasters. Focusing on protecting critical facilities would lead to quick recovery." Assoc. Prof. Shuji Moriguchi, representing the Tohoku branch of the Geotechnical Society, reported on the ground disasters and landslides that occurred in Fukushima and Miyagi Prefectures. He pointed out that the database is still insufficient and that particular information below the ground's surface needs to be improved for a highly accurate landslide simulation.

Several presenters, including Prof. Hitoshi Tanaka (the head of the joint research team), pointed out that the severity of disasters is becoming more intense as of late. They also stressed the need to work together with local governments, citizens, and other stakeholders, because DRR cannot be achieved by science and technology alone. The debriefing meeting was attended by 134 people; not only from the three prefectures of Tohoku but also from distant areas, such as the Tokyo metropolitan area and Kyushu.

Activity 03

Preserving the Ruins of the Great East Japan Earthquake, Nakahama Elementary School

Associate Professor **Masashige Motoe**
Disaster Information Management and Public Collaboration Division

In September 2020, the former school building of Nakahama Elementary School in Yamamoto Town, Miyagi was opened to the public as a site to preserve the ruins of the 2011 disaster. On March 11, 2011, 90 people including school children, faculty members, and parents fled from the approaching giant tsunami to the roof of the school building and spent the night in its attic storage room before being rescued. The elementary school was closed, but in 2014, the town began to consider preserving the affected building as a heritage object. IRIDeS concurrent faculty Assoc. Prof. Masashige Motoe, who is a faculty in the Architecture department at the School of Engineering, Tohoku University, became the leader in charge of directing the design of this project. Dr. Motoe formed a team with an editor, graphic designer, filmmaker, and architects and proceeded with the project to maintain the site as a heritage, interviewing, coordinating, and creating a consensus with the people involved.

While directing, Dr. Motoe kept in mind not to make a place that simply reminds people of the threat of the tsunami or that teaches lessons already learned. As Motoe says, "The school principal at that time and others who experienced the disaster have repeatedly asked themselves whether their decision to evacuate to the roof was really the right one, as they would have been victims if the tsunami had been one meter higher. They say that it was not at all a heroic tale of making the right decision and saving lives. So, in the remains, we have included the message that in times of disaster, you must find your own answer in your own places." The remains became a place that asks visitors various questions and makes them think. "One of the challenges in the design of the ruins was how to make a good balances: we aimed at presenting a complex story as it was, but it shouldn't be too complicated to be understood by visitors; safety must be ensured in the ruins, while its damaged state should be shown as much as possible," says Motoe. After extensive coordination with the town and local people, the site for the ruins was finally completed and opened to the public. Afterwards, their project won the Good Design Award 2020 and was selected as one of Good Design Best 100. Furthermore, it also received one of the Good Focus Awards [Disaster Prevention & Recovery Design].

When you walk through the remains, you can see the rubble still inside the former school building and feel the sea breeze blowing through the broken windows. "Except for a few parts, we did not use rust-proofing materials to force the time of the place to stop for visitors to see the damaged state as it is. We let the place rust away. But it does not mean that the ruins should be left untouched in the future. On the contrary, it requires constant attention to ensure safety and proper management. All the memorial monuments that have survived for a long time exist today because people have been looking after them over generations," says Dr. Motoe. There are motivated docents on site, and English displays are also available at the Nakahama Elementary School. "I hope many people both from Japan and abroad visit there and experience the place," concludes Motoe.

Ruins of the Great East Japan Earthquake, Nakahama Elementary School
(Photo taken in January 2021)

Ruins of the Great East Japan Earthquake, Nakahama Elementary School

Address: 22-2, Aza-Kune, Sakamoto, Yamamoto Town, Watari-gun, Miyagi Prefecture, 989-2111, Japan

Access: 10 minutes by car from Yamamoto-minami-SIC, Joban Expressway / 25 minutes on foot from Sakamoto Station, JR Joban Line. Rent-a-bicycle is available at Yamamoto Yumeichigono sato next to the station.

For more information (in Japanese), please visit:
https://www.town.yamamoto.miyagi.jp/soshiki/20/8051.html.