

IRIDeS Report 03

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Information Transmitted by IRIDeS

The institute holds periodic meetings for the purpose of transmitting information and achieving cooperation and integration.

1 Expanded general meeting

● IRIDeS Now

Shares information inside IRIDeS.

● Information on the IRIDeS Friday Forum

Shares information on the content of research activities.

● Great East Japan Earthquake Watcher

Follows the various activities in disaster sites and inside and outside of Japan, and social movements.

2 IRIDeS Friday Forum

This forum is held on the evening of the 4th Friday of each month as a place for periodic announcements and discussions for the purpose of sharing information related to the research and other activities conducted at IRIDeS and to foster cooperation and integration in research. For details, see the website (<http://irides.tohoku.ac.jp/event/irides-forum.html>).

Information is also published on the IRIDeS website.

● Activity announcements <http://www.irides.tohoku.ac.jp/topics/index.html>

● Future plans <http://shinrokuden.irides.tohoku.ac.jp/>

Evolving disaster prevention and reduction.
Creating a society prepared for
large-scale disasters.



Name: IRIDeS

Symbolizes the Iris sanguinea, Iris laevigata, and Iris ensata, as well as hope and nobility

Meaning of the logo: Reverses the Chinese character for "disaster", to symbolize the determination for overcoming disasters by promoting recovery and reconstruction, and creating a society that can intelligently handle disasters. The key color of the institute is the color of the Iris sanguinea, and comes from the logo of Tohoku University. This flower symbolizes hope and nobility.

IRIDeS Report 03

Issued on March 7, 2015

Edited and issued by the Tohoku University
International Research Institute of Disaster Science

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IRIDeS Report

Transmitting Practical Disaster Prevention
Studies from Tohoku to the World

International
Research
Institute of
Disaster
Science



03
2015.03

A three year journey traveled together
with disaster affected areas

Close Up

- 1 The regional role IRIDeS plays in reconstruction after the Great East Japan Earthquake
- 2 Conveying the results of practical disaster prevention research to the world at the Third UN World Conference on Disaster Risk Reduction

New disaster prevention studies tailored to society from the Tohoku disaster region.

The Tohoku University International Research Institute of Disaster Science (hereinafter referred to as "IRIDeS") conducts research by gathering 37 fields of study in seven divisions that transcend the border between sciences and the arts. IRIDeS promotes "practical disaster prevention studies" that can be useful in society and people's lives. IRIDeS aims to utilize its comprehensive knowledge to contribute to the recovery of disaster-affected areas and building a society that can withstand disasters.

Hazard and Risk Evaluation Research Division

Building disaster-resilient society by exploiting lessons from the 2011 Tohoku earthquake and tsunami disaster

Human and Social Response Research Division

Researching the culture and history of domestic and international disasters, disaster cognition, and disaster mitigation/recovery measures

Regional and Urban Reconstruction Research Division

Developing and researching various technologies to create communities where people can live with peace of mind

Disaster Science Division

Revealing the mechanisms behind disasters to forecast hazards

Disaster Medical Science Division

Multifaceted evaluation and enhanced preparedness for health and medical care during disasters

Disaster Information Management and Public Collaboration Division

Enhancing the record of the earthquake and assisting urban reconstruction

Endowed Research Division

Enriching disaster research with private sector donations, etc.

“About three years has passed since IRIDeS was established. The new research building has been completed for further development in practical disaster reduction research.”

The new research building of IRIDeS was completed in November 2014. This enables researchers that were spread out in various campuses and research facilities to gather in a single place to conduct efficient research. The research building is a five story reinforced concrete building. The building incorporates measures to enable activities to be smoothly conducted in times of a disaster, such as a seismic isolation system and 72-hour emergency power generation equipment. The entrance hall features an open ceiling up to the second floor. High windows enable people inside to enjoy natural wind and light. The opening features a wide balcony that is designed to prevent direct sunlight from entering.

The building has the functionality required by a site that widely conveys the results of research. The first and second floors feature a space for conveying information to visitors, a multi-purpose hall for 150 people, seminar rooms, and lecture rooms. It can also hold national and international symposiums including those for publishing research results and conveying information on disaster prevention and reduction. Research laboratories are located on the second to fifth floors. The common spaces of each floor feature interaction spaces, and most of the research laboratories have glass walls. The new building places emphasis on an environment where researchers can see each

other's faces.

The building also features the latest equipment. The multi-dimensional visualization system installed in the multi-purpose hall enables stereoscopic maps and tsunami and disaster simulations to be projected on a large 2.5 x 10 m screen. The ability to render stereoscopic video deepens research on tsunami flood speed and flood areas, etc. There is also a large-capacity server which enables tsunami simulation analysis to be quickly performed and more earthquake data to be stored than before.

The building also enables IRIDeS to approach visitors. The space for conveying information to visitors features a large four-screen display. This display will be used to show video on the latest efforts of IRIDeS, real-time observations, and the earthquake records collected with the Michinoku Shinrokuden earthquake archive project. IRIDeS also plans to use these systems to conduct tours where regional leaders and government officials are invited to see research results.

Interaction between researchers has become increasingly active since the research building was completed. Cross-field research is being conducted more than ever before and IRIDeS is promoting research into practical disaster prevention and conveying information to the world.

Further progress in practical disaster reduction studies based at our new building

Fumihiko Imamura

Director of IRIDeS
Professor of Tsunami Engineering Research
at the Hazard and Risk Evaluation Research Division

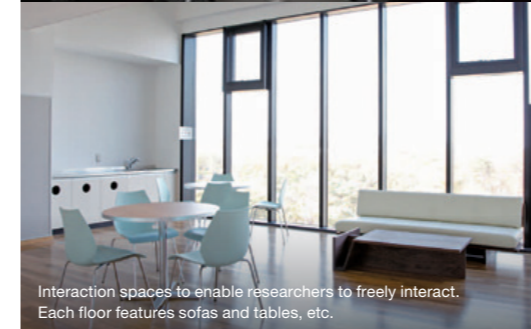
IRIDeS turns three years old in 2015. I am proud of our achievements made possible during this time by conveying the results of practical disaster prevention studies and conducting research that transcends

the border between sciences and the arts.

In December 2014, our long-awaited new building was completed. With this new facility, about 140 people conducting research in different locations have been



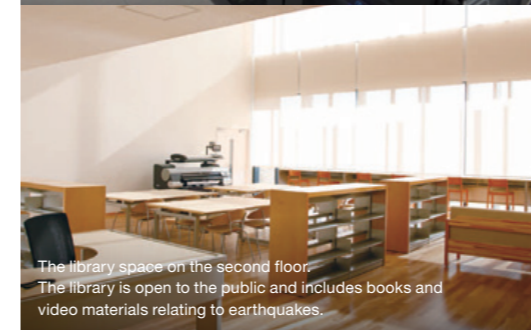
The multi-purpose hall with a multi-dimensional visualization system. Symposiums and receptions are also held here.



Interaction spaces to enable researchers to freely interact. Each floor features sofas and tables, etc.



The large-capacity server room. The environment of the room enables a large amount of information to be smoothly processed.



The library space on the second floor. The library is open to the public and includes books and video materials relating to earthquakes.



The stylish exterior with a brick-like façade. The building was built in a quiet location surrounded by the greenery of Mt. Aobayama.



Many of the research laboratories have glass walls to promote communication between researchers.

able to come together in a single location. Research labs are mostly glass-walled and there are common spaces on each floor to provide a space for researchers to interact with each other. I hope this can promote interaction between different fields to enable researchers to actively solve issues they encounter.

We plan to use our new building as a place where we can interact with various people including people from disaster areas. In our multi-purpose hall, people will be able to see 3D video taken immediately after the Great East Japan Earthquake occurred and video of evacuation drills, etc. We also plan to open up to the outside world by planning tours for visitors of the institute, and have set up a project room that can be used by institutes in Japan and overseas, and people related to disaster prevention. I hope the new building of IRIDeS can become the center of disaster prevention in the Tohoku region.

I believe that our activities for the UN World Conference on Disaster Risk Reduction (hereinafter "the WCDRR") are also important. Almost 50,000 people from around the world will attend the WCDRR. During the conference and its side events, we will have to widely convey how IRIDeS has been able to gain knowledge on practical disaster prevention studies and how it has deepened its research. I am also looking forward to the participation of people living in Sendai and the Tohoku region, people in related industries, and students. We will hopefully be able to pursue planning together with a wide range of people in order to enrich discussions with a variety of perspectives.



Progress at IRIDeS

Looking at the history of disaster prevention research conducted from before the Great East Japan Earthquake until the establishment of IRIDeS

2007

Before the earthquake

Establishment of the Research Group on Disaster Prevention and Management at Tohoku University

Tohoku University established the Research Group on Disaster Prevention and Management in 2007 to prepare for an earthquake off the coast of Miyagi prefecture, which was predicted to have a 90% chance of occurring within 30 years. Approximately 20 researchers in 19 fields transcending the border between sciences and the arts started conducting research on disaster reduction. While their scope of activities was gradually starting to broaden, the Great East Japan Earthquake occurred.

TOHOKU UNIVERSITY The Research Group on Disaster Prevention and Management



2011

The year of the disaster

March 11th

The Great East Japan Earthquake occurred

After the disaster occurred, researchers immediately started surveys and research in their fields using the Research Group on Disaster Prevention and Management as a stepping stone. The organization got more popular, and about 40 researchers were involved with it at its height. In addition to conducting surveys and research related to earthquakes, tsunamis, and disasters, the researchers also tirelessly supported the reconstruction of disaster areas in need of relief. Tohoku University is continually expected to fulfill many roles as a university located in the disaster area. The university has also been widely conveying the results of surveys to citizens since immediately after the disaster occurred. It has also frequently lobbied local and national government on a wide range of issues.



April 11th

Tohoku University emergency one month briefing session on the Great East Japan Earthquake

In a climate of much confusion, Tohoku University held an emergency briefing session centered on the Research Group on Disaster Prevention and Management. In a rapidly changing environment, the university announced 21 efforts requiring speedy reporting, and these live reports received attention from a number of fronts, since they created a sense of really being there, despite being disorganized. One particular report that gained attention was a comparison of the 869 Sanriku Earthquake with the Great East Japan Earthquake, by Assistant Professor Daisuke Sugawara (who was a researcher at the time). His research that showed that a tsunami of this scope that was only thought to come once in a thousand years had actually struck during the Edo period, and was featured in various media.



June 11th

Tohoku University emergency three month briefing session on the Great East Japan Earthquake

27 studies were published on the three themes of A) The reality and mechanisms of damage caused by tsunamis, B) Vibrational damage and earthquake/seismic movement and C) Issues facing regional society. Not only the mechanism of earthquakes, but social themes such as community changes and medical systems were analyzed academically. Researchers at Niigata University conducting research into reconstruction after the 2004 Chuetsu Earthquake were invited to announce matters that may become issues in the disaster area in the future.



September 13th

Tohoku University six month briefing session on the Great East Japan Earthquake

Researchers from Fukushima University and Iwate University were also invited to this briefing session. In addition to reports from researchers, there was a baseline report from Miyagi prefecture, and a lecture by staff at the crisis management center of Kobe city, which broadened the scope of this session. In 2001, briefing sessions were held one month, three months, and six months after the disaster, and interest was so strong that the capacity of the venue was exceeded each time.



Great East Japan Earthquake archive project "Michinoku Shinrokuden" begun in earnest

The "Michinoku Shinrokuden" also started in earnest in 2011. The project was named "Shinrokuden" to mean handing down memories, records, and knowledge of the Great East Japan Earthquake to future generations and conveying information inside and outside Japan. These important materials will be utilized in research into large earthquakes that may occur in the future and research into the reconstruction of disaster areas, etc. This project collects every kind of photo, video, testimony, and record document related to the earthquake. Efforts for the project are scheduled to be continued until 2021.



2012

One year after the earthquake

March 11th

Tohoku University one year briefing session on the Great East Japan Earthquake

This day was one whole year after the earthquake. Many events were held on this day, and Tohoku University also held a one year briefing session. The session featured a keynote lecture by the President of the National Defense Academy and invited lectures by professors of the Tohoku Institute of Technology, as well as reports from eight researchers. These reports published after one year of efforts had not only academic meaning, but also pointed out social problems and challenges that may arise in the disaster area in the future.

2012

One year after the earthquake

April 11th

IRIDeS established

The Great East Japan Earthquake was a large-scale disaster that combined a huge earthquake, a huge tsunami, and a nuclear accident. Researchers hit problems unable to be handled with existing systems when surveying and researching local areas. The Tohoku University International Research Institute of Disaster Science (IRIDeS) was established to solve these problems and widely convey the knowledge and experience gained from the Great East Japan Earthquake. To utilize existing experience and knowledge while also promoting further links between science and the arts, an organization was formed from seven departments and 37 fields.



July 3rd to July 4th

Participated in breakout sessions for the World Ministerial Conference on Disaster Reduction in Tohoku

On July 3rd (Tue) and July 4th (Wed), representatives from more than 80 countries and international institutions gathered in Tohoku to hold the World Ministerial Conference on Disaster Reduction in Tohoku. At the conference, countries shared experience and lessons from recent large-scale natural disasters including the Great East Japan Earthquake, and discussed themes related to disaster prevention in order to build a strong and flexible society. IRIDeS participated in breakout sessions, where Director Imamura gave a speech and poster sessions were conducted.



2013

Two years after the earthquake

IRIDeS "Power to Live" citizen mobilization project "Disaster prevention notebook of all" released

IRIDeS started the "Power to Live" citizen mobilization project as a special project of the International Regional Cooperation Office. The goal of this project is to increase the ability of citizens to make decisions and take actions required to survive in an emergency. As a result of the project, the "disaster prevention notebook of all" was produced. This notebook is comprised of seven chapters, with the first six containing information on disaster prevention and reduction and the last chapter has space for information on local government.



February 8th

Agreements started to be entered with Tagajo city, etc. for cooperation and collaboration

IRIDeS enters agreements with the local government of disaster areas to deepen cooperation. The first such agreement was with Tagajo city. IRIDeS collaborated with Tagajo city to perform efforts for handing down experiences and records of the earthquake since July 2012. Two years after the Great East Japan Earthquake, IRIDeS and Tagajo city entered an agreement to further promote and enrich their cooperation.

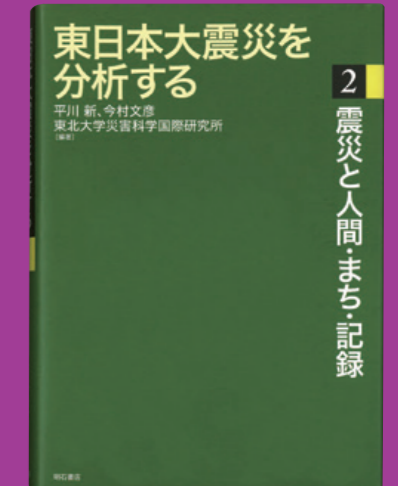
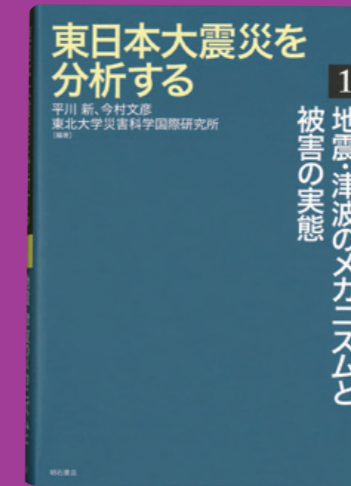


Tagajo city

June 12th

"Analyze the Great East Japan Earthquake Disaster" report of research results published

Briefing sessions were held five times in 2011 and 2012. The first and second "Analyze the Great East Japan Earthquake Disaster" reports were published based on the reports of those sessions and the accumulation of further research. The first report featured the mechanisms and damage of the earthquake and tsunami, and an analysis of logistics and the nuclear accident, etc. The second report featured the medical support during the disaster, physical and mental health assistance, efforts for urban development, and efforts for the preservation of documents. Researchers frequently visiting disaster areas and compiling their research in a book played an important role in conveying the efforts of IRIDeS.



2014

Three years after the earthquake

March 9th

Symposium held on the third anniversary of the Great East Japan Earthquake

The practical disaster prevention research promoted by IRIDeS is only meaningful once it has been conveyed to people. Symposia and sessions including the emergency briefing sessions are held occasionally to convey results to citizens, companies, government, and researchers. In the third anniversary symposium, IRIDeS invited the director of NHK and the general director of research at the Real Estate Transaction Improvement Organization to conduct lectures and a panel discussion. Discussions by people based in disaster areas transcended the borders of research.



Third UN World Conference on Disaster Risk Reduction in March 2015

This year, IRIDeS will take a new step and participate in the Third UN World Conference on Disaster Risk Reduction. IRIDeS will continue its efforts for conveying its actions to the world and leading the recovery of Tohoku towards a better future.

01

The regional role IRIDeS plays in reconstruction after the Great East Japan Earthquake

Implementing a specific vision based on regional issues

IRIDeS has been actively visiting disaster areas since its inception to perform various activities together with local regions. The practical disaster prevention research that IRIDeS promotes is always connected with these disaster areas. IRIDeS looks back on its past activities to think about the reconstruction in disaster areas that is entering its fourth year.

Disasters cannot be understood without understanding the local region

Disasters do not occur in areas without people. Take for example, a volcanic eruption. If a mountain explodes somewhere on the planet where nobody lives or nobody has rights, this is simply a hazard called a volcanic eruption. If the volcanic cinders and lava from the eruption harm people or cause somewhere to lose their property, that hazard then becomes a disaster. "Disasters occur in places where people have communities. Disasters and regional communities are inseparable," says Professor Makoto Okumura, deputy director of IRIDeS. Whether a hazard becomes a disaster depends on the status of the region. For example if a tsunami occurs, that tsunami will not become a disaster if we can ensure that it does not

reach people and their property. Therefore, when we think about disasters, we must think about the status of the region.

"As long as IRIDeS is called an institute of 'disaster' science, we must always be oriented in the same direction as the region. Regions do not exist as a place for us to utilize science, rather these regions are incorporated in our research. Ultimately, the goal of practical disaster prevention research is to prevent regions from being devastated by disasters. Unless we use methods that match the circumstances of each region, we cannot expect the proposed effect to be achieved."

Disasters show us different aspects each time they occur. The Great Hanshin Earthquake and the Great East Japan Earthquake were both disasters caused by large earthquakes, but the characteristics of their damage were completely different. The Great Hanshin Earthquake highlighted

the question of how to create cities resilient to earthquakes and fires. The Great East Japan Earthquake highlighted the question of how we can quickly escape from tsunamis, which cannot be protected against by humans. "Every disaster has something new for us to learn. No matter how many simulations we perform, there are always things that we will not know until a disaster occurs. What we must do is analyze the experiences of the Great East Japan Earthquake properly and convey this to the next generation."



Progress at IRIDeS after three years



● Activity 1

Preserving a record of the earthquake

IRIDeS collects and organizes photos and video captured with mobile phones and video cameras during the earthquake and stores it in the "Michinoku Shinrokuden," etc.

● Activity 2

Preserving old documents

IRIDeS rescues old documents in houses along coastal areas that were damaged by the tsunami, etc. In addition to collecting the documents, it researches and implements repairing, restoration, storage and management.

● Activity 3

Evacuation training

Evacuation is essential in town planning for reconstruction. IRIDeS formulates tsunami evacuation training programs that link industry, academia, and government in cooperation with residents.

● Activity 4

Disaster relics

IRIDeS participates in committees in Kesennuma, etc. for preserving disaster relics. It gives advice and explanations to residents and government from a scientific viewpoint.

● Activity 5

Disaster prevention education

IRIDeS conducts activities for raising the disaster prevention awareness of residents and children to create regions that can recover under their own power when a disaster occurs.

Handing down memories of the disaster by collecting records and memories

IRIDeS performs various activities to achieve this. They include surveying and researching the earthquake and tsunami, and preserving a records. It also conducts efforts for regional disaster prevention.

First, IRIDeS surveyed the damage caused by the Great East Japan Earthquake and tsunami.

The disaster caused damage on a scale that greatly exceeded expectations. IRIDeS visited the region immediately after the disaster to perform a detailed survey on how the tsunami occurred, what route it came inland, and how buildings were destroyed.

There was a large amount of video captured with mobile phones and video cameras, etc. during the disaster. Collecting these materials is another important role of IRIDeS. The "Michinoku Shinrokuden" Great East Japan Earthquake archive project is a project for collecting and preserving video and audio. It collects various records via the "Michinoku/Ima wo tsutaetai," which involves residents conducting hearings and making a record of the disaster areas.

In addition to collecting information, the project also promotes the database compilation of the records collected by each municipality. IRIDeS cooperates with the "Tagajo Kenbunoku" of Tagajo city to support efficient collection and preservation. "The goal of our archive activities is not to gather everything in the "Michinoku Shinrokuden." Records belong to the region and its people. It is important to understand which locations have which materials. I want to create a situation where data can be easily accessed for use in research."

Professor Okumura says that no matter what activity IRIDeS is involved in, it is important to build a relationship of trust with local government and residents. "Regions where we communicate well with government and residents are easier for us to survey and research. It is important to build a relationship with the region in order to conduct better surveys."

Old document preservation and tsunami evacuation training to create a regional vision

In addition to recording the disaster itself, IRIDeS also performs activities for rescuing and preserving old documents. Prof. Okumura says that strong relationships with local regions have been effective in these activities. "We will organize and collect old documents that we have rescued in an appropriate location, but I also want to make efforts to build relationships with local residents."

Activities for disaster prevention are gradually becoming active. "Immediately after the disaster, no areas were thinking about future disaster prevention. I think that after lives become stable and a vision of the reconstructed town starts to become clear, disaster prevention will become more and more important in town planning."

IRIDeS enters cooperation agreements with the local government of disaster areas to perform various activities. "Kakeagare! Nippon" is one example. This is a tsunami evacuation training program conducted by linking industry, academia, and government, which has been implemented by the governments of places such as Iwanuma city, Yamamoto, Iwaki city, and Sendai city. "It is important to continue disaster prevention efforts for reconstruction. I believe we have to tackle the detailed challenges for each region and solve them one by one."

More specifically, there were problems with evacuation in flat areas such as Natori city, Iwanuma city, and Yamamoto. Since there are no mountains or high ground near the sea, many people evacuated by car, which caused severe traffic jams in various areas and prevented some people from escaping.

During "Kakeagare! Nippon" in August 2013, IRIDeS conducted tsunami evacuation training for car evacuation in cooperation with Yamamoto. "In flat areas, evacuation plans that assume people will evacuate by car are starting to be created. We aim to find out how to perform surveys that reflect reality in evacuation training with limited time and people by performing tests many times with researchers in various fields including psychology," says Prof. Okumura.

Discussions on disaster relics that include regional issues

New issues have been identified from the three years of activities conducted by IRIDeS. One of these is the problem of disaster relics. For example, the No. 18 Kyotoku-maru ship in Kesennuma city and the Minamisanriku Disaster Emergency Center. These were regularly featured in the media, and have become symbols of the disaster. However, they are also a painful reminder of the disaster to those people that experienced it. "The problem of whether to preserve or dismantle disaster relics includes two major problems. The first is the problem of resident agreement. The second

is the problem of disaster prevention education."

Resident agreement is an issue faced by many regions that are implementing reconstruction plans. It is ideal to deepen discussions between residents to lead to a conclusion, but on the other hand, it is necessary to proceed with reconstruction quickly to prevent regions from declining.

"Since it is difficult to reach a decision that everyone agrees to, some researchers are directly involved in heated debates. Although the direction the region will take is ultimately decided by the residents themselves, we are able to relieve anxiety with our previous knowledge. I want us to provide support by giving advice based on scientific knowledge so that decisions that make more people happy can be reached."

● Lunar new year event in Kesennuma



The lunar new year event called "Henyoe" has children delivering sea bream made with paper to houses in the area. Events like this are performed throughout the year to raise awareness of children as a member of their village.

Disaster prevention education that enables regions to flexibly mobilize

"I believe that 'disaster prevention education' is the act of increasing the ability of an entire region to respond to a disaster," says Prof. Okumura. "For example, the Kesennuma area incorporates disaster preparations in its regional systems since it faces accidents at sea in the fishing industry, not only a tsunami that comes once every few decades. In this region, when village children reach a certain age they are taught the traditions of their village at study camps, and there is a ceremony where village children are introduced to all the heads of households in the area as children shared by the entire village. If the successor to a household passes away in a tsunami or accident at sea, one of these children takes over that household. Efforts

to respond to disasters are included in such cultural and social systems. There was always an awareness of disasters throughout the region." Prof. Okumura says that disasters are not something to be prevented or something to reduce, but rather something that we have to learn to live with. "I believe that disasters are something we have to learn to live with. Hazards are a natural phenomenon. We must face them several times during our lives. We must minimize loss of life and create regional strength that will enable people to recover from disasters time and time again. I want to include this concept in disaster prevention education."

"Disaster prevention education for children is of course important. IRIDeS has developed 'Yui', a pocket handkerchief for disaster prevention education. We also conduct school visits in various regions. I hope that they will provide an opportunity for getting their parents' generation and

The other problem is disaster prevention education. Disaster relics are an important tool for thinking about disaster prevention and conveying memories of the disaster to the next generation. "Disaster prevention education has not been actively implemented in disaster areas due to problems such as the mental healthcare of residents. However, we face the risk of the lessons of the disaster being forgotten if we do not proceed. We must implement more and more disaster prevention education in disaster areas."

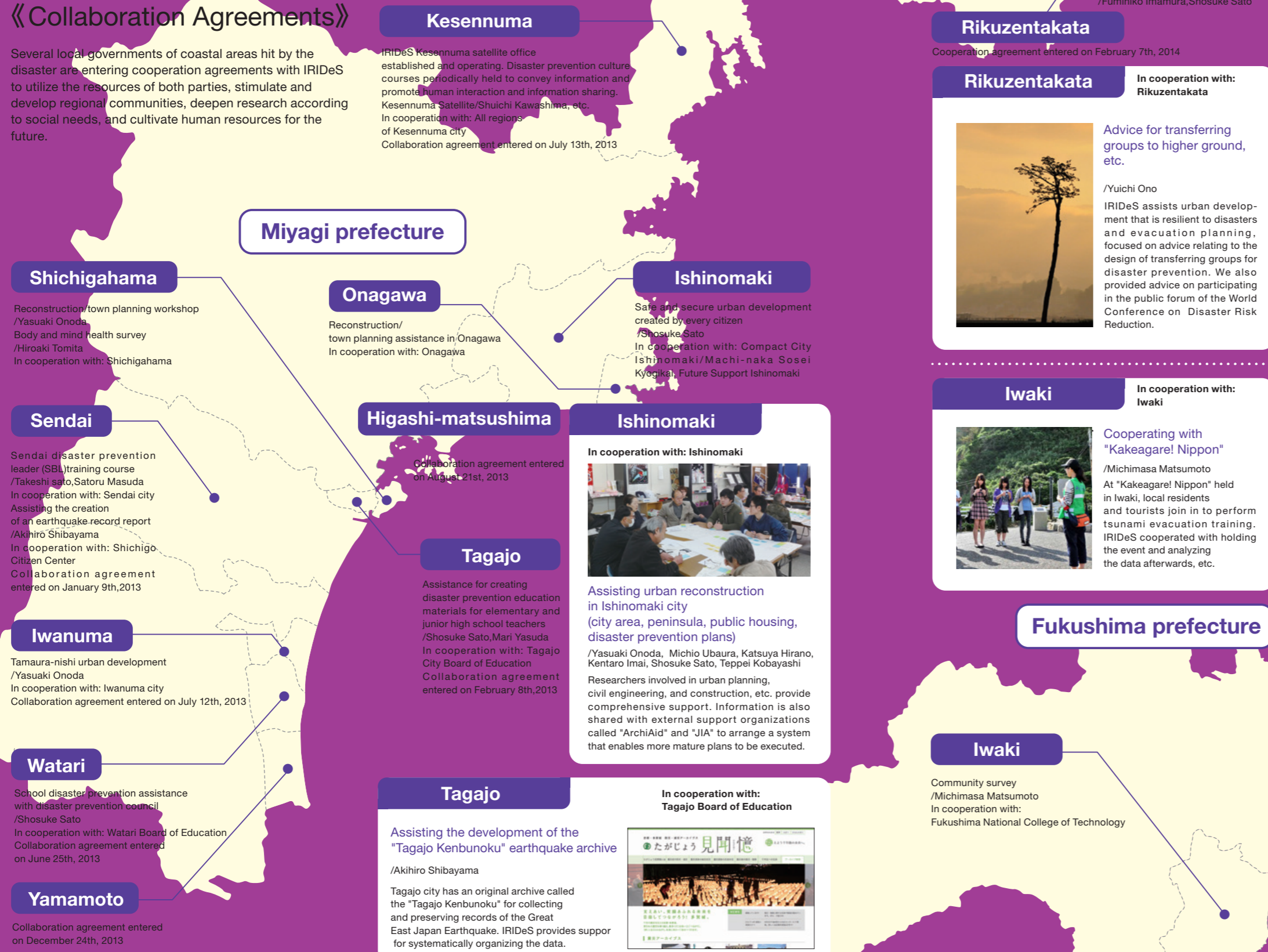
When we think of disaster prevention education, many people might remember the fire drills they experienced in elementary school or junior high school. However, Prof. Okumura looks at disaster prevention education from a wider point of view.

grandparents' generation to think about disaster prevention." IRIDeS also holds seminars for local government that includes roleplaying for evacuation site management. "The 'Yui' pocket handkerchief includes knowledge about disasters and what people should do when they face one. The handkerchief can be folded up to hold quizzes to enable children to think about disaster prevention while having fun. Children bring what they have learned at school back home. This is how the disaster research of IRIDeS is always linked with local communities. I hope we can continue to assist town development with flexibility and strength, by surveying and recording disaster, and implementing evacuations and education, etc."

IRIDeS is linking with various regions across Tohoku to implement these major efforts

《Collaboration Agreements》

Several local governments of coastal areas hit by the disaster are entering cooperation agreements with IRIDeS to utilize the resources of both parties, stimulate and develop regional communities, deepen research according to social needs, and cultivate human resources for the future.



Efforts performed across regions

Integrated disaster response training /"Kakeagare! Nippon"

IRIDeS advises six municipalities regarding disaster prevention training. At "Kakeagare! Nippon", IRIDeS, Kahoku Shimpo Publishing, and local government join together to aim to create a grand design for tsunami evacuation training.

● Related local governments
Sendai city, Ishinomaki city, Kesennuma city, Iwanuma city, Watari, Yamamoto, Iwaki city

● History
September 1st, 2012: "Kakeagare! Nippon" held in Iwanuma
August 31st, 2013: "Kakeagare! Nippon" held for vehicle evacuation in Yamamoto
July 29th, 2014: "Kakeagare! Nippon" held in Iwaki city together with tourists
March 5th, 2014: Participated/cooperated in workshop for formulating an evacuation plan in Sendai city



Restoring and preserving materials damaged by the disaster

Historical materials damaged by the tsunami and disaster are collected, restored, and preserved. Researchers not only from Tohoku University but from all over Japan cooperate in these efforts.

● Related local governments
Ishinomaki city, Iwanuma city, Watari, Yamamoto

Participating in a committee for investigating disaster remains

IRIDeS participates in a committee investigating whether buildings damaged by the disaster should be preserved as disaster relics. In regards to this delicate issue, we assist citizen decision making and give advice on preservation methods.

● Related local governments
Sendai city, Ishinomaki city, Kesennuma city, Yamamoto

Giving advice on regional disaster prevention and reduction plans

IRIDeS gives advice on disaster prevention and reduction plans based on scientific and academic knowledge we have gained from our research.

● Related local governments
Ishinomaki city, Higashi-matsushima city, Natori city, Watari

02

Conveying the results of practical disaster prevention research to the world at the Third UN World Conference on Disaster Risk Reduction



Making IRIDeS and Sendai a world center of disaster risk reduction

The Third UN World Conference on Disaster Risk Reduction will be held soon. For five days from March 14th 2015, representatives of each country and other participants will surely deepen discussion on disaster risk reduction all over Sendai and Tohoku, centered on the Sendai International Center. What will IRIDeS convey and gain from the conference? IRIDeS will convey the knowledge gained from its activities in disaster areas during these three years, and aim to develop Sendai into a world center for disaster risk reduction.

Rich range of side events that hold the key to the success of the conference

IRIDeS has been involved with the Third UN World Conference on Disaster Risk Reduction (the "WCDRR") since its activities for attracting the conference to Sendai. One of the biggest reasons why Sendai city was a candidate location was because of its experience in the Great East Japan Earthquake. We learned many lessons and gained new knowledge from the disaster. Many of the researchers of IRIDeS have been constantly entering the disaster area since immediately after the earthquake, and have accumulated a lot of knowledge during those activities. "I believe that widely conveying this knowledge is our duty," says Professor Yuichi Ono of the International and Domestic Office of IRIDeS. "The world is currently

paying attention to the disaster areas of the Great East Japan Earthquake. Everyone wants to know what is actually happening, including what happened to the disaster areas, how reconstruction is progressing, and what problems there. I want to create an opportunity to convey the information that is wanted and answer questions that people have."

The opportunity for conveying this information is the side events that will be conducted alongside the main conference of the WCDRR. More than 350 hundred symposiums, forums, and sessions are planned to be held in the Tohoku region, centered on Sendai, and IRIDeS will hold 24 of these events. "The symposiums and forums will be an opportunity for us to convey information, and the poster sessions will be an opportunity for us to deepen discussion with one another. Creating and enriching these opportunities is the role of IRIDeS, since we are based in

Sendai, which is where the conference will be held. I want to create opportunities for the people involved in research into disaster risk reduction to meet and interact. I hope new collaborative projects will be born from the conference."

As an opportunity for interaction, IRIDeS is planning and supporting events in disaster areas. It is important that the participants of the WCDRR visit places such as Iwaki and Rikuzentakata to see what the disaster areas are like with their own eyes and interact with the local people. "Another important task of ours is to ensure that the event is meaningful and rewarding for the people of the disaster areas. I believe that we must connect the people of the affected areas with the people involved in disaster risk reduction over the world, so that we can convey the lessons learned from the disaster areas to the world."

Formulating a practical specific action framework for the countries of the world

At the World Conference on Disaster Reduction held in Kobe in 2005, the Hyogo Framework for Action 2005-2015 (HFA) and the Hyogo Declaration were adopted. The HFA outlined three strategic goals and five priority actions, and positive results were gained by implementing them in each country. "Since the characteristics of disasters differ according to the location and period in which they occur, it is difficult to simply compare them, but there is a downward trend in the numbers of people dying in disasters. The adoption of early warning systems in each country based on the HFA is thought to be a major factor in this," says Professor Ono.

Prof. Ono wants to incorporate more specific target values in the action framework that will be formulated in the

new conference. The action framework has already been considered for several years before the conference, and various drafts have been published. IRIDeS has also been involved with the process.

One such effort was the production of the "HFA IRIDeS Review Report" that was led by Professor Murao. In this report, researchers of IRIDeS evaluated the HFA from the perspective of their experiences of the Great East Japan Earthquake. A booklet containing about 20 topics was published in October 2013, and another booklet covering a further 37 detailed topics was published in May 2014.

The report was distributed at the Asian Ministerial Conference on Disaster Risk Reduction, etc. "The knowledge we have gained is extremely meaningful for disaster prevention activities over the world. We have created reports that will enable the research of IRIDeS to be utilized in the new action framework."

Prof. Ono says that the action framework

that will be adopted in this conference must be something that is practical for the people of the world. "The action framework is only a prescription. For a prescription to turn into a medicine that is really useful, that prescription must be reliable. Japan has been putting effort into disaster prevention in its processes for reconstructing the devastated nation after the war. It is also the country that experienced the Great East Japan Earthquake. The fact that Japan has been investing in disaster risk reduction since it was a developing country and later turned this into economic growth gives it the power to persuade today's developing countries that will start to implement the new action framework. I hope that we can incorporate specific knowledge in the action framework to adopt a framework that has the ability to deliver."

● HFA IRIDeS Review Report



The "HFA IRIDeS Preliminary Review Report" and "HFA IRIDeS Review Report." Japanese versions are also available.

Using the conference as an opportunity to make Sendai a world center of disaster risk reduction

The WCDRR is an extremely important conference for formulating the future disaster risk reduction policy of the world. On the other hand, IRIDeS considers the WCDRR to be a waypoint, rather than the final destination. "What we as Japan and IRIDeS present to the world to take initiative is extremely important," says Prof. Ono.

One concept is to establish an "International Disaster Statistic Center (tentative title)" that would collect, analyze, and transmit statistics on disasters around the world. Research on disaster risk reduction is widely conducted in countries around the world, but national statistics on disasters are essential for incorporating that research in government policies.

Currently, systematic disaster loss data is not being actively collected around the world. IRIDeS proposes the promotion of national disaster statistics in each country together with international institutions such as the United Nations Development Programme (UNDP) and the establishment of a center that will bring together the world's data.

Prof. Ono is also starting to promote the idea of holding a periodic "International Disaster Forum (tentative title)" in Sendai after the WCDRR. "The ideal would be to have an international forum where the industry, government, and academia of the world can gather. I am thinking about an informal forum where people can freely participate, and various mixed events such as business such as cultural festivals, business exhibitions, academic symposiums, etc. It would be great if we could present a forum that makes people think of Sendai when it comes to disaster



Professor
Yuichi Ono
Disaster Information Management and Public Collaboration Division
International Regional Cooperation Office

risk reduction, much in the same way people currently think of Davos when it comes to economics. I want to use this conference as a springboard for actively promoting Sendai as the world center of disaster risk reduction."

The WCDRR gathers various people from around the world that are involved with disaster risk reduction. These people are already starting to interact before the conference. IRIDeS and Sendai will be at the forefront of this to convey the results of their practical disaster prevention research gained from the Great East Japan Earthquake to the world.

Local actions supported by IRIDeS for the UN World Conference on Disaster Risk Reduction

Rikuzentakata



[Rikuzentakata City Symposium: The Power of Reconstruction]

Date/time: 13:30 to 15:30, March 16th (Mon), 2015

"Symposium for Disaster Prevention Regarding People with Special Needs" Resilience for Tomorrow: Creating an Intentionally Inclusive City

Rikuzentakata city promotes "town planning without normalization," due to the reality that vulnerable groups in society lost their lives during the disaster. The city will convey its activities for creating a society that is gentle on all people via a symposium and exhibits. On February 26th, IRIDeS assisted tsunami evacuation training that included the participation of vulnerable groups, in advance of the symposium.

Tagajo



[Citizen Conference on Disaster Reduction, Excursions and Workshops]

Date: March 19th (Thu), 2015
Location: Tagajo City Citizen Activity Support Center

A day for thinking about disaster reduction via lectures and workshops

A conference that enables citizens to think about and discuss disaster reduction, which minimizes the damage from disasters. Events are held in various locations of Tagajo city, centered on the citizen activity support center. Features speeches, briefing sessions, field work for reconfirming the tsunami damage, and workshops on the theme of food. IRIDeS cooperates with Tagajo city to support overall planning and field work, etc.

Iwaki, Hirono, etc.



[Fukushima Coastal Study Tour and Symposium]

Date: March 11th (Wed) to March 12th (Thu), 2015

Two-day tour of the coast of Fukushima to learn about the disaster damage and the current situation

A two day tour for conveying the actual situation of the coast of Fukushima prefecture to participants of the WCDRR from Japan and overseas. The tour joins a regional forum and visits areas damaged by the tsunami and decontamination sites, etc. Participants learn about the status of the damage and the reconstruction/recovery process while interacting with local government officials and local residents. The tour also introduces reconstruction assistance activities conducted by IRIDeS in cooperation with the Fukushima National College of Technology.

Third UN World Conference on Disaster Risk Reduction

Date: March 14th to 18th, 2015

Location of the main conference: New exhibition hall at the Sendai International Center

Introducing the public forum where the efforts of IRIDeS will be conveyed.

See here for details on events held by IRIDeS and other co-hosted events: <http://drr.tohoku.ac.jp/en/>

Language: **J** ...Japanese **E** ...English organizer:Org

<p>01 The Great East Japan Earthquake Memorial (Tohoku Forum for Creativity)</p> <p>Symposium and 3D documentary <i>The Great March Eleventh Tsunami Remembering for the future</i></p> <p>Date:2015-03-10(Tue) Time:12:30-20:00 Venue:Tohoku University Centennial Hall (Hagi Hall)</p> <p>Conference format J E Interpreted</p>	<p>02 International Interaction Forum of Disaster Prevention Education</p> <p>Date:2015-03-14(Sat) Time:9:30-16:50 Venue:Tohoku University Kawauchi-kita campus Multimedia Hall Org:Aiko Sakurai</p> <p>Conference format J E Interpreted</p>	<p>03 social implementation of disaster robots and systems</p> <p>Date:2015-03-14(Sat) Time:13:30-16:00 Venue:Tokyo electron Hall Miyagi ,Rm 601 Date:2015-03-16(Mon) Time:9:50-11:50 Venue:TKP Garden City Sendai Kotodai (Sendai Park Bldg.) Org:Satoshi Tadokoro</p> <p>Conference format J E Interpreted</p>	<p>13 Recovery after mega-disasters: People, community and planning</p> <p>Date:2015-03-16(Mon) Time:13:10-19:30 Venue:Tohoku University Kawauchi-kita Campus C201 Org:Kanao Iuchi</p> <p>Conference format E Not interpreted</p>	<p>14 Disaster Management and Private Sectors:Private Civil Partnership - from business to community resilience</p> <p>Date:2015-03-16(Mon) Time:13:15-15:45 Venue:Tohoku University Kawauchi-kita Campus C206 Org:Takako Izumi</p> <p>Conference format E Not interpreted</p>	<p>15 Medical and Public Health Preparedness for Large Scale Disaster</p> <p>Date:2015-03-16(Mon) Time:13:30-19:30 Venue:Tohoku University Kawauchi-kita Campus B102 Org:Shinichi Egawa</p> <p>Conference format E Not interpreted</p>
<p>04 Lessons learned from recent water-related disasters in Southeast Asia ~How to save lives~</p> <p>Date:2015-03-14(Sat) Time:17:05-19:55 Venue:Tohoku University Kawauchi-kita Campus C202 Org:Shuichi Kure</p> <p>Conference format E Consecutive Interpretation</p>	<p>05 Enhancing Disaster Resilience by Fusion of Simulation, Sensing and Geospatial Information</p> <p>Date:2015-03-15(Sun) Time:9:30-16:45 Venue:Tohoku University Kawauchi-kita campus Multimedia Hall Org:Shunichi Koshimura</p> <p>Conference format J E Interpreted</p>	<p>06 Tohoku University Symposium Our Message to the future ~ Lessons learned from the Great East Japan Earthquake ~</p> <p>Date:2015-03-15(Sun) Time:10:30-17:00 Venue:Tokyo Electron Hall Miyagi Main Hall Org:Fumihiko Imamura, Makoto Okumura and others</p> <p>Conference format J Interpreted</p>	<p>16 Archiving and Memorializing Disasters International Workshop</p> <p>Date:2015-03-16(Mon) Time:17:30-19:45 Venue:Tohoku University Kawauchi-kita Campus C206 Org:Akihiro Shibayama, Sabastien Boret</p> <p>Conference format E Not interpreted</p>	<p>17 Science and Practical Disaster Risk Reduction - Role of Universities in DRR</p> <p>Date:2015-03-17(Tue) Time:13:15-19:00 Venue:Tohoku University Kawauchi-kita Campus B200 Org:Takako Izumi</p> <p>Conference format E Not interpreted</p>	<p>18 Think geopark on stricken area: Disaster and Gift of Geo</p> <p>Date:2015-03-17(Tue) Time:13:30-15:45 Venue:Tohoku University Kawauchi-kita Campus C202 Org:Miwa Kuri</p> <p>Conference format J Partly English</p>
<p>07 Capacity Building of Earth Sciences toward decrease of geohazards: Establishment of global networks for decreasing geohazards</p> <p>Date:2015-03-15(Sun) Time:13:30-18:00 Venue:Tohoku University Kawauchi-kita Campus C202 Org:Kazuhiisa Goto</p> <p>Conference format E Not interpreted</p>	<p>08 Extreme Natural Disaster due to Climate Change - From Big Data to risk communication</p> <p>Date:2015-03-15(Sun) Time:18:00-20:00 Venue:Sendai Civic Auditorium Meeting Room 1 Org:Carine J. Yi</p> <p>Conference format E Not interpreted</p>	<p>09 Typhoon, storm surge, and wave modelling and damage assessment</p> <p>Date:2015-03-16(Mon) Time:9:00-20:00 Venue:Sendai Civic Auditorium Meeting Room 1 Org:Jeremy Bricker</p> <p>Conference format E Interpreted by staff</p>	<p>19 Symposium on Civic Participation and Empowerment of "Zest for Living in Disaster"</p> <p>Date:2015-03-18(Wed) Time:9:30-15:30 Venue:Tohoku University Kawauchi-kita Campus B200 Org:Fumihiko Imamura, Shosuke Sato</p> <p>Conference format J Partly English</p>	<p>20 Architecture, Space, and Disaster</p> <p>Date:2015-03-16(Mon)-18(Wed) Venue:Sendai ENNICHII (Sendai Television) Org:Osamu Murao</p> <p>Exhibition J E</p>	<p>21 3D Documentary <i>The Great March Eleventh Tsunami Remembering for the Future</i> (Special 25min. edition)</p> <p>Date:2015-03-14(Sat)-18(Wed) Venue:Tohoku University Kawauchi-kita Campus A200 Org:Anawat Suppasri</p> <p>Exhibition J E</p>
<p>10 Resilient Communities: Our Home, Our Communities, Our Recovery</p> <p>Date:2015-03-16(Mon) Time:9:15-11:45 Venue:Tohoku University Kawauchi-kita campus Multimedia Hall Org:Osamu Murao</p> <p>Conference format J E Interpreted</p>	<p>11 Earthquake-induced Tsunami Risk Evaluation (Tokio Marine) Endowed Research Division, International Research Institute of Disaster Science, Tohoku University -Tsunami risk researches and Educational activities for disaster prevention -</p> <p>Date:2015-03-16(Mon) Time:9:15-12:00 Venue:Tohoku University Kawauchi-kita Campus B200 Org:Yo Fukutani</p> <p>Conference format J Interpreted</p>	<p>12 Resilience Workshop ~Technologies and their social implementation to actualize lithe disaster prevention/mitigation~</p> <p>Date:2015-03-16(Mon) Time:9:45-17:30 Venue:Tohoku University Kawauchi-kita Campus B101 (Exhibition):A307 Org:Kenjiro Terada, Makoto Okumura</p> <p>Conference format J Consecutive Interpretation</p>	<p>22 Disasters in the World and Urban and Architectural Design for Disaster Risk Reduction</p> <p>Date:2015-03-14(Sat)-18(Wed) Venue:Tohoku University Kawauchi-kita Campus A102 Org:Osamu Murao</p> <p>Exhibition J E</p>	<p>23 The 2011 Great East Japan Earthquake and Tsunami -Past and Future-</p> <p>Date:2015-03-14(Sat)-18(Wed) Venue:Tohoku University Kawauchi-kita Campus A102 Org:Osamu Murao</p> <p>Exhibition J E</p>	<p>24 Technology demonstrations and exhibition on "Enhancing Disaster Resilience by Fusion of Simulation, Sensing and Geospatial Information"</p> <p>Date:2015-03-14(Sat)-18(Wed) Venue:Tohoku University Kawauchi-kita Campus A102 Org:Shunichi Koshimura</p> <p>Exhibition J E</p>
<p>25 Passing on our historical heritage -the studies of Pre-Disaster Activities to Preserve Historical Materials-</p> <p>Date:2015-03-14(Sat)-18(Wed) Venue:Tohoku University Kawauchi-kita Campus A102 Org:Daisuke Sato</p> <p>Exhibition J E</p>	<p>26 Experimental practices of reconstruction design in Ishinomaki city</p> <p>Date:2015-03-14(Sat)-18(Wed) Venue:Tohoku University Kawauchi-kita Campus A102 Org:Yasuaki Onoda, Katsuya Hirano, Michio Ubaura, Teppei Kobayashi, etc.</p> <p>Exhibition J E</p>	<p>27 Tsunami forecasting technology based on real-time geodetic observation</p> <p>Date:2015-03-14(Sat)-18(Wed) Venue:Tohoku University Kawauchi-kita Campus A102 Org:Ryota Hino, Motoyuki Kido</p> <p>Exhibition J E</p>	<p>28 Tohoku Reconstruction & DRR Pavilion</p> <p>Date:2015-03-14(Sat)-18(Wed) Venue:sendai mediatheque Org:Yasuaki Onoda, Masashige Motoe, Akihiro Shibayama</p> <p>Exhibition J E</p>	<p>29 Tohoku University Reconstruction Action ~Leading the reconstruction of Tohoku and the regeneration of Japan~</p> <p>Date:2015-03-14(Sat)-18(Wed) Venue:Tohoku University Centennial Hall (Hagi Hall) Conference Room</p> <p>Exhibition</p>	<p>30 Tohoku University Guided Tour ③ Global Research Center for Disaster Science & Campus library</p> <p>Date:2015-03-17(Tue) Time:10:30-11:45 Venue:IRIDeS, Tohoku Univ. Org:Osamu Murao, Shuji Moriguchi, etc.</p> <p>Study tour E</p>

Professor

Shunichi Koshimura

Hazard and Risk Evaluation Research Division
Remote Sensing and Geoinformatics for
Disaster Management



“We have achieved the 10-10-10 (Triple Ten) challenge, enabling us to predict whether a tsunami will occur within 10 minutes and predict the damage the tsunami will cause within 10 minutes, up to a scale of 10 meter blocks.”

After completing his doctor's course at the School of Engineering at Tohoku University, worked as a special researcher of the Japan Institute for the Promotion of Science (at the Earthquake Research Institute of Tokyo University), as a guest researcher at the National Oceanic and Atmospheric Administration in the United States, and as a full-time researcher at the Disaster Reduction and Human Renovation Institute at the Great Hanshin-Awaji Earthquake Memorial, before assuming his current position.

Immediately after the Great East Japan Earthquake struck, we were faced with significant anxiety. One of the biggest reasons for this was a lack of information on damage that occurred. We did not know where an earthquake and tsunami had occurred, how we should evacuate, and what kind of damage had occurred. A lack of information hinders evacuation and leads to a delay in rescue efforts. In order to avoid this kind of situation, Professor Shunichi Koshimura of Remote Sensing and Geoinformatics for Disaster Management aims to create a new system that provides quick information and enables an accurate understanding of the full picture of the damage that has occurred. Research into predicting the flooded areas and damage caused by tsunamis produced dramatic results this year.

Conveying the full picture of damage as soon as possible

“When the Great East Japan Earthquake occurred, I was riding the Shinkansen at Tokyo station. I immediately left the station and headed to Sendai in a rental car, but I was able to receive only fragments of information from the car radio. I knew that a tsunami had occurred, but not how big it was or where. I did not know how much damage was caused and in which areas. This experience motivated me to conduct research into how we could provide accurate information as soon as possible.” says Prof. Koshimura. The first thing that evacuation and rescue efforts need to protect lives is an understanding of the full picture of damage that has occurred. This includes how many people there are, where they are, and what situation they are in. Normally government and the mass media take on the role of surveying the overall damage in a disaster, but since this earthquake affected an area more than 500 km² and local government bodies themselves were damaged, it was not possible to see the overall picture. “If we take the example of a human being, it is like not knowing which part of your body has been hurt. This meant that

calls for help could not be transmitted.” There was also the problem of evacuation information not being able to reach those that were affected. Problems occurred with the municipal disaster prevention wireless system in certain areas and some people were unable to hear the system.

“A lack of information leads to delays in evacuation and rescue efforts. Our role is to prepare technology for conveying accurate information to citizens as quickly as possible.” Prof. Koshimura has been researching this since 2004, and that research is now starting to bear fruit after the experience of the Great East Japan Earthquake.



A super computer SX-ACE which has been introduced in the Tohoku University Cyberscience Center and utilized for real-time forecast of flood and damage from tsunamis.

More detailed simulations by closely linking with other fields

The research of Prof. Koshimura entails predicting the damage before the tsunami reaches an area and conveying information. Up until now, tsunami predictions forecast the height of the tsunami in meters at a certain location. However, this information makes it difficult to understand how much the area you are in will be flooded. Prof. Koshimura focused on faster and more detailed forecasts of flood areas and damage. He planned to predict not only the height of the tsunami but also how far inland and how strong the waves will be, to understand the areas that will be flooded and use this information for better evacuation.

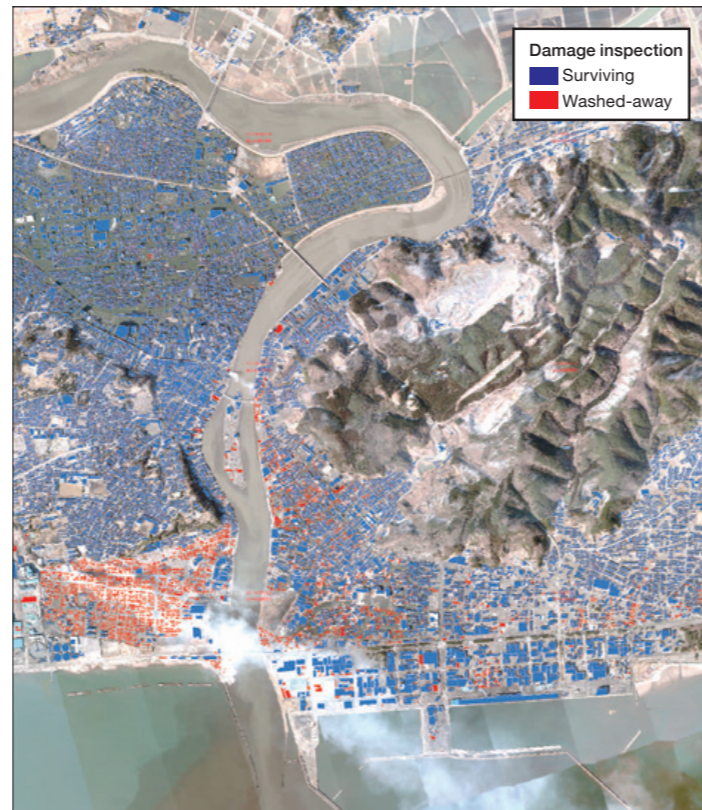
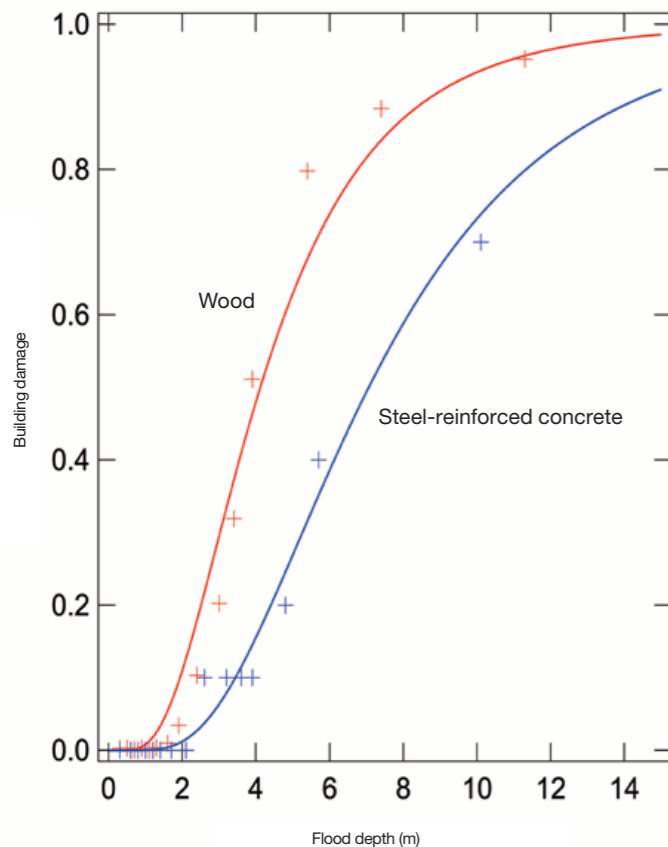
This involves three things. The first is accurately predicting where the earthquake occurs, how high a tsunami will come inland, and over how wide an area. This involved deepening his research with Professor Ryota Hino and Associate Professor Yusaku Ota, who are researchers in the field of science for predicting earthquakes and tsunamis, and Professor Hiroaki Kobayashi of the Tohoku University Cyberscience Center, who is a supercomputer specialist. As a result, he was able to complete tsunami waveform prediction in about 8 minutes.

The second thing is predicting flood areas. The flood areas of a tsunami depend on the structure of the bay and the concentration of buildings, etc. Prof. Koshimura first surveyed the situation in the Nankai Trough and areas where an earthquake could hit the Tokyo

metropolitan area. He simulated how far inland waves could come. "First of all, I quantitatively surveyed how strong a tsunami is required to destroy buildings such as those made of wood and those made of steel reinforced concrete. In tests conducted in Kochi, I was able to predict flood areas within 10 minutes." Furthermore, it is possible to accurately understand the position and locations of buildings in Japan due to its detailed national census. By incorporating this data, it became possible to predict flooding in blocks as small as 10 m. This did not stop at basic university research, as he was also able to promote research linked with public companies and local government bodies to enable prospects for practical use.

More practical warnings by predicting flood areas

● Correlation between flood depth and building damage ● Test in Ishinomaki



This is the first research in Japan to quantitatively demonstrate the damage to different types of buildings such as wooden buildings and steel reinforced concrete buildings. By understanding the correlation between tsunami flood depth and damage to buildings, it is possible to predict which buildings will be swept away, almost on a building to building basis. (Conceptual diagram from the Satellite Positioning Research and Application Center)

10-10-10 Challenge

Predicting the tsunami waveform within 10 minutes and tsunami flood area within 10 minutes, in blocks of 10 meters

The 10-10-10 Challenge (Triple Ten Challenge) is a target set by Prof. Koshimura's group to perform effective tsunami predictions. It enables the scope and scale of a tsunami to be predicted within 10 minutes, and then the inland flood areas

to be predicted within 10 minutes based on this information. Furthermore, flood area predictions are made in detailed blocks as small as 10 m. As a result of this research, the basis for achieving these three "tens" is starting to take shape.

Utilizing quasi-zenith satellites to deliver useful information to people

The third thing is creating a system to reliably deliver these predictions to people. Even if detailed damage predictions are generated, they are meaningless unless people can receive them. Furthermore, speed and reliability is required to convey this information. Quasi-zenith satellites are expected to fulfill this role.

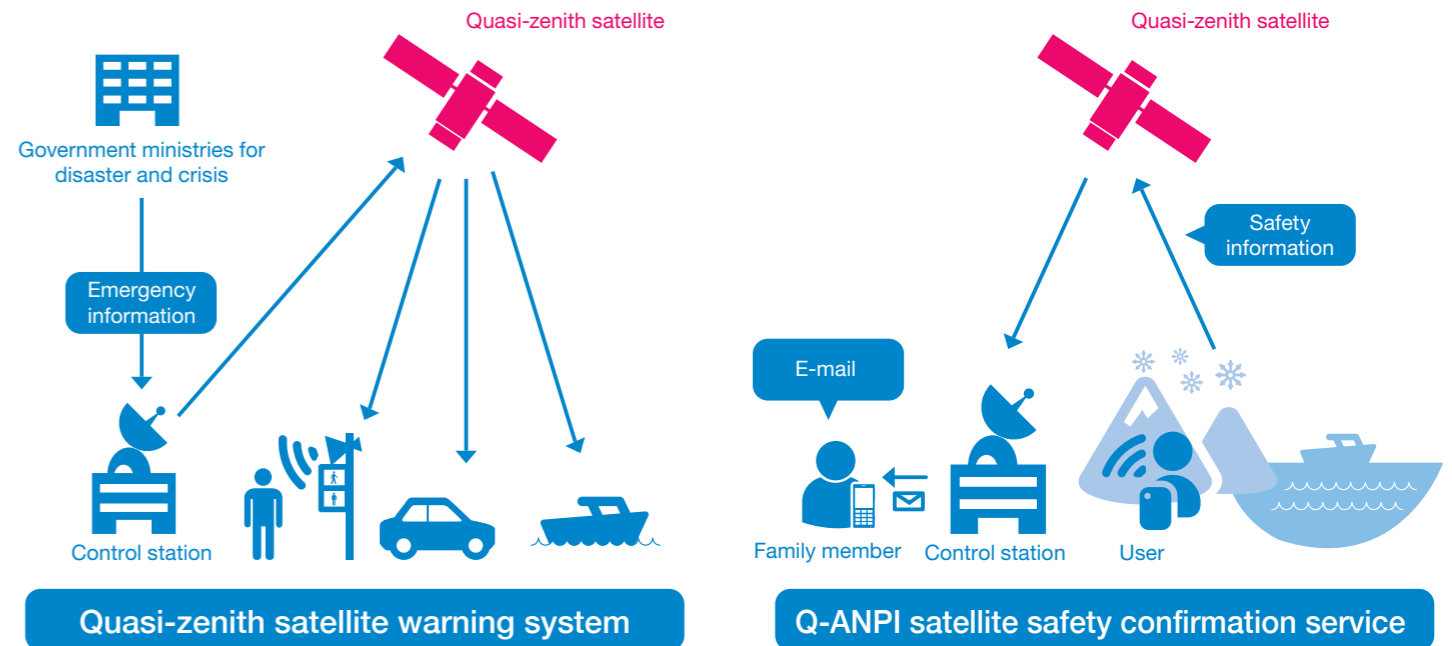
A quasi-zenith satellite is a satellite system designed to increase the precision of positioning. By having a satellite constantly flying almost directly above Japan, we can provide an accurate positioning service that is not hindered by things such as buildings or mountains. "Since a quasi-zenith satellite not

only increases the precision of positioning, but can also broadcast messages to mobile devices, etc. it can be used to send information to personal mobile phones, fishing vessels, cars, and municipal disaster prevention wireless systems, etc. without a time loss." A test utilizing a quasi-zenith satellite and area mail has started in Shizuoka from January 2015. "If this can be implemented, we can solve the problem of evacuation information not reaching people and people not knowing where to evacuate to. People can quickly understand the situation that they are in, and rapid rescue efforts become possible."

Tsunami predictions were previously only performed by the Japan Meteorological Agency, but after the Great East Japan Earthquake, an approval and license system

has been put in place, similar to with weather information. If we can put this flood area prediction technology into practical use, we can cooperate with public companies to deliver information to people as a new service. Research that has the possibility to change the behavior of each person is close to being realized.

● Ground that moved with the afterslip



Example of operating a warning system using a quasi-zenith satellite. Warnings based on predictions can be delivered to cars and municipal disaster wireless systems, etc. by satellite, almost in real-time. (Conceptual diagram from the Satellite Positioning Research and Application Center)

Effectively utilizing big data is the key to future research

So-called "big data" will be used to predict tsunami flooding and understand the damage in disaster areas. A huge amount of information from various sensors and flows of people and cars will be handled in addition to information on the status of buildings and the waveform of tsunamis, and that large amount of information is essential for accurately understanding the disaster situation. However, the more this information

increases, the larger the amount of data is predicted. This is called the "scenario explosion," and is when there are so many scenarios that we do not know which ones to choose. "The scenario explosion is a dilemma found in simulations. It is impossible to make ideal predictions without overcoming it. What we must do is clarify the possibilities and backgrounds behind a number of scenarios. We have to clarify which scenarios are effective based on figures and think about what we need to prepare for."

Prof. Koshimura has been conducting joint research with researchers in universities over

Japan, and that research has already been applied to estimate the damage that would be caused in the event of an earthquake in the Nankai Trough or directly below the Tokyo metropolitan area. He pursues efforts that will be of use in formulating national and municipal disaster prevention policies. Prof. Koshimura's research has become possible due to the emergence of big data, the deepening of tsunami prediction research, and the development of super computers. A new page is being added to the book of disaster prevention research.

Assistant Professor

Shuichi Kure

Hazard and Risk Evaluation
Research Division
Disaster Potential Study



“Using the knowledge gained from the Great East Japan Earthquake for reconstruction in the Philippines.”

Assistant professor in Disaster Potential Study at the Hazard and Risk Evaluation Research Division of IRIDeS. Specializes in hydrology. After graduating from the Department of Civil Engineering in Faculty of Science and Engineering at Chuo University, worked as a doctoral researcher at the University of California, Davis, before assuming his current position.

On November 8th 2013, typhoon (with Asian name Haiyan and Philippine name Yolanda) made landfall in the Philippines. When it made landfall, its central atmospheric pressure was 895 hpa and its maximum wind speed was 90 m/s. This super typhoon of a magnitude rarely seen before gave birth to a storm surge that caused widespread destruction. IRIDeS formed a survey team of about 30 people that was dispatched to the disaster areas immediately after the typhoon, where they started surveying and assistance.

A survey team of about 30 people was dispatched to survey damage and assist reconstruction

A survey team led by IRIDeS director Fumihiko Imamura entered Tacloban city on Leyte island in the Philippines in January 2014. Many people live in Tacloban, the fishing port of San Pedro bay, which was struck by super typhoon Haiyan. The coastal area had become a mountain of rubble and was overflowing with the makeshift tents of people that had lost their homes. "There were no houses along the coast like there should have been, and agriculture was devastated, particularly coconut trees. At the time, no one had an accurate understanding at what had happened." says Assistant Professor Shuichi Kure of Disaster Potential Study, who was involved with the survey team from the start.

Approximately 7,300 people throughout the Philippines are said to have died due to typhoon Haiyan. The lack of robust evacuation sites and high ground in cities and the fact that the word "storm surge" itself was not widely known by residents are thought to have prevented people from evacuating, leading to increased deaths. "The fact that the typhoon struck in the early morning when it was still dark and that not many buildings were sufficiently strong are also thought to be factors. Some evacuation sites that many people escaped to were flooded at storm surge

and some were destroyed by strong winds." The maximum wind speed when typhoon Haiyan made landfall was 90 m/s, which is as powerful as a tornado. "The typhoon directly hit an area where many poor people live. Their crude houses would not have been able to withstand such strong winds." The storm surge that reached 5 to 6 m in height inflicted tremendous damage in particular. Storm surge coupled with high waves can surge inland like a tsunami. It is thought that many of the single-storey buildings were swallowed up by the storm surge. The survey team of IRIDeS had four objectives. First, to strictly survey the damage to coastal areas. Second, to survey the situation of resident evacuation. Third, to survey the status of damaged hospitals and infectious diseases. Finally, to assist town reconstruction.



Steady surveying by researchers in various fields to understand the status of damage

First the team surveyed the damage to coastal areas. Dr. Kure said "Since the damage from the tsunami and the damage from the storm surge had many things in common, we were able to use the knowledge gained from the Great East Japan Earthquake in the Philippines." First of all, they accurately understood the damage to Tacloban city. The team visited local houses to collect data by checking how many meters high the water was and conducting questionnaires. Before starting the local survey, Professor Shunichi Koshimura and Assistant Professor Erick Mas (of the Hazard and Risk Evaluation Research Division) lead an analysis of the status of damage using

satellite images. Associate Professor Jeremy D. Bricker and Assistant Professor Volker Roeber (of the Hazard and Risk Evaluation Research Division) lead a calculation to reproduce the storm surge and high waves using a numeric model. "As a result, we discovered that a typhoon of the largest class in history passed through the worst possible route and at the worst speed. The low air pressure heaved up the sea water, and strong wind blowing towards the head of the bay made the storm surge stronger."

Poverty was also another factor that increased deaths. "Many people were forced to live on the coast due to its convenience for fishing and due to poverty (coastal areas are national land that is not subject to rent and land costs). Naturally these houses were structurally weak, but a questionnaire conducted by Assistant Professor Yasuhiro Jibiki (Leading Graduate School) found that

many people did not leave their homes because they wanted to protect their possessions. Also, more than 80% of residents did not know the meaning of 'storm surge.' Many people said that they would have run away if the word 'tsunami' was used instead of 'storm surge.'" Since the route of a typhoon can be roughly predicted, it is a disaster for which evacuation is relatively easy. The government of the Philippines called on people to evacuate, but people did not or could not evacuate for various reasons, such as not understanding the meaning of "storm surge" or there being not enough robust evacuation facilities. "On the other hand, there were few deaths in areas where the city mayor or village mayor exerted leadership to evacuate people. This highlighted the importance of disaster prevention education for government and regional leaders."

Severe poverty hinders reconstruction incorporating disaster prevention measures

The Philippines does not have a detailed resident registry system like Japan. The numbers of dead and missing are based on self-reports. "We were finally able to evaluate the status of the damage after one year of not knowing the real numbers. Now I would like to gradually shift towards supporting recovery."

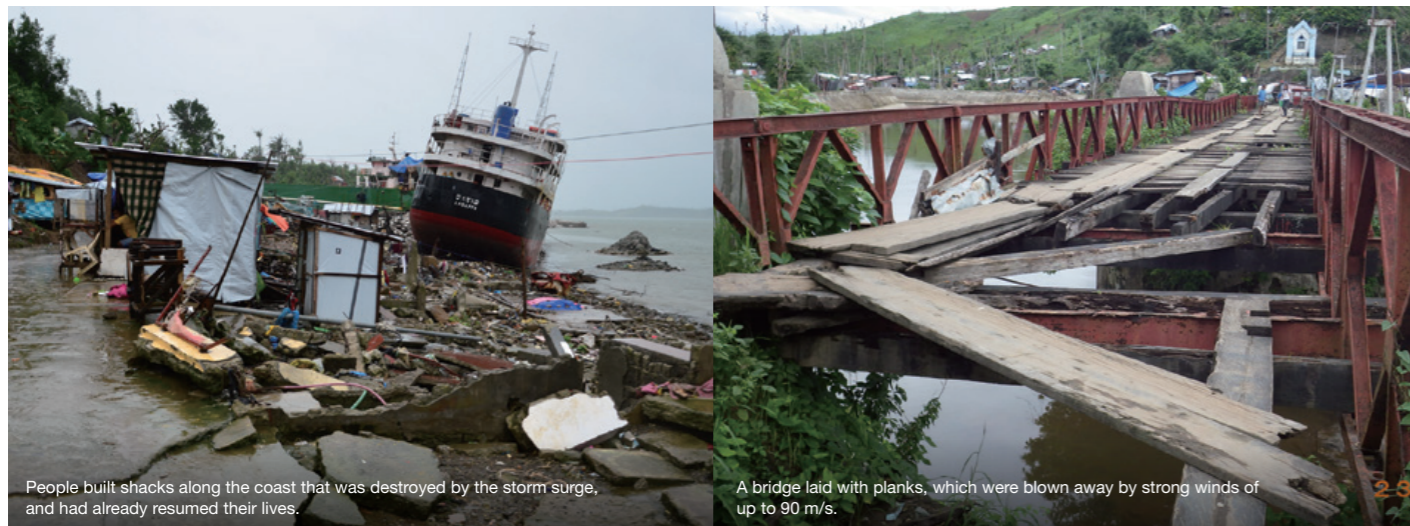
When becoming involved in reconstruction in the Philippines, the biggest hurdle to face is poverty. During World War II, the Philippines was an area of heavy fighting as it was where Japan and the United States clashed. It took time to reconstruct the war-torn country, and due to political instability the country put off measures related to disaster prevention.

"The reconstruction of Tacloban is surprisingly fast. This is because people build shacks using rubble, etc. even though the coast has not been restored yet. The coast that was a mountain of rubble is already starting to resemble a town. The main source of livelihood is fishing and coconuts. Living next to the sea means life for these people. Their life and work cannot be separated. This is why disaster prevention measures get postponed. However, since the Philippines is in an area that is often visited by typhoons, proper measures will be required in the future. The biggest difference between typhoons and tsunamis is that typhoon damage can occur every year. It is quite possible that a super typhoon could even strike Tacloban again during the typhoon season this year."

In December 2014, the economy of the

Tacloban City was said to have recovered to 70% of what it was before the disaster. However, the agriculture of the area where the typhoon came inland is still devastated and not showing signs of recovery, in particular the coconut industry. "The Japan International Cooperation Agency (JICA) is providing assistance for reconstruction in terms of disaster prevention, economics, and livelihoods. What we can do is seek countermeasures from an academic perspective. What situation is the country in, and what are people thinking? I would like us to continue steady surveying and support reconstruction in a way that suits the Tacloban City while utilizing the knowledge we have. Even if they are poor and hit by natural disasters, the people in the Philippines live their life with a positive attitude and a smile. We will try our best to help them."

● Satellite photos of Tacloban before and after the disaster (created and provided by Dr. Erick Mas)



People built shacks along the coast that was destroyed by the storm surge, and had already resumed their lives.

A bridge laid with planks, which were blown away by strong winds of up to 90 m/s.



Surveys are conducted with the cooperation of local people. The survey team also conducted detailed questionnaires.

Children learning at an elementary school temporarily reconstructed with foreign assistance



Tacloban was hit by a storm surge of 6 m. Houses along the seaside were swept away and aquaculture racks and piers were destroyed. (Mas, E and B. Adriano, IRIDeS Fact-finding missions to Philippines, pp.14, 2014.)



“We have incorporated the scientific knowledge of IRIDeS to construct evacuation facilities and tsunami evacuation plan, etc.”

Major examples of linking between Sendai city and IRIDeS

- Advising the formulation of regional disaster prevention plans
- Advising tsunami evacuation measures
- Participating in preparations, for the 3rd UN World Conference on Disaster Risk Reduction

■ For questions or enquiries regarding examples or linking, please contact IRIDeS at contact@irides.tohoku.ac.jp

Closer linking for the UN World Conference on Disaster Risk Reduction

Sendai city and IRIDeS entered an agreement for linking and cooperation on January 9th, 2014. Researchers of IRIDeS entered the disaster areas of Sendai city immediately after the Great East Japan Earthquake to conduct surveys and research. In particular, director Fumihiko Imamura worked as an advisor for formulating the evacuation plans of Sendai city, such as working as the head of a committee for organizing tsunami evacuation facilities. "We had already received the cooperation of IRIDeS to create hazard maps and conduct lectures on disaster prevention, but we decided to enter an agreement in order to enable closer linking before the UN World Conference on Disaster Risk Reduction," says Mr. Fukurai at Sendai city crisis management department disaster-resilient city

promotion section

Sendai city is now building 13 new evacuation facilities along the coast, including evacuation towers, buildings, and outdoor staircases. IRIDeS assisted in coordinating a basic concept for organizing tsunami evacuation facilities, including having evacuation facilities in locations that residents can reach within 15 minutes and having evacuation facilities where everyone can evacuate to higher ground after arriving in the facility. "By receiving advice from professor, we were able to make more specific plans. Since we could add scientific knowledge to the plans, the plans became more persuasive to residents," says Mr. Fukurai.

In Sendai city, workshops for creating evacuation maps, etc. are held based on the policy of having citizens think about evacuation themselves. Researchers from IRIDeS participated in the workshop held in Sanbontsuka, Wakabayashi-ku in November, 2014.

"We have IRIDeS involved with both the tangible aspect of constructing evacuation facilities and the intangible aspect of conducting workshops. Another appeal is having professors from a wide range of fields coming to visit. We are also thankful that professors from IRIDeS can give us advice from a different perspective since they are also conducting activities in other municipalities." IRIDeS is also closely coordinating with Sendai city to prepare for the UN World Conference on Disaster Risk Reduction. "It is the responsibility of Sendai city to enhance the main conference and the public forum, and convey the valuable experience and lessons gained from the earthquake to Japan and the rest of the world. IRIDeS is an extremely reliable partner." IRIDeS and Sendai city will continue to deepen their link to widely convey the results of practical disaster prevention studies and return the results to the community.



Tohoku University International Research Institute of Disaster Science "Michinoku/Ima wo tsutaetai"

Officer in charge of Onagawa

Fumiaki Sato



Photos depicting the situation in the Onagawa area immediately after the disaster



The Fukko Machizukuri Joho Koryukan is one place for communication



Onagawa town under reconstruction and a four-storey building that fell on its side. Taken in August, 2014.



Onagawa bay starting the saury harvest. Taken in September, 2014.

"I believe I have something important to convey because I was born and bred in Onagawa"

Michinoku/Ima wo tsutaetai

This team works to collect various kinds of regional information to keep and convey, including records and evidence of the areas struck by the Great East Japan Earthquake, current lives of residents, and their thoughts and hopes for the future. It is currently active in 15 cities and towns on the coast of Miyagi prefecture.

The team is made up of residents from the various regions, which are openly recruited. The activities of the team are part of the "Michinoku Shinrokuden" archive project of IRIDeS.

● Michinoku Shinrokuden <http://shinrokuden.irates.tohoku.ac.jp/>

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● Michinoku Shinrokuden Earthquake Archive

<https://www.facebook.com/MichinokuShinrokuden>

Onagawa is a fishing town that surrounds the bay. The center of the town is lined with shops selling fresh seafood, and each morning the market is filled with fishmongers crying their wares. This is the Onagawa that Mr. Sato of "Michinoku/Ima wo tsutaetai" grew up in. However, his home was swept away by the tsunami. On that day, he saw his hometown being swallowed up by waves after he frantically retreated to high ground. "When I saw my hometown being swept away, I decided to not give up. I made up my mind to keep moving forward."

Mr. Sato started his "Michinoku/Ima wo tsutaetai" activities in February 2012. This was a time when the memory of the disaster was still fresh in his mind. "I was a complete amateur when it came to interviewing people, but I was able to engage people honestly, maybe because I was also someone that was affected by the

disaster. I was also lucky to receive information from my friends and acquaintances in advance about the people I would interview. This was important because the things I can ask someone may differ if that person has lost some of their relatives in the disaster." Interviewing is an act that can tread on people's painful memories. It can also be difficult to find people willing to respond to an interview. "Even so, many people agreed to be interviewed because they believed it was their duty as a survivor to communicate their experiences. If that is their duty, then my duty is to convey their message. I want to be able to convey the memories of the disaster to future generations without these memories getting lost."

Four years after the earthquake, Mr. Sato says that the things he can ask about are starting to change. "Immediately after the earthquake, I believe that everyone wanted to tell

someone about their experiences. People would talk away after I struck up a conversation. However, after time went by, there are now more people who do not want to talk about that time. Some people suddenly fall silent in the middle of a conversation. I suppose they do not want to remember things that they have tried so hard to forget. These are some of the ways in which things are different to when I first started surveying."

The town of Onagawa is steadily on the path to reconstruction, but on the other hand, the difficulty of having villagers create a new town together is becoming apparent. "I would like to make a record of what has been going on and how people have been feeling during the reconstruction process. I believe that there are many things I can convey, from the point of view of a disaster victim, and I hope to continue my activities for a long time into the future."