Activities

Conducting surveys on mental health during disasters in cooperation with towns clarified the necessity of continued care

Prof. Hiroaki Tomita works on mental healthcare for disaster stress* at temporary housing in Shichigahama. He conducted the third health survey in February, 2014. The survey found that almost the same number of people that were in a poor condition immediately after the earthquake were still experiencing disaster-related distress, depressed feelings and difficulty in sleep even after 3 years have passed. Prof. Tomita says that “Since people are now moving to public housing, it may become harder to provide assistance. We need to facilitate relationships among communities to take care of each others, and makes it easy for people to consult with professionals.” Knowledge from the new survey will hopefully be used for long term mental healthcare settings.

*Disaster stress: Stress caused by disaster-related traumatic events, losses, and changes in life environments. Can be a cause or modifying factors of PTSD and depression.

The best remedy for disaster stress is having people close to you listen to your experiences during the disaster. Public nurses of the affected community along with Prof. Tomita has been holding the “Dan-Dan Conversation Salon” in temporary housing since September 2011.

Professor
Hiroaki Tomita

Professor of Disaster Psychiatry at the Disaster Medical Science Research division. Born in 1963. Specializes in disaster psychiatry. After graduating from the Medical School of Okayama University, worked in Okayama University, Nagasaki University, University of California, Irvine, and Tohoku University as a psychiatrist and a researcher, before being assigned his current position.

Learning from a handkerchief filled with knowledge “YUI” project for disaster risk mitigation

The “YUI” project for disaster risk mitigation was started in April 2014 as a collaboration between IRIDeS and Sendai Television. A “YUI” pocket handkerchief printed with knowledge on disaster mitigation and disaster mechanisms is utilized to conduct school visits at elementary and junior high schools. “By conducting disaster prevention education for children, we can raise the disaster prevention awareness of families. We want disaster risk prevention to become common knowledge in society like traffic safety is now." says Ms. Mari Yasuda, who developed the “YUI” pocket handkerchief. The “YUI” pocket handkerchief was distributed to all fifth year elementary students in the prefecture from mid May, and is scheduled to be utilized in the disaster prevention education at each school.

The handkerchief describes the specialized knowledge of IRIDeS in an easy to understand manner, such as the items required for evacuation and the mechanisms of tsunamis. It can be folded up and enables students to learn about disasters and disaster mitigation in quiz format.

Research Associate
Mari Yasuda

Works with Tsunami Engineering Research at the Hazard and Risk Evaluation Research Division, Disaster Archive Research at the Disaster Information Management and Public Collaboration Division, and at the Endowed Research Division. Worked as a research assistant at the Disaster Control Research Center of the Graduate School of Tohoku University, before the current position. Certified disaster prevention expert and vice director of the Bousaishi-Miyagi NPO.

Satellite office opened in Kesennuma hopes to promote communication between citizens and researchers

Kesennuma city and IRIDeS entered into a comprehensive collaboration agreement in July 2013 and IRIDeS opened its first satellite office, the “Kesennuma Satellite” in October 2013. The Kesennuma Satellite is utilized as a base for practical research activities, such as tsunami evacuation planning and archiving of the process of recovery from the Great East Japan Earthquake and Tsunami. For citizens, the office conducts lectures related to disaster science, disaster mitigation measures, etc. It promotes the transmission of the latest research results and the exchange of information.
Prof. Ikeda of the Kesennuma Satellite Working Group says that “It is stimulating for me to talk with the people actually living in Kesennuma in the course of our activities. We want to understand the needs of the people in disaster-affected areas to conduct research that fit with what the local people feel.” In early July 2014, group members visited some local communities in Kesennuma to learn about the situation at the time of the earthquake and tsunami disaster, the current status of recovery, the lifestyle and culture of the region, and so on. “We hope this can become a model case for how a research institute can interact with a regional area, and we hope the Kesunnuma Satellite can play a role in connecting the researchers of IRIDeS with local citizens.”

Assistant professor
Naho Ikeda

Disaster Information Management and Public Collaboration Division / International and Regional Cooperation Office. Specializes in geography, mountain study, livelihood research, and study of disaster management in community level. Worked as a research fellow at the National Research Institute for Earth Science and Disaster Prevention and as a researcher at the Disaster Prevention Research Institute of Kyoto University, before assuming her current position.

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IRIDeS
International Research Institute of Disaster Science

Tohoku University International Research Institute of Disaster Science NEWSLETTER

Conveying the results of practical disaster prevention research from TOHOKU to the World.

TOHOKU UNIVERSITY

IRIDeS Quarterly

vol. 04

September 2014

“Soma Nomaoi” at Minamisoma city in Fukushima prefecture

A traditional event designated as a significant intangible folk cultural asset. Gallant mounted warriors wage cavalry battles and have martial parades. Highlights of the festival include “kacchu horse racing” (pictured) and the “nomagake”, where wild horses are offered to a shrine. http://www6.ocn.ne.jp/~nomaoi/english.htm

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. The heads of each division introduce their divisions below.

Professor
Shunichi Koshimura

Hazard and Risk Evaluation Research Division

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

We reconstruct disaster prevention/mitigation technologies based on the findings and lessons from the 2011 Tohoku disaster and analysis of the disaster generation mechanisms. Through our action-oriented research exploiting the findings to the area of high possibility in mega disaster occurrence, we aim for the contribution to enhance the preparedness for the risk reduction and early recovery.

Endowed Research Division

Enriching disaster research with private sector donations, etc.

This division enriches and invigorates education and research using donations from the private sector, etc. The Earthquake and Tsunami Risk Evaluation (Tokio Marine & Nichido) Endowed Research Division has now been established for three years since 2012.

Professor
Takeshi Sato

Disaster Information Management and Public Collaboration Division

Enhancing the record of the earthquake and assisting urban reconstruction

Our division further enhances the “Michinoku Shinrokuden” and promotes the utilization of disaster records in Japan and overseas. We also assist the creation of recovery plans. Our division also pursues designs for a new society that prevents and reduces the risk of disasters, while promoting and enhancing the links between relevant organizations both inside and outside Japan.

Professor
Hiroaki Maruya

Human and Social Response Research Division

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

Our division surveys the culture and history of disasters in various regions, internationally conducts comparative research, and reevaluates the disaster cycle/recovery from a historical perspective. We also research human disaster cognition and behavior mechanisms, assist recovery in conjunction with damaged areas, and propose legislation and social systems for disaster management.

Professor
Kenjiro Terada

Regional and Urban Reconstruction Research Division

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

Our division develops practical technologies for maintaining safety and peace of mind. We analyze data to understand the status of disaster sites, build methodology and planning technology to create robust regional communities, and develop and implement decontamination and restorations technologies, etc.

Professor
Shinichi Egawa

Disaster Medical Science Division

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

Our division enhances preparedness for disasters from the perspective of health and medical care. We strengthen links with other departments and international organizations to include disaster health and medical care in new action frameworks, while also providing education for disaster medical science, emergency radiation exposure treatment, and international medical care assistance.

Professor
Shinji Toda

Disaster Science Division

Revealing the mechanisms behind disasters to forecast hazards

To reduce the damage from disasters, we need to understand their sources and evaluate their hazards. Our division seeks the mechanisms that bring natural disasters such as earthquakes, tsunamis, volcanic eruptions, and climate change, and provides more accurate and reliable hazard assessments.

“Aiming to achieve a society that prevents and reduces the risk of disasters with concrete actions”

Fumihiko Imamura

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

In 2014, there are two main pillars that IRIDeS must focus on. One is the promulgation and propagation of “practical disaster prevention studies” and the other is deepening disaster research.

One specific part of our practical disaster prevention studies is our “Kakeagare! Japan” evacuation training. We aim to have evacuation training that residents can voluntarily participate in. Having people think about detailed actions such as who they will evacuate with and which route they will take enables people to become accustomed to more practical evacuation behavior. Evacuation plans are an essential element of safe urban planning. I believe it is exactly what is required at the moment. I want us to also focus our efforts on disaster prevention education. From last year, we have been overseeing a reader on disaster prevention distributed to all elementary schools in Miyagi prefecture. This April we also started the “YUI” project for disaster risk reduction (see the back cover).

We will continue to support each school in various ways so that they can conduct their own disaster prevention education.

Another pillar that we must focus on this year is deepening research into the disaster cycle of events from occurrence to recovery when a disaster occurs. Last year, we developed a 3D tsunami simulation system in conjunction with Fujitsu. When a tsunami penetrates inland, its shape changes in a complex manner due to the buildings and geography.

The 3D simulation enabled us to view the inland movement of the tsunami in detail, which helps design evacuation buildings, etc. At the same time, we are conducting research into the mechanisms that cause earthquakes. A recent paper jointly published by Tetsu Miura, professor in volcanic hazard research, and Takashi Iinuma, professor in marine geodesy research, of the Disaster Science Division, was awarded best paper in 2013 by the Seismological Society of Japan. This research conducted a detailed analysis of tectonic fluctuation that occurred during the Great East Japan Earthquake based on GPS data.

By deepening our research in each field, we have started to see openings for new types of research. I hope we can further increase cooperation between fields to conduct more comprehensive activities.

Special Talk

Talking about how to face the radiation problem

A grave nuclear disaster occurred in Fukushima Daiichi Nuclear Power Station due to the Great East Japan Earthquake. At IRIDeS, we have also focused on bringing closure to the accident and the radiation problem. How will IRIDeS handle the radiation problem that will continue in the future? Researchers on the frontline of research held discussions on past and future efforts, lead by Prof. Okumura, deputy director of the institute.

Utilizing knowledge to conduct a wide range of research in topics such as surveillance robots, shielding technology, and medical efforts

The nuclear accident led to the deepening of research

Prof.Makoto Okumura (Prof. Okumura): First of all, please let us know what each of you has researched in regards to the topic.
Prof. Koichi Chida (Prof. Chida): Before the earthquake, I was researching radiation exposure at medical sites. After the nuclear accident, I was in charge of a telephone consultation service regarding radiation, which was set up at a local government office. At the time, everyone was panicking and since all kinds of information were flying around, correct information on radiation from the standpoint of a professional was required. I handled consultations everyday until early April, and provided advice afterwards as necessary. Through this experience,
I realized that citizens felt very uneasy because of their lack of knowledge regarding radiation, and thought we would need to find a way to convey our knowledge in an easy to understand manner. To achieve this, we made pamphlets for adults and also for elementary school children to provide
a simple description of radiation. It turned out that it was rare to find something like that for early elementary school children. We hope they can be utilized at elementary and junior high schools.
Prof. Yusuke Suzuki (Prof. Suzuki): My specialty is concrete engineering. At the time of the earthquake, I was living in Fukushima, but I had no idea what radiation even was. However when the earthquake occurred, I thought about what I could do in my area of expertise, and now I am researching the optimal shielding design for concrete in regards to radiation. In the future, the method for storing soil and rubble contaminated with radiation will be a major challenge. Since concrete that is environmentally friendly and low cost will certainly be used as a shielding material, I believe that the development of shielding technology that suits the application and location is an urgent need.
Prof. Okumura: Was there any previous research?
Prof. Suzuki: There was research into how much radiation can be shielded. However, this research was for specialized facilities, and was not conducted from the viewpoint of ease of use and thickness of shielding materials. I want to deepen research into the physical properties of concrete and create concrete that can shield radiation even when it is thin.
Prof. Satoshi Tadokoro (Prof. Tadokoro): I also didn't know the first thing about radiation before the earthquake. I was creating rescue robots for cases such as terrorism and gas leaks, and at the time of the accident I had no idea that the robots I had created could help nuclear power facilities. At the end of June in 2011, a robot we developed called Quince entered the second floor of the nuclear reactor building. Quince was the first Japanese robot to have entered a nuclear reactor building. The robot was made to climb up to the fifth floor to survey the distribution of radiation, and they were able to plan the process based on the results of that survey whether humans can enter to perform work. This was a happy result for an agent robot that performs surveys in lieu of human beings.
Prof. Okumura: Does the robot itself emit radiation after performing work?
Prof. Tadokoro: The materials that comprise the robot do not become radioactive. However, dust and soil that contains radioactive materials can become attached to the rollers and belts when the robot performs surveys. Since it is not an easy thing to decontaminate the robot every time it enters a building, it was necessary to make such detailed improvements. The basic parts of the robot required to climb over rubble and conduct surveys were able to be handled with existing technologies.
Prof. Okumura: How does each of you want to utilize your efforts in the future?
Prof. Suzuki: First of all, I want to organize data about how much concrete can shield radiation from materials contaminated by the nuclear accident (volume radiation sources). We also have to assure that concrete can maintain its performance when it is actually used in various applications and locations.
Prof. Tadokoro: The accident at the Fukushima Nuclear Power Station is not over. Research and development for putting an end to the accident shall be actively pursued. I believe that robots will be one of the keys to doing so. Up until now, robots that can effectively move in radioactive confined space have not been researched much at all. We are actively developing new technologies, such as fitting robots with a function for measuring radiation, and exploring the effectiveness of flying robots. We need to establish a strong base of technology for the goal of bringing closure.
Prof. Chida: I want to think more about how we can spread correct knowledge to citizens. I also think that there is regional variation in the level of knowledge regarding radiation. Some things have become common knowledge in Fukushima prefecture because of progress in education regarding the radiation problem, but this knowledge has not made it to some other areas. I want us to improve this situation. IRIDeS also established a research center for radiation emergency medicine in July 2014 as a research center for linking projects, due to regrets about the emergency exposure treatment system of Fukushima prefecture not functioning well enough at the time of the accident.
I want to promote the setting up of systems for providing effective emergency exposure treatment.

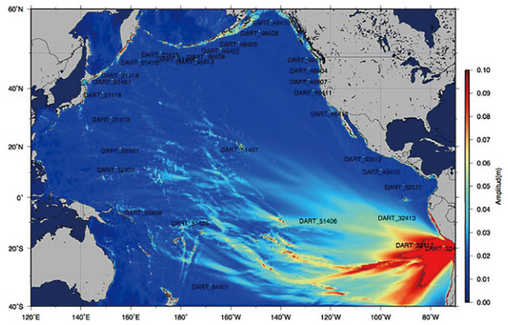
After the discussion

After the disaster, we have been at the mercy of intangible unease and fear. IRIDeS must correctly understand radiation and widely convey its knowledge to citizens. We want to continue research in various fields in the future. (Prof. Okumura)

Feature 1

Emergency Report of the Earthquake and Tsunami in Chile in April, 2014

"Approx. 2 hours after the earthquake, we published a mostly accurate arrival time and predicted height for the tsunami."



●2014 Chile earthquake and tsunami simulation

2014 Chile earthquake and tsunami simulation. Results of the calculated tsunami figures published by IRIDeS for the Chile earthquake on April 2nd, 2014. We can see that a high wave headed towards the south after the earthquake occurred in the north of Chile.(Image: Adriano Bruno, Erick Mas, Shunichi Koshimura)

Assistant Professor
Erick Mas

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

Born in Peru. Specialist in disaster risk, tsunami engineering, and tsunami and evacuation simulations. After graduating from the Peru National University of Engineering, was in charge of disaster prevention at the province of Callao in Peru, a disaster prevention adviser in La Punta, and then completed his master's program in disaster risk management at the Peru National University of Engineering. In 2012, completed his PhD course in civil engineering (tsunami engineering) at the Tohoku University Graduate School of Engineering, and then assumed his current position.

Rapid simulation of the arrival time and predicted height of the tsunami

An earthquake of magnitude 8.2 occurred in the north of Chile on April 2nd of 2014. It was a large-scale earthquake with the possibility of causing tsunami damage to Japan. IRIDeS immediately started analysis in various fields.

The Laboratory of Remote Sensing and Geoinformatics for Disaster Management of the Hazard and Risk Evaluation Research Division, where Prof. Erick Mas, Bruno Adriano, and Prof. Shunichi Koshimura are, started a simulation on the scope of the tsunami that would reach Japan. Approximately two hours after the earthquake, they were able to announce the arrival time and estimated height of the tsunami that would hit the coast of Japan. Prof. Mas explains "We set up various models and started simulations simultaneously, and one of those was able to output values that were mostly accurate."

What the analysis succeeded in this time was generating data related to the scope of the first tsunami wave. "One of the reasons that we were able to perform such a quick simulation was because we focused on analyzing only the arrival time and height of the tsunami, for which calculation is relatively simple. We analyzed that data first because its speed is important, and later we use much more complex calculations to estimate the inland water penetration." Another thing that played an important role in deriving accurate data was the fault data in the area around Chile.

Linking with Tsukuba University supported accurate analysis

Tohoku University has been participating in a joint research project for the past five years with Peru, which is a country next to Chile, and has been sharing data related to earthquakes and tsunamis. Prof. Mas himself is also from Peru. "The detailed fault data for the area surrounding Chile obtained via Tsukuba University was useful for configuring the model. The knowledge of IRIDeS regarding tsunamis is recognized around the world. It is very important that we closely link with local universities on a regular basis by sharing our knowledge and experience widely. This was a chance for us to reaffirm this importance."

A simulation of the Chile earthquake and tsunami was performed at other universities in Japan, such as Tsukuba University, Tokyo University, Kansai University, and Kyoto University.

"Of course the height of tsunamis is also announced by the Japan Meteorological Agency, but original analysis is essential for announcing our own views. At IRIDeS, we strive to share the latest information while constructing networks for linking with other universities. We want to widely announce the calculation process and results of this simulation to assist future tsunami research in Japan and over the world."

More specific announcements to help evacuations

A feature of this earthquake and tsunami in Chile was the fact that there was movement in the height of the sea surface even 24 hours after the earthquake occurred.

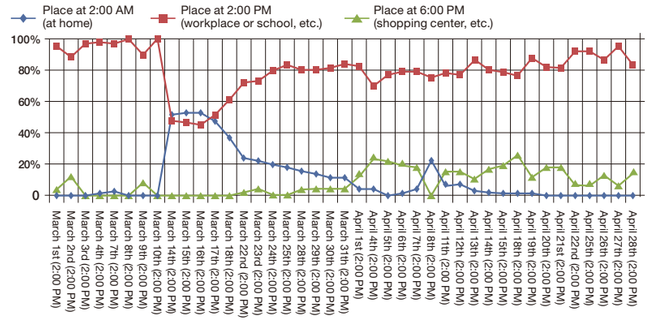
"We believe that waves propagated over a wide range, and the tsunami that reached the Kamchatka Peninsula, etc. was reflected back and reached Japan as a succeeding wave." In Japan, a tsunami alert was issued at 3:00 AM on April 3rd, and was not lifted until 6:00 PM. Since the evacuation lasted a long time, there were many citizens that went home before the alert was lifted. "The tsunami turned out to be 20 to 30 cm high, but tsunamis arrived multiple times repeatedly. The simulation was for up to 30 hours after the earthquake occurred, but simulations with a longer span will be required in the future. We want to be able to produce more accurate estimations on when and how danger will escalate and link this to the evacuation behavior of residents. We also want to be able to quickly announce information that will help residents, such as which inland areas will be submerged, in addition to the arrival time of the tsunami."

Prof. Mas says "This time we were able to provide reliable information based on links with other universities and daily research. We will broaden the scope of our activities so that we can continue to provide useful information to save lives and contribute to science."

Feature 2

Disaster logistics that consider the flow of aid materials

"Despite our lifestyles becoming more convenient, we are losing our skills for dealing with disasters."



●Process for people returning to everyday life

This diagram indicates where people were at 2:00 PM each day. Immediately after the disaster, 55% of people were in the place they would normally be at 2:00 AM (at home), but in late March, 80% of people were in their workplace or school. The remaining 20% of people had moved to the place they would normally be at 6:00 PM (shopping center, etc.)

Professor
Makoto Okumura

Deputy director of IRIDeS
Human and Social Response Research Division
Disaster Area Support

Born in 1962. Graduated from the School of Engineering and Graduate School of Engineering at Kyoto University. Worked as an assistant professor at the Faculty of Engineering at Hiroshima University and as a professor at the Center for Northeast Asian Studies at Tohoku University before assuming his current position. Specializes in regional/urban planning, transport planning, transport interruption/regional isolation problems, and regional planning for Siberia and Bolivia.

Importance of building a system for receiving aid materials

Disaster areas received various types of aid materials from around the country, such as water and food, daily goods, and even school backpacks. Prof. Makoto Okumura of Disaster Area Support researches logistics during a disaster. Logistics normally refers to the material flow through processes from creating something to delivering it to the consumer. Therefore, research into disaster logistics covers a wide range of topics, including distribution, road planning, and demand management.

"A huge amount of aid materials arrive in disaster areas. Sometimes they cannot be handled by the recipients, which can even be called a 'second disaster'. It is sad to think that this can happen to items sent with a good intention."

Prof. Okumura explains that a big problem with receiving aid materials at disaster areas is that they do not have storage sites. To store large amounts of aid materials requires buildings with high ceilings and hard floors that enable forklifts to operate. In this disaster, many locations that were suitable for storage areas were being used as evacuation sites. "One reason behind this is that disaster prevention plans are missing information on how to efficiently receive aid materials. It is necessary to survey and list what buildings are suitable for use as warehouses during normal times."

Analyzing how people return to their daily lives

When and where aid materials can be delivered is a big problem. Prof. Okumura's research lab received the cooperation of a private company to start analyzing where people were at 2:00 PM every day after March 14th, 2011.

On March 14th, it is predicted that half of the people living in the disaster area were in the place they would normally be during the day, where the other half were at the place they would normally be during the night. Several weeks later, 80% of people were in the place they would normally be during the day, and the number of people in the place they would normally be during the night dropped to about 20%. After that, the remaining 20% of people started going to the place they would be during the evening, such as shopping centers or train station areas. "From this data, we can see that if materials are distributed several weeks after a disaster, we should create distribution centers in shopping centers or near train stations. By clearly knowing people's movements in this way, we can efficiently locate facilities that can be used to store and distribute aid materials." Prof. Okumura also cooperates with IRIDeS professors that deal with information to discover methods for analyzing information. "When our research is finalized, we will be able to discover new ways for handling disasters. We are only half of the way there, but have high expectations for the future."

Various experiences in daily life cultivate the ability to survive disasters

We now have a "convenient" society where the development in distribution channels and increase in distributors enables us to receive items with a single click. On the other hand, people are losing required skills such as how to effectively sort materials. "Some disaster areas were able to effectively distribute materials by receiving the cooperation of distributors, etc. However in recent years, the warehouses of companies that perform delivery have become more mechanized, and there are less opportunities for people to manually sort goods. Although this makes things convenient, it is possible that even such distributors will lose the required management skills."

To cultivate the ability to survive a disaster, it is necessary for people to increase the things they can do under their own power. Prof. Okumura believes that placing importance on regional cultural activities is essential. "For example, arranging sites, setting up shops, and carrying portable shrines during local festivals. I think this kind of fun regional activity actually cultivates extremely useful skills."

Regional cultural activities enable us to cultivate the ability of dealing with disasters without us even realizing so. Conducting such activities may be the first step towards gaining the ability to survive a disaster.

Feature 3

Non-destructive radiation measuring instrument that can inspect whole products

"Needs are always found locally.
Research from the perspective of citizens is important."

●Non-destructive radioactive contamination inspection device

The non-destructive radioactive contamination inspection device located in the monitoring center. The device has been designed to be easy to use by citizens without specialized knowledge, with a simple measurement procedure that enables the whole target product to be measured.

Professor
Keizo Ishii

Regional and Urban Reconstruction Research Division Radiational Decontamination Science

Specializes in radiation engineering and the application of radiation in medicine and environmental conservation. After graduating from the Graduate School of Science at Tohoku University, received an internship at the CNRS Orleans Cyclotron Center as an international student funded by the French government, worked as an assistant and an assistant professor at the Tohoku University Cyclotron RI Center, and then became a professor at the Tohoku University School of Engineering in 1995. Currently a research professor at Tohoku University since 2013.

A measuring instrument developed for food security and reassurance

Radioactive materials spread over a wide area in the South Tohoku region and North Kanto region due to the accident at the Fukushima Daiichi Nuclear Power Station operated by Tokyo Electric Power Company. Even three years after the accident, high concentrations of radioactive materials are sometimes detected in some agricultural and marine products.
A radiation measuring instrument inspects the concentration of radioactive materials included in the products. Conventional measuring instruments require part of the target product to be extracted and chopped up into a mince for inspection. Therefore, the food products that are actually eaten have not been inspected for contamination and we were unable to directly gain ease of mind regarding food.

Prof. Ishii explains that "to provide safe and reassuring food and prevent harmful rumors, it is necessary to sample all or an extremely large number of products." The non-destructive radiation contamination measuring device was developed for this purpose. It enables a large volume of samples to be inspected for contamination since the concentration of radioactive materials can be measured simply by placing whole products in the measuring instrument and measurements can be taken in a small amount of time. It also enables us to avoid wasting food for inspection.

Device brushed up based on requests from disaster areas

Experiments showed that there was almost no difference between the results of this device and the conventional measuring instruments. In January 2013, the first non-destructive radioactive contamination inspection device was installed at the monitoring center for citizens of Fukushima. At first it was only used by about 5 people every day, but by March, it was used by more than 40 people a day. The number of users continued to increase, with more than 2,000 people using the device by September 2013. The devices are now installed in 10 locations over Fukushima city.

"First of all, meeting user needs is important. Then we can brush up the technology and devices." He also developed a continuous individual non-destructive radioactive contamination inspection device that uses a conveyor belt system, based on a request from local government. With a conveyor belt system products can be efficiently measured. For example, approximately 900 fish can be inspected in an hour. Four devices have also been installed in places such as Marumori and the port of Ishinomaki city in Miyagi prefecture. Currently under development is a whole body counter that can measure the internal exposure of infants. This was based on requests from parents in Fukushima.

Effectively utilizing joint research with other fields in disaster areas

Prof. Ishii specializes in radiation engineering. He has placed emphasis on developing radiological devices, etc in conjunction with medical fields. Tohoku University leads national universities in developing PET, a device for detecting cancer. "I have actively conducted various kinds of joint research such as that relating to environmental pollution and bioscience. Just by chance, I had acquired all knowledge that would be required for developing radiation measuring instrument. After the nuclear accident, I thought I must utilize this knowledge."

In addition to the non-destructive radioactive contamination inspection device, Prof. Ishii also develops things such as wireless air dose rate monitoring systems. Many devices are developed in conjunction with small and medium sized companies operating in the disaster prefectures. "By collaborating local small and medium sized companies we can make measuring instruments at about one third the price of those from major manufacturers. Since a small amount of the revenue returns to the company, it helps out both the company and local government, which can aid regional recovery." With his agility and technical ability to respond to constantly respond to changing needs, the efforts of Prof. Ishii will continue.

Feature 4

The key to "better recovery" lies in the strength of local communities

"Researching the process for rebuilding communities for faster and better reconstruction."

●Surveying the Niigata Prefecture Chuetsu Earthquake

1) Landslides caused the flow of rivers to change, and housing in the yamakoshi-kogomo region of Nagaoka city were buried by earth and sand. 2) Public housing in yamakosh-itakezawa region of Nagaoka city, which is made by Japanese cedar in the prefecture and considered to fit in the landscape of the area. 3) A rock that was split during the earthquake was named the "protection rock" from the desire for it to protect those returning to their hometown.

Associate professor
Kanako Iuchi

Human and Social Response Research Division

Specializes in urban planning and policy, disaster management plans, international development, and community development. After graduating from the College of Policy and Planning Sciences at the University of Tsukuba, worked at a consulting company. Holds her master's degree from the Department of City and Regional Planning of Cornell University, completed her doctor's degree from the Department of Urban & Regional Planning at the University of Illinois at Urbana-Champaign. Worked at the Department of finance, economy, and urban development at the World Bank, before taking her current position.

Realizing the importance of community in implementing plans

Three years after the earthquake and tsunami, reconstruction is entering a new phase. There is clear regional variation with some areas recovering quickly, while others are not recovering as quickly as expected. But all regions aim for the same thing, which is "good recovery." So what is "good recovery?" Prof. Iuchi researches this from the perspective of international government policies and planning processes.

Prof. Iuchi used to work in a development consulting company. "I shared the knowledge regarding disaster prevention found in Japan to help countries formulate disaster prevention policies and plans, and provide advice. However, no matter how good the policy is, it is meaningless unless it is implemented in the context of the region. It was a challenge to figure out how to deliver plan that could be executed by the people living in the region."

She says at that time she realized the strength of traditional communities in Japan. "In Japan, communities have the mechanisms and strength to function with a sense of ownership. For example, when building a community center, local residents use various methods to share information. They have the ability to include opinions that arise in plans and implement them. Such processes are extremely important in the reconstruction stage."

Characteristics of the community affect the quality of recovery

"However, although these mechanisms functioned effectively in some areas after the Great East Japan Earthquake, they did not function well in others," says Prof. Iuchi. After the earthquake, she periodically visited the Kesennuma area to survey how plans and decisions about issues such as collective relocation are implemented, by conducting interviews and fieldwork.

"Generally disasters bring various underlying problems of the region to the surface." For example, the Sanriku region was already facing a decline in population before the earthquake, and after the earthquake that issue became evident. The same applies to communities. Communities that already featured lively communication saw positive discussions regarding construction after the earthquake."

Prof. Iuchi conducted field work for three years in Niigata Prefecture after the Chuetsu Earthquake. She researched the difference between communities that remained during the reconstruction process and those that shrunk. "The key to that difference was the satisfaction that residents felt towards their community before the earthquake occurred. The existing strength and lifestyle satisfaction of the community played a greater role, rather than systems such as funding."

Reconstruction lead by residents tends to long-term satisfaction

Another thing that became evident was that it was important to have residents making their own decisions regarding the direction of reconstruction. "Where government and planners took initiatives to perform relocation work, local residents were not always happy with the results. On the other hand, in areas that took time to discuss relocation issues with the residents, they were highly satisfied after reconstruction, even if they were anxious about their future in evacuation period. Regions where the residents themselves made decisions had a tendency to think about things in the future positively."

The reconstruction plans for the Great East Japan Earthquake are mainly led by government, because of the need for controlling land use and the constructing seawalls due to the risk of tsunamis. "When the plans were first formulated, some plans did not take the characteristics of the region and regional lifestyles into account. That caused various problems to occur when implementing the plans." Prof. Iuchi believes that in the future, systems that place importance on the characteristics and needs of the community at an early stage will be invaluable. "Analyzing and sharing recommendations to society on the issues currently faced by affected areas is important for faster and better recovery in future events. I will continue to conduct long-term recovery research."

News & Topics

The newest result of research etc.

Research Result 1

Performing a detailed analysis of damage caused to marine vessels based on 20,000 vessels hit by the tsunami

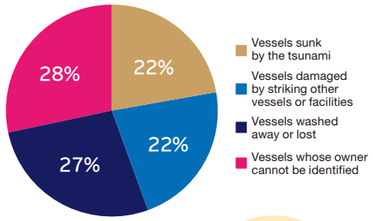
Researching marine vessel damage during a tsunami disaster to protect a valuable asset

Prof. Anawat Suppasri of the Endowed Research Division released a new paper called “Loss functions for small marine vessels based on survey data and numerical simulation of the 2011 Great East Japan tsunami” at the American Society of Civil Engineers (ASCE).

This paper used the surveyed damage to marine vessels caused by the tsunami of the earthquake in 2011. First, the surveyed data is combined with the results from tsunami simulation analysis. Since it is predicted that damage to marine vessels is closely related to the flow velocity of the tsunami, the tsunami height and flow velocity information was applied to the surveyed data. Then information received from an insurance company was used to analyze the damage received by vessels in each area. The survey was conducted on approximately 20,000 vessels. This was the largest survey of damage to marine vessels in Japan. As a result of the analysis, it was found that in areas reached by a tsunami of 5 m or higher, most vessels were completely destroyed. It was also found that in Miyagi, Iwate, and Fukushima, close to the epicenter, and in Aomori, Ibaraki, and Chiba, relatively far away from the epicenter, more damage was caused in areas closer to the epicenter, even when the height of the tsunami was equivalent. This proved that the flow velocity of the tsunami is an important parameter to explain the damage to marine vessels.

Prof. Suppasri says that “Fishing boats are a valuable asset. In the future I want to perform detailed analysis that is divided into smaller areas. I want to also understand the problem of marine vessel evacuation to discover when and where marine vessels should be evacuated during a disaster.” His future research will be the subject of attention.

●Damage to marine vessels



Associate professor
Anawat Suppasri
Earthquake induced Tsunami Risk Evaluation (Tokio Marine & Nichido) Endowed Research Division

Suppasri, A., Muhari, A., Futami, T., Imamura, F. and Shuto, N. (2013) Loss functions for small marine vessels based on survey data and numerical simulation of the 2011 Great East Japan tsunami. *Journal of Waterway, Port, Coastal and Ocean Engineering (ASCE)* 04014018-1～10.

Research Result 2

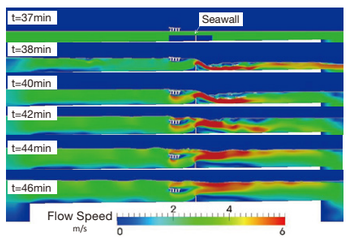
Analysis of damage to the Utatsu Bridge shows the tsunami exerted lift and overturning forces on the bridge decks

Analyzing the status of the bridge during the earthquake from the perspective of hydraulic engineering

Prof. Jeremy Bricker of Technology for Global Disaster Risk at the Hazard and Risk Evaluation Research Division published a paper that analyzed damage to the Utatsu bridge from the perspective of hydraulic engineering. The Utatsu bridge is a 304 m bridge spanning the bay of Minamisanriku in Miyagi prefecture. The bridge was washed away by the tsunami of the Great East Japan Earthquake, leaving only the bridge supports. Prof. Bricker explained that “Since the entire bridge was swallowed up by the tsunami, it was necessary to analyze the reason the bridge was destroyed from the perspective of hydraulic engineering, not only from a structural perspective.” As a result of the research, it was found that the bridge was not destroyed because of the shock from the wave, but because of the lift caused by difference in water pressure. "Flow speed was faster above the bridge than below it. Via the Bernoulli equation, faster flow results in lower pressure. This generated a lift force on the bridge, which caused it to rise up off its piers."

The paper states that three factors caused the lift. The first was the difference in flow velocity at the top and bottom of the bridge caused by the embankment on the inland side. The second was that the bridge was superelevated upward toward the ocean due to a curve in the highway. The third factor was that the bridge had a space below it where air was trapped. "If any one of these three factors had been absent, the bridge decks would not have lifted off their piers. I hope these results are applied to future bridge construction in tsunami-prone areas." This information is expected to be adapted to recovery work.

●Flow speed near the Utatsu Bridge



Associate professor
Jeremy Bricker
Hazard and Risk Evaluation Research Division Technology for Global Disaster Risk

Bricker, J.D., and Nakayama. A. (2014) Contribution of Trapped Air, Deck Superelevation, and Nearby Structures to Bridge Deck Failure During a Tsunami. *Journal of Hydraulic Engineering (ASCE)*, 05014002-1～7.

Research Result 3

Annual traditions of a fishing village lost in the tsunami published in a booklet

Fieldwork spanning 30 years in the Kogoshio area of Kesennuma City

In March this year, Prof. Kawashima whose field is Japanese Disaster Culture published the “Annual Traditions of Kogoshio Ninya.” The Kogoshio area was a small fishing village in Kesennuma City. Prof. Kawashima, who was born in Kesennuma City, visited a family in the Kogoshio area called Ninya frequently since 1983 to record its annual traditions. “They had more than 20 days in the year where specific things were eaten on specific days, and something was placed on their household altar. For a family that relies on sardine fishing for their livelihood, superstitions are very important. Concepts such as ‘hare’, ‘ke’, and ‘kegare’ remained deeply rooted in their family.”

The earthquake caused destruction to the Kogoshio area. The main Ninya family home was swallowed up by the tsunami, and the head of the family lost his life. Prof. Kawashima also lost his home, but luckily the negatives and records he had taken of the traditions remained, and with them he was able to create this book. “The village called Kogoshio disappeared before my eyes, and with it culture that had been passed down over generations. I thought that maybe the reason I had visited this place for 30 years was to create this record. However, I do not think that this record should be used to revive the annual traditions. This is because lifestyles change with the necessity of the times. I hope that it can help us think about how people that lived together with the sea faced nature via their annual traditions.” Prof. Kawashima emphasizes that protecting communities means protecting the lifestyle culture of their regions. This is something that we cannot forget when reconstructing communities.

Left: Booklet (Memory of a Village) 1: “The Annual Traditions of Kogoshio Ninya”Edited and published by the Tohoku Culture Research Center of the Tohoku University of Art and Design
Top right: The Kogoshio area that was hit by the tsunami. Photo taken in late April, 2011. Bottom right: Eishichi Ogata of the “Ninya,” who provided information regarding the relationship between people and the sea

Professor
Shuichi Kawashima
Human and Social Response Research Division Japanese Disaster Culture

Research Result 4

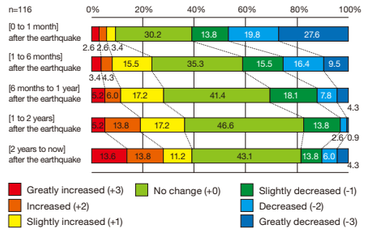
Fundamental researchers in the field of medicine surveyed to analyze changes in motivation during the disaster

It was found that the majority of fundamental researchers felt their motivation declined after the earthquake

Fundamental researchers in the field of medicine study the mechanisms behind diseases using human cells. This is an important field that supports medicine, and is also a competitive one. In February of this year, lecturer Miki of Disaster Obstetrics and Gynecology conducted a survey on how the Great East Japan Earthquake affected the motivation of researchers. Lecturer Miki says that the reason for conducting the survey was hearing a pro baseball player asking himself “Is it OK to play baseball at a time like this?” immediately after the earthquake. “I noticed that people of various occupations were questioning what they were doing, which got me thinking. What about other researchers? Maybe some of my colleagues feel the same?”

As a result of the survey, he found that 37.5% of fundamental researchers actually felt that they wanted to quit their research after the earthquake. 61.2% of researchers felt their motivation declined immediately after the earthquake, and 24.1% still feel that their motivation has declined. "We found that many fundamental researchers were wondering why they were doing their research. In the future, we will obtain statistics about how differences such as age, position, and gender affect motivation, and use this to provide mental care for fundamental researchers.” says lecturer Miki. This was the first research in Japan to focus on the psychology of fundamental researchers. We can expect further analysis.

●Survey Regarding Research Motivation



Target: Users registered in Tohoku University EAST (the medical science information system)
Respondents: 131 people
Analysis performed on: 116 anonymous people

Lecturer
Yasuhiro Miki
Disaster Medical Science Research Division Disaster Obstetrics and Gynecology