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 Ishinogahama. 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 other, 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 disasters. Public nurses of the affected community along with Prof. Tomita has been holding the “Dan-Dan Conversation Salon” in temporary housing since September 2011.

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.

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; 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 Kesennuma Satellite can play a role in connecting the researchers of IRiDeS with local citizens.”

*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.
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 to 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.

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 occurrences, 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 2015.

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.

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 restoration technologies, etc.

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.

Introduction

“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 “Kakeageare! Japan” evacuation training. We aim to have evacuation training that residents can voluntarily participate in. Having people think about detailed actions such as what 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 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 Sismological 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.
Talking about how to face the radiation problem

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, accident, I was researching radiation exposure at medical sites.

Prof. Satoshi Tadokoro (Prof. Tadokoro): I think it is a rare case to find something like this. Few elementary school children have knowledge of radiation, so I was trying to share knowledge to elementary school children.

Prof. Yusuke Suzuki (Prof. Suzuki): My specialty is concrete engineering. When the earthquake occurred, I thought about what concrete can be used for. I was trying to research into the physical properties of concrete to use it as shielding material.

Prof. Satoshi Tadokoro (Prof. Tadokoro): I also didn’t know the first thing about radiation before the earthquake. I was creating rescue robots for nuclear reactors.

Prof. Koichi Chida (Prof. Chida): I want to organize robots for measuring concentrations in areas where humans cannot enter. We need to establish a device that can maintain its performance even in radiation.

Prof. Makoto Okumura (Prof. Okumura): 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.

Prof. Koichi Chida (Prof. Chida): I want to think more about how we can spread correct knowledge to citizens. We want to continue research in various fields in the future. (Prof. Okumura)
35. 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 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 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 tsunami 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 widen the calculation process and results of this simulation to assist future tsunami research in Japan and over the world."

36. 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 lifted until 6:00 PM. Since the evacuation lasts for 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 tsunami waves 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 analyzed the scope of our shared work, so that we can continue to provide useful information to save lives and contribute to science."
Non-destructive radiation measuring instrument that can inspect whole products

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

Professor Keizo Ishii
Regional and Urban Development Research Division
Tohoku University-CNRS International Research Institute

Specializes in radiation engineering and the application of radiation in medicine and environmental conservation. After graduating from the Department of Engineering at Tohoku University, he served at the CRM Cyclotron Center as an international student funded by the French government, worked as an assistant and an associate professor at Tohoku University Cyclotron II Center, and is currently a professor at the Tohoku University Graduate School of Engineering. He has received the position of “Professor” from the University of Rouen, France. He was awarded the Prize for Science and Engineering Research at the University of Rouen in 2014.

A measuring instrument developed for food security and reassociation

Radioactive materials spread over a wide area in the South Tohoku region, and North Kanto region due to the accident at the Fukushima Daichi 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 minute for inspection. Therefore, the food products that are actually eaten have not been inspected for contamination and we were unable to directly gain insight into mind regarding food.

Ishi 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 installed at the monitoring center for citizens of Fukushima. At first it was only inspected 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 on the technology and devices.” He also developed a continuous individual non-destructive radiation 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 internal exposure of infants. This was based on requests from parents in Fukushima.

Non-destructive radiative contamination inspection device

The non-destructive radiative contamination inspection device is installed in the monitoring center. The device has been designed to be easy to use by citizens without specialized knowledge, with a simple button press to work. After the device has been turned on, the red LED on the top of the device will light up. The red LED means that the device is working properly. Blue LED means the device is operating. The green LED means the device is ready to be used. The device can measure any food product to be measured.

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 radiative contamination inspection device was installed at the monitoring center for citizens of Fukushima. At first it was only inspected 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.

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Effectively utilizing joint research with other fields in disaster areas

Prof. Ishi 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 detecting cancer. “I have actively conducted various kinds of joint research such as that relating to environmental pollution and biosciences. Just by chance, I had acquired all the 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 radiative contamination inspection device, Prof. Ishi 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 three times of the price that were reluctant for large 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 development.” With his ability and technical ability to respond to constantly changing social needs, the efforts of Prof. Ishi will continue.

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. such researches this from the perspective of international government policies and planning processes.

Prof. Ishi 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 a plan that could be executed by the people living in the region.”

She says that 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 planning stages, and to 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. Ishi. 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 Sarrikou 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 earth- quake.”

Prof. Ishi conducted field work for three years in Niigata Prefecture after the Chettsu Earthquake. She researched the difference between communities that 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 structure. “When the plans were first formulated, some plans did not take the characteristics of the region and regional issues into account. That caused various problems to occur when implementing the plans.”

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 deal with relocation issues with the resi- dents, they were highly satisfied after reconstruction, even if they were anxious during the evacuation period. Regions where the residents themselves were active in regional reconstruction issues was a good recovery.”

The reconstruction lead by residents tends to long-term satisfaction

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Reconstruction lead by residents tends to long-term satisfaction
Performing a detailed analysis of damage caused to marine vessels based on 20,000 vessels hit by the tsunami

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

Fieldworkspanning30yearsintheKogoshioareaofKesennumaCity
In March this year, Prof. Kawashima whose field is Japanese Disaster Culture published the "Annual Traditions of Kogoshi Ninja". The Kogoshi area was a small fishing village in Kesennuma City. Prof. Kawashima, who was born in Kesennuma City, visited a family in the Kogoshi area called Ninja 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', 'kai', and 'kagare' remained deeply rooted in their family." The earthquake caused destruction to the Kogoshi area. The main Ninja 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 Kogoshi disappeared before my eyes, and with it culture that had been passed down over generations. I thought that maybe 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 revise 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 reconstruciting communities.

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