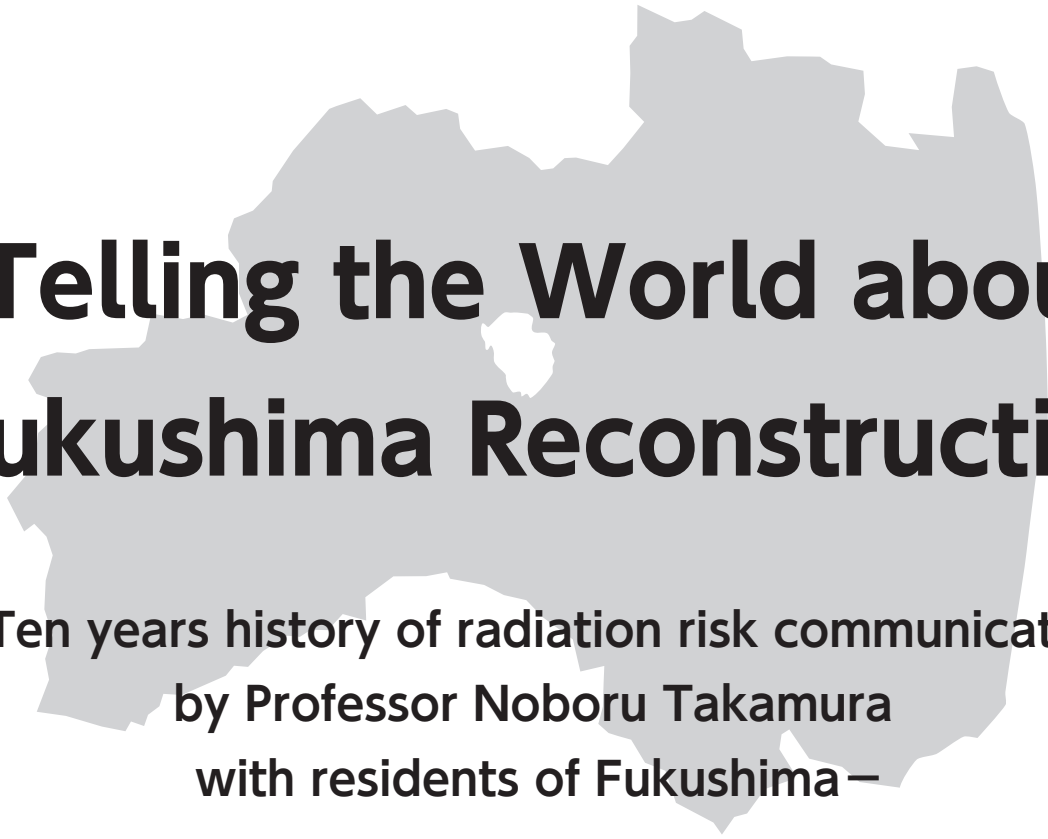

Telling the World about Fukushima Reconstruction

－Ten years history of radiation risk communication by Professor Noboru Takamura with residents of Fukushima－

Interview with Professor Noboru Takamura of Nagasaki University who continued to respond to the anxieties of local residents after the accident at the Fukushima Daiichi Nuclear Power Station

Japan Atomic Energy Relations Organaization
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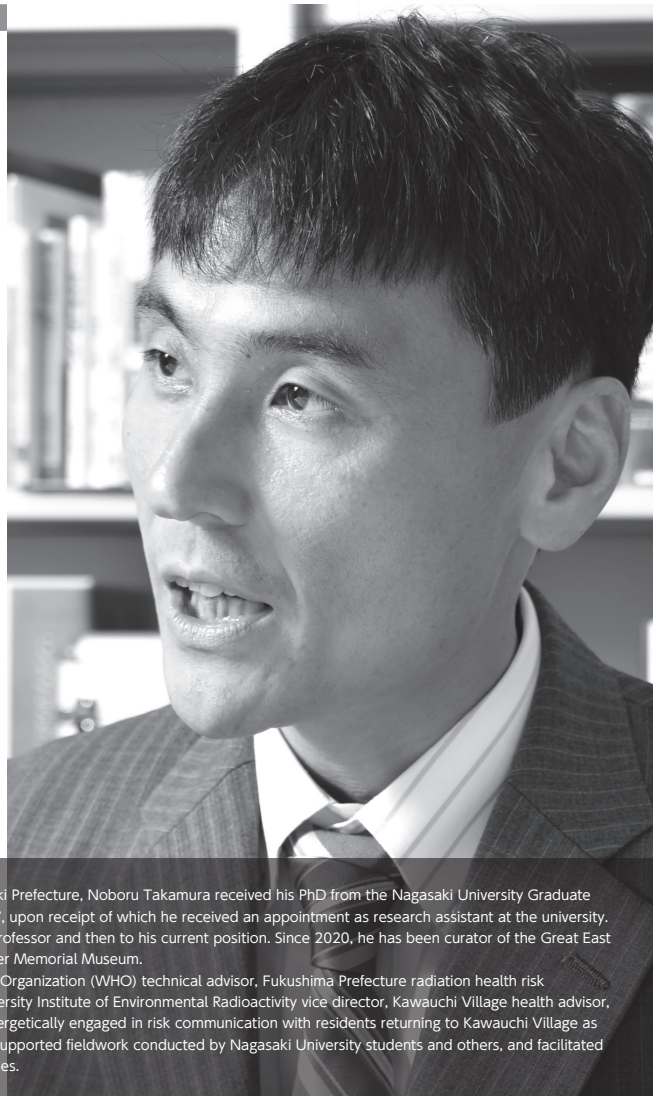
Telling the World about Fukushima's Recovery

— Building a Knowledge Exchange Hub —

Professor Noboru Takamura of the Atomic Bomb Disease Institute at Nagasaki University traveled to Fukushima one week after the accident occurred at Fukushima Daiichi Nuclear Power Station. He says that today 10 years after the 2011 accident, the people of Fukushima have a better understanding of radiation than anyone else. He discussed with us how Fukushima has recovered over the past decade. (Interviewer: Editorial Department)



Noboru Takamura
Professor, Department of Global Health, Medicine and Welfare
Atomic Bomb Disease Institute, Nagasaki University
Curator of the Great East Japan Earthquake and Nuclear Disaster Memorial Museum

Originally from Nagasaki City, Nagasaki Prefecture, Noboru Takamura received his PhD from the Nagasaki University Graduate School of Biomedical Sciences in 1997, upon receipt of which he received an appointment as research assistant at the university. He was later promoted to associate professor and then to his current position. Since 2020, he has been curator of the Great East Japan Earthquake and Nuclear Disaster Memorial Museum.
He has also served as a World Health Organization (WHO) technical advisor, Fukushima Prefecture radiation health risk management advisor, Fukushima University Institute of Environmental Radioactivity vice director, Kawauchi Village health advisor, and in other positions. He has also energetically engaged in risk communication with residents returning to Kawauchi Village as well as Tomioka and Okuma Towns, supported fieldwork conducted by Nagasaki University students and others, and facilitated other reconstruction assistance activities.

—— It has been 10 years since the Great East Japan Earthquake and Tsunami. What significant changes have taken place during this decade?

Takamura The accident occurred at TEPCO's Fukushima Daiichi Nuclear Power Station after the Great East Japan Earthquake and Tsunami struck on March 11, 2011.
I went to Fukushima a week after the accident. In my position as radiation health risk management advisor to the prefecture, I traveled around Fukushima Prefecture, giving lectures to explain radiation and health risks to residents.
At that time, many residents didn't know about radiation. There was almost no one either who knew what radiation exposure was, much less the health effects. Many of the people who came to these lectures were in a state of panic and posed all sorts of questions.
Ten years have passed since that sudden accident in circumstances which residents didn't know much at all about such matters. Over the past decade, many residents have had no choice but to evacuate.

Meanwhile, as many were striving to improve conditions at the power station in an attempt to bring the accident to a resolution, decontamination was started.

—— It has not been due to just decontamination, but the radioactive materials released during the accident have attenuated with the passage of time, haven't they?

Takamura After decontamination finished, residents began to return from the places where they had evacuated.

While residents in some communities have already returned, there are some communities where limited number of residents, or no residents have returned.

During these 10 years, Fukushima has done many things which was never tried anywhere in the world. I believe that the people of Fukushima today are perhaps more knowledgeable about radiation than any other group of people in the world. The situation has changed dramatically.

When you go to Kawauchi Village(★1) in Fukushima Prefecture for example, you can see that daily life has almost returned to normal.

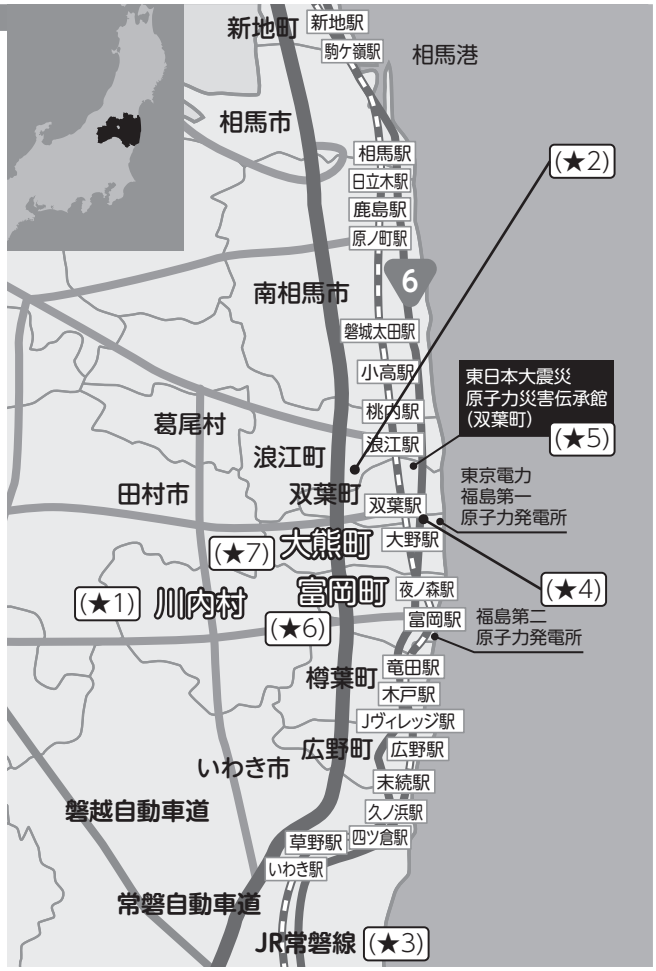
Whereas in Futaba Town(★2) where the Great East Japan Earthquake and Nuclear Disaster Memorial Museum, is located, none of the residents have returned yet. I've felt that each communities has reached different phases of recovery process within these 10 years. You can see those differences very clearly when you drive from Kawauchi Village to Futaba Town.

—— **The entire Joban Line(★3) was opened last year and I think the infrastructure is in place, but people haven't returned to Futaba Town, have they?**

Takamura In Futaba Town, the new Nakano Restoration Road from JR Futaba Station(★4) to the Memorial Museum(★5) has been completed. Evacuation orders for the surrounding areas have been more or less lifted, but people are not allowed back to thier houses.

If you go to Kawauchi Village, 80% of the population has returned. Rice paddy are filled with water and farmers are growing rice. However, if you go to neighboring Tomioka Town(★6) , very few farms are growing rice and solar power generation panels have been installed instead at many sites.

What's more, if you go to Okuma(★7) or Futaba Town, grass is growing pretty much anywhere and there are many places where it is also difficult to tell whether it was originally a rice paddy or not. Just looking at such differences, you can see very well that communities are in different phases of recovery.

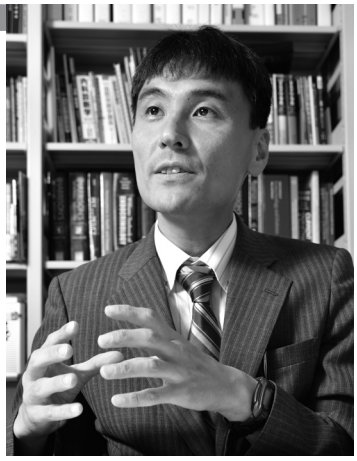


—— **How many people visit the Great East Japan Earthquake and Nuclear Disaster Memorial Museum in Futaba Town?**

Takamura **The Museum opened on September 20, 2020 last year and has seen more than 34,000 visitors as of the end of March 2021.** The number of visitors decreased in February because of the state-of-emergency declaration due to COVID-19. However, before that, students from high schools and junior high school in particular in Fukushima Prefecture used to visit the museum as part of their studies. We have had many more visitors than we had expected.

—— **What sort of impression do high school and junior high school students get from touring the museum?**

Takamura Well, it has been 10 years since the accident, so students, who are today 15 years old and in their third year of junior high, were five years old at the time of the accident, and those in sixth grade of elementary school now were two years old then. This younger generation does not have much



memory of the accident. Students in their third year of high school now were elementary school students at the time, so they might recall some. However, the future will bring more and more generations that know nothing about the accident.

I hope that younger generations of Fukushima prefecture,who don't have any memory of the disaster,would learn more about the hardships that older generations, such as their parents', went through during the disaster and the path that they have taken toward recovery.

The experience of Chernobyl has had a tremendous impact on the response to the accident in Fukushima.

—— **The Museum was also established to preserve records as well as memories, wasn't it?**
Professor Takamura, you have also done research on the accident that occurred at the Chernobyl Nuclear Power Plant in the former Soviet Union. How would you compare 10 years after the Fukushima accident to 10 years after the Chernobyl accident?

Takamura The difference between Chernobyl and Fukushima 10 years after each of these accidents is that, in 1986 when the Chernobyl accident happened, the surrounding area was part of the Soviet Union. Soon after that, in the early 1990s, the Soviet Union collapsed and its dissolution led to 15 independent countries. That same area around Chernobyl, which used to all be part of the Soviet Union, was divided into three countries: Ukraine where the power plant is located, the Republic of Belarus which was severely impacted by radioactive contamination, and the Russian Federation.

Later, these independent nations were hit by economic crisis. The accidents occurred, the union dissolved, countries became independent, and then an economic crisis arose.

The countries stricken by the Chernobyl disaster were affected not only by the accident, but these sorts of diverse turbulent changes as well. This was also, I believe, a distinguishing feature of the Chernobyl accident.

I have vivid memories of traveling to countries around Chernobyl at that time, which were struggling with inflation and rapidly-changing values of their currencies. Under such circumstances, incidences of thyroid cancer were on the rise due to radiation exposure and economic turmoil worsened. These countries were unable to sufficiently provide diagnosis and treatment on their own for those afflicted. I think that is ultimately the biggest difference between Chernobyl and Fukushima.

—— **I think the experience gained from the Chernobyl accident was also helpful during the Fukushima Daiichi accident. Restrictions were instituted so that, among other limitations, people wouldn' t drink milk and all bags of rice would be inspected.**

Takamura I believe that the Chernobyl experience has had a tremendous effect on how we responded to the accident at Fukushima Daiichi Nuclear Power Station.

At Chernobyl, the accident released radioactive iodine into the environment, contaminating food and particularly milk which was ingested by children, leading to radioactive iodine being absorbed by the thyroid and thus internal exposure.

When the Fukushima accident occurred, provisional standards were issued for radioactive iodine immediately after the accident based upon that experience at Chernobyl. Restrictions were placed upon food intake and distribution to reduce internal exposure. This was a very significant.

—— **After the Chernobyl accident, the Soviet Union collapsed. Does that mean that residents had no opportunities to be briefed as was done for Fukushima?**

Takamura Immediately after the accident, there were unfortunately no explanations by experts to residents.

In 1990, four years after the accident occurred, my mentor Dr. Shigenobu Nagataki made his first trip to Chernobyl. He also went to Gomel in Belarus where the worst radioactive contamination had been suffered. He stated later that the residents had not been told anything at all, so they were very worried about radiation. So, the situation was probably a little different from Fukushima.

In the early days after the accident, there would be many questions from the audience after my lectures.

—— Professor Takamura, you have been very close to the people of Fukushima since the early days after the accident. What were some of the things that you struggled to explain about the effects of radiation?

Takamura When I give lectures to students at universities, I use prints or slides or show them other materials to explain what I am talking about.

However, at that time, there were no projectors set up in halls for me to use when I gave my lecture nor did I bring any slides with me when I went to Fukushima, so I had to give those explanations using just my hands and words without any prints or slides.

Moreover, radiation is invisible and silent. I had to explain using just words this invisible radiation. It was my first time to have such experience. At first, I wondered how I was going to do this.

—— Without any devices or equipment, how did you give your explanations?

Takamura I decided on five things that I wanted to talk about and tried to explain those in order.

For example, I would first explain the difference between radiation, radioactive materials and radioactivity, in other words what sieverts, becquerels, and other units of measure mean.

Also, the term “internal exposure” was receiving a lot of attention at the time and many people were afraid of it, so I would explain what internal and external exposure are and how internal exposure can be minimized. I would explain these using examples from Chernobyl as well as the Nagasaki and Hiroshima atomic bombings.

Then, I would also explain how radiation affects health. Although radiation damages genes, they are often soon repaired.

However, in cases where individuals are subjected to comparatively high doses, more specifically doses above 100 mSv, the damaged gene might undergo a rare but erroneous repair, which poses a risk of cancer in the future. Nevertheless, it was difficult to imagine that the external and internal exposure doses to which Fukushima residents were exposed at the time would have a damaging effect on their health, so I also explained that.

—— How long did you continue to give these talks to residents?

Takamura Beginning in March 2011 through that summer, I lectured quite frequently. In the early days after the accident, I would talk for 30 or 40 minutes and then there would be lots of questions from the audience after that. On occasions when there were a lot of questions, the lectures would take more than an hour. Sometimes people posed questions for an

●Tomioka Town resident receiving an explanation about measuring radioactive materials in food (Courtesy of Nagasaki University)

●Tomioka Town junior high school students touring the Tomioka Town Office Food Inspection Center (Courtesy of Nagasaki University)

hour and a half or even two hours. Naturally, there were things that people didn't understand just from my talk, so I did my best to answer all questions down to the last one.

—— What were the most common sort of questions?

Takamura What people were most worried about was the effect on children's health. During the early days, people would read online or hear about children being more susceptible to the effects of radiation, so they would ask questions such as whether their children would be all right or would their daughter be able to give birth safely.

There were also many questions about whether it would be okay to stay in Fukushima in the first place. Many people had voluntarily evacuated Fukushima, so there were also a lot of people worried about whether they would be all right if they didn't evacuate. There were also many questions about whether it was okay to go outside, whether laundry could be hung outside to dry, and other questions about exposure in daily life.

—— So, you answered each and every one of these questions, didn't you?

What sort of work is being carried out at the Reconstruction Promotion Base in Kawauchi Village?

Takamura Beginning at quite an early stage after the accident, I started thinking about how we could use the Chernobyl experience to help the Fukushima recover after the nuclear accident. So, in 2011, we began offering assistance in Kawauchi Village, which was the first municipality to allow people to return. Then, in 2013, we established the Kawauchi Village Reconstruction Promotion Base at Nagasaki University and later set up similar bases in Tomioka Town in 2017 and Okuma Town(★7) in 2020 to offer reconstruction assistance.

More specifically, we have been able to properly ascertain the doses to which residents are exposed. We have done this for external exposure as well as internal exposure. With a good understanding of these levels, we offer consultations to residents about radiation.

Initially, Makiko Orita, a public health nurse at Nagasaki University, was stationed at Kawauchi Village for three years where she provided consultations about radiation during her rounds with village residents. Now, rather than permanently stationing someone there, we have several people serving in rotations during they go around Kawauchi Village, Tomioka Town, and Okuma Town, measuring exposure doses and engaging in risk communication with residents.

—— It has been 10 years since the accident and the degree to which communities have recovered varies. What does Fukushima need for the future?

Takamura Recovery phases vary considerably depending upon the community. Based on an understanding of that, I think the most important thing is to offer support that aligns with the community's needs.

I think what should be done first is to create an environment so that the people who have returned to the community are glad they did and to empathize with the anxiety that people feel.

For people who have returned, radiation dose around their home needs to first be measured. In many cases, we also loan out personal dosimeters and explain to people that this is approximately the dose that they are exposed to over the period of a year. However, this level is equivalent to the dose that people receive from a certain number of chest x-rays and will not affect their health. This is the kind

of environment that should be created. Also, we need to periodically engage in risk communication on a small scale with people to answer their concerns. I think this is probably the first step that needs to be taken.

The next thing to do is approach those who are agonizing over whether to return or not. For example, we contact people who have evacuated from either Tomioka or Okuma Town to provide consultations. These kinds of initiatives need to be given priority.

(Courtesy of Nagasaki University)

●Student enrolled in the Faculty of Education at Nagasaki University conducting a class for Kawauchi village Elementary school sixth-graders.

Another important thing is to connect with the younger generation. I think it is very important to do this as they hold the keys to Fukushima's future. At Nagasaki University, we have been offering radiation education to elementary school students from Kawauchi Village as well as opportunities to learn about the process of recovery, such as how Nagasaki recovered from the atomic bombing. In Tomioka Town as well, we have conducted classes for junior high school students. I think it is very important also that the generation who will lead the region's development in the future have correct knowledge about radiation.

—— Are Nagasaki University students also serving as instructors?

Takamura It is mainly students from the Faculty of Education at Nagasaki University who have taken the lead. They intend to be school teachers in the future, so they are probably much better at teaching children than I am.
The Faculty of Education students actually go to Kawauchi Village, visit schools, and conduct classes. Students from Kawauchi Village also take advantage of summer break to come to Nagasaki where they work in the lab and take classes at Nagasaki University. We conduct these classes with the full cooperation of Kawauchi Village.

We are trying to do our best so that, hopefully, children from Kawauchi Village will enroll and study at Nagasaki University someday.

At the university, my specialty is radiation medical science and professors from several other schools and faculties have also been cooperating with this effort.

After the accident at the Fukushima Daiichi Nuclear Power Station, the Research and Support Center for the Future of Fukushima was created at Nagasaki University. It is not only radiation experts that are working there, but Faculty of Education professors have also extended their cooperation to help educate children and Faculty of Environmental Science professors have been active addressing environmental issues. Instructors from a variety of schools and faculties, such as the School of Health Sciences and the School of Engineering, have organized and been actively engaged in supporting Fukushima. The creation of this organization, which transcends schools and faculties, has made it possible to carry out the projects that we do.

(Courtesy of The Great Esat Japan Earthquake and Nuclear Disaster Memorial Museum)

●Many people visit The Great East Japan Earthquake and Nuclear Disaster Memorial Museum

—— What sort of projects are there?

Takamura For example, there are many elderly people who have now returned to Kawauchi Village. The percentage of senior citizens has risen dramatically, so we decided to provide assistance for the elderly. Professors from the School of Dentistry have visited Kawauchi Village to offer assistance with oral and swallowing functions, and they have implemented initiatives to provide oral healthcare as well as maintain the oral health of children that have returned. Professors from a range of specializations are providing assistance to Fukushima.

Fukushima reconstruction efforts are important lessons not only for Japan but for the world

—— Professor Takamura, you have also said that human resource development is necessary.

Takamura I believe that the efforts to reconstruct Fukushima over these past 10 years offer very important lessons for Japan, but also for the world. Of course, we should never allow an accident such as that at Fukushima Daiichi to happen again, but we will need to prepare for such an event if one does occur. This is an issue that not only Japan, but the world must face, I believe. That is why I feel it is absolutely necessary to tell the world about the lessons and experiences gained in Fukushima.

The Nagasaki University and Fukushima Medical University Joint Graduate School that is the Division of Disaster and Radiation Medical Sciences has been active since 2016 and welcomes six or seven foreign students every year to Nagasaki University. Of course, they take classes at Nagasaki, but they also conduct fieldwork in Kawauchi Village. At Kawauchi Village, they inspect foods, measure radiation, as well as listen to what residents have to say and engage in risk communication. That is why, today, Kawauchi Village is a place where human resources are developed through people-to-people exchange.

This is also linked to the museum's mission. **While telling the story of Fukushima's these past 10 years-experience,we will also communicate these information to the world as well from now on.** Up until now, the museum has primarily been a reconstruction promotion hub, but I believe that we must add to that mission so that the museum also plays the role of a knowledge exchange hub.

I believe that, despite Kawauchi Village and Tomioka and Okuma Towns facing the reality of aging and declining populations, our efforts might contribute to some extent to increasing the nonresident population.

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