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# The Kawauchi co-expertise experience in Japan after the Fukushima accident

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### Abstract

How residents, local governments and specialists can work together to rebuild daily life and local communities after a nuclear disaster is a major challenge worldwide. In situations involving radiological risks, scientific knowledge is often complex and uncertain. This chapter describes the co-expertise process of the Kawauchi Village after the Fukushima Daiichi Nuclear Power Plant accident with the support of activities carried out by a team of professionals and researchers from Nagasaki University. These activities involved several interconnected processes, such as dialogues between experts and residents, sharing measurement data on radiation collected in the affected areas, support for residents and local authorities' decisions and actions to improve their protection and living conditions, and the provision of recovery assistance that respects local culture and ways of life. The aim of this chapter is to present practical examples of how co-expertise is formed and to help readers understand how experts, local governments, and residents can work together following a disaster.

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## Introduction

On March 11, 2011, the Great East Japan Earthquake struck eastern Japan with unprecedented force. Although Kawauchi Village is located in a mountainous area at mid-slopes of the Abukuma Highland, it suffered no direct damage from the earthquake itself (Figure 1). None of the approximately 3,000 residents of the community were injured, and no buildings collapsed, but the ensuing

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accident at the Fukushima Daiichi Nuclear Power Plant located about 20-30 km from the village profoundly altered the life of the community. The situation at the nuclear power plant was not immediately clear after the earthquake and the tsunami. It was only on the following day that village authorities became indirectly aware of the severity of the accident, when the mayor of Tomioka Town — where the nuclear power plant is located — asked whether Kawauchi could temporarily accommodate evacuees from Tomioka.



FIGURE 1. Location of Kawauchi village in relation with the Fukushima Daiichi nuclear power plant (FDNPP) (photo: Makiko Orita).

Kawauchi Village opened all available facilities, including community centers, schools, and sports halls, to receive evacuees. Nevertheless, the sudden arrival of approximately 17,000 people quickly exceeded the village’s capacity. On March 14, following the explosion of the third reactor and government instructions for residents living within a 20-30 km radius to remain indoors, severe supply shortages made it impossible for daily life to continue. As a result, all residents of Kawauchi Village and Tomioka town were evacuated by bus to the Big Palette Convention Center in Koriyama City, about 60 km away. This marked the beginning of a prolonged evacuation period and the initial phase of a recovery process that would later unfold.

For several months thereafter, the village remained almost completely silent. Daily life disappeared, houses were left unattended, and farmland became overgrown with weeds. Apart from occasional patrols by police, the Self-Defense Forces, and utility vehicles, there were few signs of human activity. As one resident later recalled, “No one came to Kawauchi other than cats and dogs”. This prolonged absence symbolized not only physical devastation but also the uncertainty surrounding the village’s future.

By early summer 2011, information gradually emerged indicating that radiation levels in Kawauchi Village were relatively low compared with those in other municipalities closer to the plant. At the same time, many evacuated

residents expressed a strong desire to return to their homes as soon as possible. Faced with these voices, the Mayor of Kawauchi, Yuko Endo, convened village office staff to discuss whether and how a return might be organized. Key questions quickly arose what information should be provided to residents, how risks should be explained, and what conditions would be necessary to make return feasible. Discussions with the Ministry of the Environment regarding decontamination and waste management were also initiated.

From September 2011 onward, as government restrictions were gradually lifted in areas beyond 20 km from the nuclear power plant, the municipality organized a series of explanatory meetings for residents. Paradoxically, however, the more meetings were held, the more anxiety seemed to grow. Scientific explanations and numerical indicators alone did not necessarily reassure residents; instead, they sometimes intensified fears and confusion. Recognizing this dilemma, Mayor Endo began to question whether an early return should be postponed, despite initial intentions.

The return of Kawauchi Village was officially announced at a press conference on January, 2012. Importantly, the choice of whether to return was left to individual residents, and large-scale decontamination and mutual understanding were identified as prerequisites. At this critical juncture, support was sought from Nagasaki University to assist with evaluating radiological conditions and decontamination efforts. The experience of Kawauchi Village thus raises a fundamental question addressed in this chapter: how can residents, local authorities, and experts work together to make informed decisions and rebuild everyday life under conditions of uncertainty? The following sections describe how a co-expertise process gradually emerged in Kawauchi Village through dialogue, measurements of radioactivity, and sustained engagement, and how this experience later informed recovery efforts in neighboring municipalities.

## 1. Dialogue activities

In December 2011, following the government announcement that the Fukushima Daiichi Nuclear Power Plant accident had been brought under control, Kawauchi Village began preparing for the early return of its residents. As environmental monitoring progressed, it became evident that levels of radioactive cesium contamination in Kawauchi Village were relatively low compared with those in other municipalities within the restricted zone. Based on this information, Mayor Endo and the village administration began considering the possibility of organizing the residents' return. This decision was strongly influenced by lessons drawn from areas affected by the Chernobyl nuclear accident, where prolonged evacuation had led to long-term disruption and weakening of local communities. These experiences suggested that, when radiological conditions allow, delayed return itself can become a major obstacle to recovery. Against this background, the Fukushima Prefectural Government facilitated contact between Kawauchi Village and researchers from Nagasaki University, who had long-standing experience in radiation health risk management and post-Chernobyl studies (Takamura et al., 2021).

Rather than providing directives, Nagasaki University was asked to support the village by evaluating radiological conditions and assisting in communication with residents during an extremely uncertain period (Figure 2).



FIGURE 2. Meeting with residents of Kawauchi (photo: Makiko Orita).

As noted in the introduction, explanatory meetings held from late 2011 onward revealed a fundamental limitation of one-way communication. Scientifically sound data alone did not necessarily reduce anxiety, as many residents struggled to connect numerical indicators with their own living conditions. This realization marked a turning point, highlighting the need for dialogue grounded in residents' everyday experiences rather than abstract standards. While residents actively sought information, many were less concerned with abstract standards than with how radiation might affect their own homes, food, children, and daily routines. Questions increasingly shifted from general safety thresholds to highly specific concerns rooted in lived environments. Through this process, it became clear that effective recovery required more than the transmission of expert knowledge. Dialogue needed to evolve into a form of engagement that acknowledged residents' perspectives, uncertainties, and values. This recognition marked an important turning point in the relationship between Kawauchi Village authorities, its residents, and Nagasaki University. Dialogue was no longer understood merely as explanation, but as a mutual process of listening, contextualizing information, and building trust over time. This shift laid the foundation for subsequent activities, including individualized measurements and the introduction of a public health nurse who could engage directly with residents in their daily lives. Together, these efforts transformed dialogue from a preliminary step into a core component of the co-expertise process that would continue to develop throughout Kawauchi Village's recovery.

## 2. Measurement activities

Following these developments, decontamination work began in Kawauchi Village. In December 2011, Professor Takamura made his first visit to the village, accompanied by medical students from the university. They took soil samples, measured radioactive cesium concentrations, and estimated radiation doses for residents after their return (Taira et al., 2012). At that time, the village was quiet, even during the daytime, with few signs of daily life. Untended farmlands were covered with weeds, symbolizing the difficulty of reconstruction.

The soil samples they collected were later analyzed at Nagasaki University, and the results were reported to Kawauchi Village Office staff, who were still working from their evacuation premises in Koriyama City. The analysis showed that radioactive cesium concentrations had decreased significantly due to decontamination efforts. Based on these findings, it was concluded that external exposure to homes after residents' return would be extremely limited and that returning to the village was feasible. Discussions also took place regarding the safety of the groundwater used for drinking and appropriate methods for risk communication with residents concerning radiation exposure. Staff from the village office evaluated these findings, as the data needed to make a final decision on returning. In January 2012, Kawauchi Village officials declared their intention to return.

Professor Takamura also decided that he would hold explanatory meetings, both in the village and in other locations, in step with the residents' planned return in March 2012.

There was one more thing that he emphasized, in terms of measures for reconstruction support: providing information about radiation risk corresponding to each resident's personal circumstances by being closely involved in the life of the village. Around this time, many residents began to respond in ways that differed from their reactions during the initial phase following the disaster, particularly when the first crisis communication meetings were held. Now, they often referred to doses at the meetings, saying things such as, "This place showed a high dose", or "This place did not show a very high dose", based on measurements they themselves had taken inside and outside their homes using their personal dosimeters. The problem was that people referred to values without fully understanding what they really meant. The most typical example was one of "0.23  $\mu\text{Sv}$  per hour". Most of the residents in the Fukushima Prefecture had learned this value well since the accident, as it was the one the Minister for Reconstruction set as a goal for decontamination. So, what did these values mean? Professor Takamura presumed that, unlike today, when such information is ubiquitous, hardly anyone understood these notions correctly. It is said that 0.23  $\mu\text{Sv}$  per hour is an ambient dose equivalent rate, which equals an annual dose of 1 mSv under certain everyday conditions (Ministry of the Environment, 2013). Further, negative health effects do not always appear, even when a value exceeds this number. Nevertheless, a previous study revealed that many people believed a person living in a place with an ambient dose equivalent rate exceeding 0.23  $\mu\text{Sv}$  per hour for one year would certainly experience negative health effects. This confusion originated

during the initial period after the accident, when the publicly announced, yet misleading, information set the radiation protection standard at 1 mSv for protecting the human body from radiation. People were treating exposure levels that cause health effects and the 0.23  $\mu$ Sv per hour value as if they were the same; this misunderstanding continues to cause confusion among people to this day (Orita et al., 2015).

### **3. Local project activities**

Building on the dialogue-based approach described in the previous section, local project activities in Kawauchi Village focused on close engagement with residents' everyday living environments.

In response to residents' concerns, a public health nurse was dispatched to the village in collaboration with Nagasaki University. Makiko Orita, a newly qualified public health nurse who had graduated from Nagasaki University's School of Health Sciences and was working at a hospital while doing research in Professor Takamura's laboratory as a postgraduate in the Master of Nursing program, was chosen for the role. At the end of March 2012, Nagasaki University and Kawauchi village agreed that Ms. Orita would be stationed in the village for the month of May 2012 as a trial, in response to residents' concerns about radiation exposure and its health effects. They expected that having a young female public health nurse who could consult with residents while living in the village herself and eating the same food as the residents would inspire more confidence in these efforts than anything else could. Public health activities conducted by local public health nurses generally cover a wide range of fields, including maternal and child health, elderly and mental health care, community health promotion, and infectious disease control. Within this broad scope, Ms. Orita primarily took responsibility for radiation-related public health activities in Kawauchi Village, which pursued early return after the nuclear accident. In practice, much of her work involved visiting residents directly in their homes and responding to individual concerns (Figure 3). Residents frequently asked questions such as whether it was safe to drink local water or eat rice, and whether children could touch insects... In addition to home visits, she participated in various resident meetings organized by the village, including gatherings for evacuees and discussions on future land use, where she responded to questions related to radiation and health whenever they arose. When personal dosimeters were distributed to residents through a donation program, Ms. Orita also took the initiative to distribute the devices at community centers throughout the village and to provide explanations on their proper use. Through these activities, she supported residents in understanding radiation exposure in the context of their daily lives. Indeed, living in the same environment and responding directly to residents' concerns greatly contributed to building their sense of security.



FIGURE 3. Mrs Orita talking with a villager (photo: Makiko Orita).

In 2013, Nagasaki University established the Reconstruction Promotion Base (Satellite Office) in Kawauchi Village, creating a system for continuous support from the university. The same public health nurse was stationed in the village for three years and played an important role in developing a new community-based recovery model. For example, one of the most important aspects of radiation protection in Fukushima has been the reduction of internal exposure. Since the early phase of the accident, regulatory limits for food have been established, and a system has been developed to prevent contaminated food from entering the market. However, considering the aftermath of the 1986 Chernobyl accident, it was well-known that radiocesium tends to concentrate in wild mushrooms (Fesenko et al., 2001; UNSCEAR, 2000). At the same time, collecting wild mushrooms in autumn has long been an important cultural practice for many Kawauchi residents. After the accident, information about radiocesium accumulation in mushrooms spread among residents, and questions such as “When will it be possible to collect mushrooms again?” were repeatedly conveyed to the satellite office. In response to these concerns, the Nagasaki University team with the residents initiated the Mushroom Map Project in 2013. Radiocesium concentrations in mushrooms vary depending on factors such as species and collection sites, and many uncertainties remain. The university researchers discussed this with Kawauchi’s residents and decided to implement a collaborative study, which they called the “Mushroom Map Project” (Figure 4). They asked the residents to collect mushrooms and indicate the spot of their collection on a map. They then measured the concentration of radiocesium in the mushrooms and prepared a map that included information on the types of mushrooms collected, collection spots, and radiocesium concentration levels (Nakashima et al., 2015; Orita et al., 2017; Cui et al., 2020). The project has been repeated every

autumn since 2013. Through continued dialogue with residents, this project developed as a shared effort to better understand and manage internal exposure in everyday life. Through this project, residents' local knowledge and scientific measurements were brought together in a shared process of interpretation, enabling shared interpretation rather than one-sided risk communication.



FIGURE 4. Kawauchi residents collecting mushrooms (photo: Makiko Orita).

A particularly illustrative example of co-expertise can be found in the experience of Mr. Toshio Jindo, a resident of Kawauchi Village. Mr. Jindo worked for many years at a company in the Tokyo metropolitan area. After his retirement, he chose to relocate to Kawauchi Village, attracted by its rich natural environment. A few years later, however, he experienced the Great East Japan Earthquake and the subsequent nuclear accident as a resident of the village.

In 2013, when the area where Mr. Jindo lived was still designated as an evacuation zone, Kawauchi Village was preparing for the lifting of the evacuation order. During this transitional period, Mr. Jindo returned to his home earlier than most residents. At that time, staff from Nagasaki University met him and provided radiation dose measurements and individual health consultations for residents who were considering returning. This early return highlighted both the uncertainty surrounding radiation exposure and the difficulty of making decisions based solely on generalized information. Kawauchi Village is surrounded by forests, while decontamination efforts were largely limited to residential areas and land surrounding cultivated fields. As a result, a large part of the surrounding natural environment has not been decontaminated. Mr. Jindo questioned whether explanations based only on average or representative values could convincingly address the concerns of residents and visitors, especially in a landscape dominated by forests. He recognized that reassurance required objective, site-specific evaluation rather than abstract statements about safety.

Based on this understanding, Mr. Jindo began measuring radiation doses himself and actively emphasized the importance of objective evaluation grounded in actual living spaces. His activities were not driven by protest or political advocacy but by a desire to understand the environment in which he lived and to share that understanding to others in a credible way. In response to this local initiative, Nagasaki University began cooperating with him in radiation dose measurements, sharing methodologies and interpreting results together. This cooperation represents a concrete form of co-expertise, in which residents' lived experiences and questions guide scientific inquiry, while scientific expertise supports careful measurement and interpretation. Rather than experts unilaterally providing answers, knowledge was developed through shared practice. Mr. Jindo's experience demonstrates how radiation risk communication can evolve from one-way explanation to a process of joint evaluation, contributing to trust-building and informed dialogue within the community.

Approximately five years after the administrative return (around 2017), about 80% of Kawauchi Village's residents had returned. The rice paddies, which had once become overgrown with weeds as tall as an adult, are now filled with water in the spring and covered with ripe golden ears of rice every autumn. These developments suggest that the cooperation with and support from Nagasaki University has contributed to the region's revitalization. Whenever they see a golden carpet of ripe ears, the researchers report feeling very happy to have helped the villagers to return home in safe conditions.

#### **4. Diffusion of the Kawauchi experience**

Since 2016, Nagasaki University has also begun supporting the reconstruction of Tomioka Town, another municipality in the Futaba District. In April 2017, a Reconstruction Promotion Base was established in the town, with the aim of applying the experience gained in Kawauchi Village to a different area. Because Tomioka Town had historically played a central role in the Futaba region and maintained close ties with Kawauchi Village, advancing reconstruction efforts there was considered particularly important. Although Tomioka Town faced more complex challenges than Kawauchi Village — such as higher levels of contamination, longer evacuation periods, and greater damage to social infrastructure — Nagasaki University first focused on working with the town to reconstruct its living environment in a way that would support residents' eventual return.

In April 2019, the Tomioka Town Food Inspection Center was established on the premises of the Tomioka Town Office. At this center, radioactive cesium concentrations in food are measured, and residents can consult staff about radiation-related concerns and uncertainties. Food monitoring is conducted using non-destructive testing methods, allowing radioactive cesium concentrations to be measured within approximately ten minutes. The foods brought in by residents mainly consist of agricultural products from home gardens and ingredients collected from surrounding forests, with seasonal variations such as wild edible plants in spring, summer vegetables in summer, and mushrooms in autumn.

The Nagasaki University satellite office was also located within this facility and has continued its activities there. During the waiting period for measurement results, staff from the Nagasaki University satellite office and the town office engage in conversations with residents about radiation, food safety, and everyday life. These interactions do not focus solely on numerical results but provide opportunities to listen to residents' concerns and understand their perspectives in the context of daily living.

This approach — beginning with the measurement of radioactive cesium, identifying residents' needs through dialogue, and thinking together with residents about how to respond — reflects an important lesson derived from the Kawauchi Village experience. Similar activities have since been continuously implemented in other municipalities, including Okuma Town, where residents began returning in 2019, and Futaba Town, where residents began returning in 2022. These efforts demonstrate how the co-expertise approach developed in Kawauchi Village has been adapted and expanded to different local contexts, emphasizing that risk communication grounded in risk assessment is most effective when combined with sustained, place-based engagement.

## 5. Lessons Learnt

Through these activities, the engagement of Nagasaki University in Kawauchi Village demonstrated a concrete form of “being close to” affected communities. Rather than offering temporary support, this experience highlighted the importance of sustained involvement over time. Continuous presence allowed concerns to be addressed as they emerged and enabled relationships of trust to develop gradually—beyond what short-term interventions could achieve. The role of the public health nurse illustrated how human resources embedded in daily life can sustain trust and support co-expertise beyond technical data alone.

Through its support for Kawauchi Village, Nagasaki University also recognized the importance of developing human resources capable of implementing co-expertise following nuclear disasters, both in Japan and internationally (Takamura et al., 2018). Although standardized approaches to radiation communication exist (ICRP, 2009), the most essential aspect of disaster recovery is the ability to understand residents' concerns and everyday challenges and to respond to them appropriately. While deepening expert knowledge is indispensable, the manner in which professionals engage with residents should be considered a central theme in the training of future human resources.

Building on this experience, Nagasaki University later concluded collaboration agreements with other municipalities, including Okuma Town and Futaba Town, and has continued on-site activities. However, the university team does not assume that the Kawauchi Village model can be directly applied to all municipalities. Each community faces distinct historical backgrounds, social conditions, and future aspirations. While many municipalities encourage residents to return, decisions regarding return cannot be made on the basis of radiation levels alone. Looking ahead, an essential challenge lies in how municipalities and residents can envision their future together and how such visions can be shared

and empathized with across the community. Recovery is strengthened when local people themselves can say that the place where they live is safe and acceptable, and when these voices are gradually shared within and beyond the community. In this context, co-expertise should not be regarded merely as a technical activity, but as a process that supports Fukushima's recovery and future-oriented community building. This role must not be overlooked as reconstruction efforts continue.

## Conclusion

Many societies worldwide face complex technological and environmental risks characterized by scientific uncertainty, delayed health effects, and profound societal consequences. In such contexts, the Kawauchi case illustrates that recovery cannot be achieved through expert-driven approaches alone. The concept of co-expertise, as practiced in Kawauchi Village, provides a practical framework for integrating scientific knowledge with residents' lived experiences and local values. Through regular dialogue, shared measurements, and resident-participatory projects, expertise became something collectively developed rather than externally imposed. This process not only supported local decision-making, but also fostered resilience within the community.

The recovery support activities described in this chapter demonstrate several key elements of co-expertise, including decision-making regarding planned return based on decontamination data, support for residents in understanding radiation doses provided by a public health nurse, and resident-participatory initiatives such as the Mushroom Map Project. Throughout Kawauchi Village's recovery process, the local government, residents, and researchers from Nagasaki University brought together their knowledge, experiences, and values, forming a culture of shared expertise through regular dialogue. This case therefore represents a textbook example of the co-expertise process and clearly illustrates the dynamics of its implementation, which are often difficult to capture through theory alone.

From an international perspective, the Kawauchi experience underscores the importance of long-term, place-based engagement by academic institutions in post-disaster recovery. Universities can play a unique role by combining scientific rigor with continuity, neutrality, and a commitment to education and human resource development. The experience of Kawauchi Village suggests that such sustained engagement is essential for addressing the enduring challenges that remain long after the immediate phase of a nuclear accident has passed.

## References

- Cui L., Orita M., Taira Y., Takamura N. (2020) Radiocesium concentrations in mushrooms collected in Kawauchi Village five to eight years after the Fukushima Daiichi Nuclear Power Plant accident. *PLoS One*. 15(9):e0239296.
- ICRP (2009) Application of the Commission's Recommendations to the Protection of People Living in Long-term Contaminated Areas After a Nuclear Accident or a Radiation Emergency. ICRP. 111. *Ann. ICRP*. 39(3).

- Fesenko S., Soukhova N., Sanzharova N., Avila R., Spiridonov S., Klein D., Badot P.-M., De Gentil E. (2001) Radiocesium behaviour in forest ecosystems. *Journal of Environmental Radioactivity*. 56:77-93.
- Ministry of the Environment, Japan (2013) Additional Decontamination Guidelines (Second Edition). [https://www.env.go.jp/en/chemi/rhm/basic-info/1st/attach/Additional\\_Decontamination\\_Guidelines\\_2nd.pdf](https://www.env.go.jp/en/chemi/rhm/basic-info/1st/attach/Additional_Decontamination_Guidelines_2nd.pdf)
- Nakashima K., Orita M., Fukuda N., Taira Y., Hayashida N., Matsuda N., Takamura N. (2015) Radiocesium concentrations in wild mushrooms collected in Kawauchi Village after the accident at the Fukushima Daiichi Nuclear Power Plant. *PeerJ*. 3:e1427.
- Orita M., Hayashida N., Nakayama Y., Shinkawa T., Urata H., Fukushima Y., Endo Y., Yamashita S., Takamura N. (2015) Bipolarization of Risk Perception about the Health Effects of Radiation in Residents after the Accident at Fukushima Nuclear Power Plant. *PLoS One*. 10(6):e0129227.
- Orita M., Nakashima K., Taira Y., Fukuda T., Fukushima Y., Kudo T., Endo Y., Yamashita S., Takamura N. (2017) Radiocesium concentrations in wild mushrooms after the accident at the Fukushima Daiichi Nuclear Power Station: Follow-up study in Kawauchi village. *Sci Rep*. 7(1):6744.
- Taira Y., Hayashida N., Yamaguchi H., Yamashita S., Endo Y., Takamura N. (2012) Evaluation of environmental contamination and estimated radiation doses for the return to residents' homes in Kawauchi Village, Fukushima prefecture. *PLoS One*. 7(9):e45816.
- Takamura N., Orita M., Taira Y., et al. (2018) Recovery from nuclear disaster in Fukushima: collaboration model. *Radiat. Prot. Dosimetry*. 182:49-52.
- Takamura N., Orita M., Taira Y., Matsunaga H., Yamashita S. (2021) Experiences of crisis communication during radiation emergency and risk communication for recovery of the community in Fukushima. *J Radiat Res*. 62(Supplement 1):i95-i100.
- United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) (2000) Sources and Effects of Ionizing Radiation. UNSCEAR 2000 Report to the General Assembly. United Nations.