Program Director Interview

PD Interview

12 Leading Experts Who Accelerate SIP

What are the Best Disaster Prevention and Mitigation Schemes for Repeated Large-scale Disasters?

Aiming at strengthening resilience and quick recovery while controlling infection

While risk of large-scale disasters has been more recognized, such as earthquakes, tsunamis, localized heavy rainfall, large-scale typhoons and others, it has been necessary to strengthen disaster prevention and mitigation measures. In addition, due to the COVID-19 pandemic, disaster response while controlling infection has emerged as an issue. We interviewed PD HORI Muneo, who is leading the program that has already started Practical implementation.

HORI Muneo

Director-General, Research Institute for Value-Added-Information Generation (VAiG), Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

Strengthen resilience by sharing information and creating information for future forecasts

Q: Could you tell us about the "Integrated system for assisting evacuation and emergency response activities"?

PD: It is a system that realizes better disaster response such as dispatch instructions, evacuation support, and supply of goods by collecting, analyzing, and forecasting disaster dynamics. In the event of a natural disaster, we mainly cooperate with the Cabinet Office's Information Support Team (ISUT) to have the team use it while verifying the effectiveness of this integrated system.

This integrated system mainly aggregates disaster information issued by the government ministries as well as from prefectures, and in some cases, information from the private sector. The important point is that this system is an integrated system linked with various information systems, so users can use the information without bothering to consider which system the information comes from.

Q: We understand you have been conducting research and development in collaboration with the government ministries from the very beginning.

PD: Originally, disaster prevention by the government ministries focused on precautionary measures to strengthen social infrastructure. On the other hand, we have emphasized the importance of resilience, or recovery from disaster. Resilience as a precautionary measure is important, but there is also the aspect that cost performance declines when it reaches a certain level. Strengthening resilience requires improvement of the disaster countermeasure efficiency possessed by the government ministries, and for this reason, we are proceeding with research and development efforts that focus on collaboration among the government ministries. Specifically, the content of our research and development will be innovative technologies related to information creation, such as information sharing and future forecasts. We believe that disaster response efficiency will be improved autonomically by understanding the disaster response status and trends of other government ministries. We are continuously requesting cooperation from the government ministries that employ innovative technologies, and in some cases asking them to consider budgeting for the technology employment.

The system was effectively used during extreme heavy rain in July 2020.

Q: We understand that you conducted drills and demonstration experiments in real disasters. What kind of results did you see?

PD: In the extreme heavy rain in Kyushu in July 2020, the forecast system of localized heavy rainfall was utilized in municipalities. As a result, resident evacuations were carried out based on more accurate forecasts.

We also help disaster response training. In 2020, we conducted an on-line emergency drill for the first time in Japan. We asked governors and mayors to participate in the training and it was confirmed that we could prepare for disasters even while controlling infection. It can be said that information sharing that was not possible before has become available by utilizing SIP technologies.

Q: What kind of localized heavy rainfall observation and forecast system was used in real disasters?

PD: We are developing the technologies that can predict "when, where, and how much rainfall will take place". At present, we have realized a two-hour advanced forecast of localized heavy rainfall. It was the first in the world. We aim to be able to predict rainfall 12 hours in advance in the future.

This system has two breakthrough technologies. One is the

multi-sensing technology of water vapor and precipitation. We have succeeded in observing the distribution of water vapor in the atmosphere, which had been considered difficult. The other is data assimilation technology. It is a prediction simulation of a supercomputer that effectively uses the observed data. Not only is it possible to realize a two-hour advance forecast, but for example, instead of a rough prediction that "it will rain in northern Kyushu", a highly accurate prediction that "heavy rainfall will occur in this village" has become possible owing to improvement of spatial resolution. This localized heavy rainfall observation and forecast system has been in operation at the Japan Meteorological Agency since June this year (2021), thanks to the practical application of automatic detection technology of localized heavy rainfall. I think this is a good example of how SIP efforts are properly implemented in society.

We deliver individual information via a disaster prevention chatbot using a distributed processing AI platform.

Q: What kind of information do you deliver to a wide range of users with the disaster prevention chatbot, and what effects do you expect?

PD: The central government revised the guideline about the evacuation information including abolition of the "evacuation advisory" in May 2021. Then, it becomes significant to provide evacuation support to protect yourself appropriately according to the alert level. The disaster prevention chatbot uses an advanced distributed processing AI platform that takes into account the terrain of the residential area, etc., to directly deliver tailor-made information for individuals.

Previously, when it came to evacuation support, government staff often made phone calls to individuals, but disaster prevention chatbots can automate that process. And it will be possible to devote the resources of government staff to more complicated disaster responses.

Q: We understand that some of the information systems developed in this program are being linked with disaster prevention systems of prefectures. Could you tell us about the progress?

PD: Last year, we conducted a demonstration experiment in which "Shared Information Platform for Disaster Management (SIP4D)" was connected to disaster prevention systems of 16 prefectures and confirmed that it worked appropriately. Other prefectures also want to connect to it. Although the initial cost may be high, once the group of programs for the connection has been developed, it will be easier to take the next step. Thus, we think it is adequately possible to connect with all the prefectures.

Apart the system for the prefectures, we are developing an "Integrated System for Municipal Government Disaster Response (IDR4M)" for the municipal governments. We provide the information necessary for decision-making to the mayors who issue evacuation orders. By connecting central, prefectural, and municipal disaster prevention systems via SIP4D and IDR4M, disaster information can be shared promptly. This will realize the autonomic efficiency of disaster response by the public administration.

For science and technology to change society

Q: What kind of measures are you taking for disaster prevention and mitigation in the recent COVID-19 pandemic?

PD: One is analysis in cyberspace called Digital Twin. This is mainly in the area covered by the Ministry of Health, Labor and Welfare. It combines disaster information with medical information and health and welfare information to analyze disaster dynamics while controlling infection.

The second one is analysis of the evacuation of individuals after a disaster. It aims to inform people of evacuation shelters and guide them to a place where they can avoid the so-called Three Cs (closed space, close contact, and crowded place) while using a disaster prevention chatbot. Evacuation shelters should be dispersed when considering infection prevention. On the other hand, it is more efficient to concentrate them when considering operational matters such as delivery of aid supplies. The analysis helps us to make balanced decisions between dispersion and concentration based on scientific data.

In addition, this year we started research and development of an infection control system that uses a hydrogen fuel cell bus. In the event of a disaster, the inspection facility may become unusable due to a power outage or damage. If we can move an infection control system close to an evacuation area and the system is powered by self-sustaining energy, we can perform PCR tests there to understand the positive or negative status of people. Thus, it will prevent secondary infections. The self-sustaining energy is expected to support disaster relief and volunteer activities.

Q: Could you tell us about your future prospects?

PD: The localized heavy rainfall observation and forecast system has been introduced since its innovative technologies were recognized. It was proved that cutting-edge science and technology can make a great contribution to disaster prevention. This is not limited to the area of disaster prevention. The seamless consolidation between advanced water utilization and enhanced water control of a hydroelectric dam by using the long-time ensemble rainfall forecast, which we are working on in this project, enables water utilization and water control to have a previously impossible win-win relationship in dam operations. In addition, we are developing a system that enables reasonable decision making about use of groundwater during droughts, which has been difficult to achieve due to strict regulations, by utilizing scientifically based data and forecasts. We will strengthen our resilience to disasters through research and development of innovative technologies and their Practical implementation, and at the same time, we would like to be the first in the world to integrate cyberspace and physical space, so that we can create an opportunity to realize Society 5.0 that can respond to disasters extraordinarily more effectively than before.