

## Disaster Risk Reduction Symposium/Disaster Reduction Alliance Forum 2012

### “Learning from the Tsunami Disaster: Creating a Disaster Resilient Society”



On Thursday, January 19, with the theme “Learning from the Tsunami Disaster: Creating a Disaster Resilient Society,” the Disaster Risk Reduction Symposium/Disaster Reduction Alliance Forum 2012 was held at Kobe Portpia Hotel in Kobe, Japan. With the aim of helping build a disaster resilient society in anticipation of future catastrophic disasters, the forum provided an opportunity to share and disseminate to the world the experiences and lessons learned from past major disasters. Participants reported on their restoration and recovery efforts from the Great East Japan Earthquake and tsunami, a tragedy that took place almost a year ago, and the Indian Ocean tsunami. Lively discussions were held among key actors in disaster risk reduction and public administration.

The objective of this annual forum is to raise awareness of disaster prevention from an international perspective by providing a simple explanation of the challenges of international disaster risk reduction and the roles of member organizations of the Disaster Reduction Alliance (DRA). In addition, the experiences of Hyogo and Kobe, the areas worst affected by the 1995 Great Hanshin-Awaji Earthquake, can be related in a way that could only be done at this forum.

In his keynote speech, Dr. Yoshiaki Kawata, Executive Director of the Disaster Reduction and Human Renovation Institution (DRI), stressed the need for considering the largest-possible earthquake and tsunami from every possible angle in conducting future tsunami hazard assumptions for developing countermeasures against tsunamis. He also emphasized the importance of

adopting, for the largest possible tsunami, a disaster reduction philosophy that focuses on minimizing damage. He argued that tsunami damage should be mitigated as much as possible, not only through structural measures such as coastal protection facilities, but also through non-structural measures centering on evacuation such as disaster education.

The keynote speech was followed by presentations by four distinguished speakers: Mr. Shigeru Sugawara, Mayor of Kesennuma, Miyagi Prefecture, Mr. Eddy Purwanto, Deputy of Governance, Office of the Indonesian Vice President, Dr. Srikantha Herath, Senior Academic Programme Officer, United Nations University, and Dr. Fumihiko Imamura, Professor of Tohoku University School of Engineering, who reported on their respective restoration and recovery efforts in the Great East Japan Earthquake and tsunami or the Indian Ocean tsunami.

The panel discussion that followed these speeches was coordinated by Dr. Kuniyoshi Takeuchi, Director of the International Centre for Water Hazard and Risk Management, Public Works Research Institute. Four panelists held in-depth discussions on a new recovery model and international cooperation for reconstruction from the March 11 disaster, creation of a digital archive pass for future generations, and other issues.

Thursday, January 19, 2012

**Disaster Risk Reduction Symposium/  
Disaster Reduction Alliance Forum 2012  
“Learning from the Tsunami Disaster:  
Creating a Disaster Resilient Society”**

■ **Organizer’s speech:** Toshitami Kaihara

President, Hyogo Earthquake Memorial 21st Century Research Institute (HEM21)  
Chairperson, Disaster Reduction Alliance (DRA)

Through the experiences and lessons learned from the Great Hanshin-Awaji Earthquake, which took place 17 years ago, Hyogo is now at the forefront of research, international cooperation and human resources development in regard to disaster risk reduction. In 2002, the Disaster Reduction Alliance (DRA) was established as a loose-knit network of the international disaster prevention organizations that have been set up in the HAT Kobe area (Kobe New Eastern City Center). Since then, the DRA has been striving to help enhance community disaster resilience.

It is my great pleasure and honor to welcome all of you to this forum today and I would like to extend my sincere gratitude to you. Let me take this opportunity to thank DRA members for your generous cooperation.

I would also like to express my deep appreciation to the distinguished guest speakers, who have joined us to share their insight and experiences despite their tight schedules.

The Great East Japan Earthquake of March 11 triggered a triple disaster: the combination of the earthquake, massive tsunami and subsequent nuclear crisis. Although it was an unprecedented and unimaginable disaster, we regret that we failed to prevent the occurrence of such an event despite our continued efforts over the years in disaster prevention and mitigation. Looking at the world, many countries have also suffered damage from tsunamis. We have to admit that no adequate countermeasures have yet been established.

Today, with the focus on tsunami disasters, experts and officials will share

their valuable experiences and lessons learned, and will engage in in-depth discussions on RDD issues. I hope that this forum will contribute to the development of effective disaster countermeasures worldwide.

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■ **Guest speech:** Tomoyuki Yoshimoto, Vice Governor of Hyogo Prefecture

Since the occurrence of the Great Hanshin-Awaji Earthquake, receiving generous assistance from around the world, Hyogo Prefecture has pushed ahead with its recovery and reconstruction efforts under the slogan of “creative reconstruction.” We now recognize that it is our responsibility to share our experiences and the lessons gained from the disaster to make use of them for creation of disaster resilient communities.

We set up the Disaster Reduction and Human Renovation Institution (DRI) in the Kobe New Eastern City Center (HAT Kobe) to promote the activities of the Disaster Reduction Alliance in cooperation with 17 members, including United Nations offices and other international organizations related to disaster risk reduction. Within the DRI, the Center for Disaster Reduction of the University of Hyogo has been established to foster cooperation among universities researching disaster prevention and mitigation and other DRR-related organizations, aiming to create a Hyogo platform for disaster risk reduction.

The 21st century has already witnessed a host of large-scale natural disasters in various parts of the world. Among them, the Great East Japan Earthquake triggered a combined mega disaster on an unprecedented scale. Since immediately after the disaster, Hyogo Prefecture, as a member of the Union of Kansai Governments, has been making all-out efforts to help the people and regions affected by the disaster. From overseas, 170 countries and international organizations have offered various forms of assistance to Japan. However, there is a long way to go before we fully recover from the disaster. It is important to develop disaster recovery and reduction measures tailored to local conditions, drawing on the experiences and lessons learned from past disasters around the world.

I hope that this forum will provide an opportunity to share the challenges and up-to-date knowledge related to large-scale disasters, and to discuss effective

and speedy ways of responding to and recovering from disasters. I look forward to seeing productive discussions, and hope that the results will be widely disseminated to the world.

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■ **Presentation of activities:** Presentation of activities of DRA members in response to the Great East Japan Earthquake

1. Immediately after the occurrence of the Great East Japan Earthquake, the Asian Disaster Reduction Center (ADRC) began receiving many inquiries and offers of assistance from overseas. From March 21 to 23, we conducted an on-the-spot survey in the disaster-stricken areas in Miyagi Prefecture. Based on the results of analysis of this survey and the information collected by various other institutions, we compiled a comprehensive report on the disaster and provided the report to overseas disaster management organizations and other interested parties. The ADRC organizes international conferences inviting DRR experts from abroad as well as Asian Conferences on Disaster Reduction, and participates in UN conferences. Through these conferences and taking other opportunities, we promote sharing of the experiences and lessons learned from past disasters, and encourage disaster prevention and reduction efforts. We have also found out about the concerns and needs of DRR institutions overseas. Based on that information, we have already begun working on a new project.

2. On the theme "Toward Creative Reconstruction from the Great East Japan Earthquake," the International Recovery Platform (IRP) organized an Expert Group Meeting jointly with the Asian Disaster Reduction Center, the World Bank, the Cabinet Office, the Government of Japan, Hyogo Prefecture and other partners. Participants discussed ways to make use of the valuable experiences and lessons learned from major disasters that have occurred in other parts of the world. Immediately after the occurrence of a disaster, IRP members visit the affected areas to observe the progress of restoration and conduct interviews and other surveys of local municipalities regarding recovery planning. In collaboration with the World Bank and the Japanese government, the IRP compiles the survey results into a report.

3. In collaboration with the Government of Japan and many DRR organizations, the United Nations International Strategy for Disaster Reduction (UNISDR) has

provided the international community with the details of, and the lessons learned from the March 11 earthquake, and has promoted discussion on common issues, DRR measures and cooperation on a global scale. (In May, we held the third session of the Global Platform for Disaster Risk Reduction. In September, the head of the UNISDR visited Japan to visit the disaster-stricken area. In October, we organized a United Nations Day event at Tohoku University, where local students and students from Hyogo Prefecture jointly announced a youth declaration on behalf of young people, who will play an important role in the DRR field in the future. In addition to the above activities, the UNISDR supports the "open reconstruction" program led by the Government of Japan.

4. Jointly with UN Disaster Assessment Coordination (UNDAC), the UN Office for the Coordination of Humanitarian Affairs (OCHA) commenced various activities immediately after the occurrence of the earthquake. The activities included: collecting and analyzing information on the humanitarian situation and relief needs; transmitting to the world accurate and objective information in English; coordinating international search and rescue teams that had arrived from various countries; and helping the Japanese government manage offers of assistance from overseas. OCHA Kobe Office is going to strengthen cooperation with relevant Japanese organizations in the fields of emergency response and humanitarian assistance.

5. The WHO Centre for Health Development (Kobe Centre) supports the Hyogo Framework for Action, which focuses on building the resilience of cities to emergencies and natural disasters. In response to the Great East Japan Earthquake and tsunami, the Kobe Centre has carried out such activities as monitoring the situation in affected areas, organizing international conferences and domestic forums and conducting on-site surveys, in collaboration with the WHO Headquarters in Geneva and the WHO Regional Office for the Western Pacific in Manila.

6. On the day the earthquake hit, the Japanese Red Cross Society Hyogo Chapter sent to Iwate Prefecture a medical relief team consisting of 13 medical staff from Kobe Red Cross Hospital with air tents, medical supplies and equipment. For the first 30 days following the earthquake, the team treated disaster victims around the clock at temporary clinics in Kamaishi City. The

Hyogo Chapter deployed a total of 24 medical care teams (221 staff) and 4 psychological care teams (13 staff) in Iwate Prefecture. In addition, we accepted monetary donations, sent relief goods, organized voluntary activities in and outside the affected areas, and assisted in supplying blood products for transfusion.

7. The Disaster Reduction and Human Renovation Institution (DRI) dispatched researchers to the affected area on March 14. They worked in the Miyagi prefectural government office for about three months on a full-time basis, providing advice and information to the national government's field disaster response headquarters set up in Miyagi and the prefectural disaster response headquarters. A total of 28 briefing sessions were held to share the experiences and lessons learned from the Great Hanshin-Awaji Earthquake and major disasters that occurred thereafter, and to suggest the problems and things to keep in mind in responding to the disaster. We also provided the response headquarters with the materials necessary for analyzing conditions in the stricken areas. As a project entrusted by Miyagi Prefecture, we are currently conducting an interview survey of prefectural government employees and other interested parties to examine the local government's response to the disaster.

8. The Hyogo Institute for Traumatic Stress dispatched staff to Sendai City eight days after the earthquake struck. For a total of 64 days, they operated psychiatric aid stations in evacuation centers and went around other shelters. During the restoration stage, our mental health experts visited temporary housing facilities in Fukushima Prefecture for a total of 15 days. In addition, to support aid workers, we have sent lecturers to their training sessions, and provided advice to municipal governments regarding psychological recovery as part of their community health care services. We also provided information on psychological first aid (PFA) and skills for psychological recovery (SPR) on our website.

9. The Hyogo Emergency Medical Center dispatched a Disaster Medical Assistance Team (DMAT) to Hanamaki Airport in Iwate Prefecture. As a DMAT Commander, Dr. Shinichi Nakayama, Deputy Director of the Center, took command of 30 DAMTs consisting of 300 members to perform wide-area medical evacuation in the Staging Care Unit established at the airport. The Center

functions as an Emergency Medical Information Control Center and a core hospital for providing emergency medical services in Hyogo prefecture. Jointly with the National Disaster Medical Center in Tokyo, our Information Control Center provided logistical support. As a core hospital, we sent a medical relief team to Ishinomaki City. Our DMAT was also dispatched to Hirono Town, Fukushima, to conduct radiation screening and health monitoring surveys on evacuees who were temporarily allowed to visit their homes.

10. In May 2011, the University of Hyogo set up a headquarters for assisting the people and communities affected by the Great East Japan Earthquake and tsunami. We have organized and sent teams of students four times so far to engage in voluntary work in the affected areas in collaboration with Miyagi University. We also provided assistance to local municipalities in terms of information processing to help put residents' lives back in order, for example, by assisting in developing a disaster victim registry. Other activities implemented by the schools and institutes of the University include: providing suggestions for reconstruction; bringing in fresh vegetables to affected areas; providing an opportunity to conduct research using a synchrotron radiation facility; and planning healthcare support for temporary housing communities.

11. The Hyogo Earthquake Memorial 21st Century Research Institute (HEM21) submitted to the ruling and other political parties and ministries and agencies concerned a proposal regarding restoration and reconstruction assistance after the Great East Japan Earthquake drawn up by President Kaihara and other members of HEM21 on April 11, 2011. We also donated to 190 municipalities affected by the disaster a handbook for disaster management, "Saigai taisaku zensho," in four volumes, edited and published by the HEM21. The Institute has provided grants for research and studies conducted mainly by the Asian Disaster Reduction Center on the theme "Toward Creative Reconstruction from the Great East Japan Earthquake."

12. At the request of Miyagi Prefectural Social Welfare Council, researchers and staff of the Hyogo Earthquake Engineering Research Center and the National Research Institute for Earth Science and Disaster Prevention (NIED) engaged in activities to help improve information dissemination and sharing in local disaster volunteer centers and evacuation shelters from March 23 to April 10,



2011. They explained how to use the web-based disaster information sharing platform, a research product of the NIED, particularly regarding the use of disaster area maps and how to input and extract information, thereby assisting volunteers.

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**Keynote Speech**

**Learning from the tsunami disaster:  
creating a disaster resilient society**

**Dr. Yoshiaki Kawata**

Executive Director, Disaster Reduction and  
Human Renovation Institution (DRI)

After the Great East Japan Earthquake, an expert investigation committee was established under the Central Disaster Management Council. The committee conducted a total of twelve meetings and made several proposals to the government on measures for earthquake and tsunami disaster control in the future. In accordance with the establishment of the Reconstruction Agency in February, the Reconstruction Design Council established in April 2011 will become the Reconstruction Promotion Committee and continue to engage in reconstruction efforts for the coming ten years.

On October 11, 2011, the expert investigation committee presented a report to Prime Minister Noda, and the Disaster Prevention Measures Promotion Council, which is headed by Chief Cabinet Secretary Fujimura and includes six cabinet members, was established. Although the fourth meeting of the council had been scheduled for January 13, 2012, it was postponed due to a cabinet shuffle. The fourth meeting is to deal with a revision of assumptions regarding a possible earthquake with an epicenter directly below the capital and the so-called Tokai, Tonankai and Nankai earthquakes, as well as the concept of disaster mitigation as the main topics. The council uses the terms “disaster mitigation” and “complex disaster” that we proposed more than 20 years ago.

In the Great East Japan Earthquake, two strong earthquakes and tsunami occurred, having an impact on a very wide area. The seabed moved 50 meters in a horizontal direction and the fault moved up to 10 meters upward, causing a huge earthquake and tsunami that hit Iwate and Miyagi Prefectures. According to an ancient document, it is likely that there was a huge earthquake in the past. However, there is a description only of a tsunami. Therefore, hazard maps were not created based on an assumption that an earthquake with a magnitude 9 could occur. As a result, the area flooded by the tsunami following the Great East Japan Earthquake was far larger than expected. The maps just served as safety maps rather than hazard maps.

The Japan Meteorological Agency issued a large-scale tsunami warning three minutes after the earthquake. In the warning, the predicted scale of the tsunami was much smaller than that of the actual tsunami. Although 30 minutes later, the agency issued another warning correcting the predicted height of the tsunami, residents were not able to access the information due to power failures. It is said that residents thought that the tsunami would not exceed the height of the seawalls, and that this misunderstanding delayed their evacuation.

A total of 190 kilometers of seawalls and other coastal facilities were damaged. Many firefighters and district welfare officers were killed by the tsunami while they were trying to evacuate residents. The deaths of many people like them, who had been engaged in important work to protect their community, are a huge loss to our reconstruction efforts in the future.

It is incontrovertible that governments had assumed that a disaster would not appear on a scale exceeding the level to which their own capacity could respond, and conducted emergency drills based on this assumption. The massive earthquake in Tohoku showed us that such drills are useless when a disaster occurs on a scale beyond such assumptions. We should take all possibilities into account when conducting drills and be bold in implementing countermeasures.

To better manage the occurrence of a tsunami, we need measures to enhance coastal protection facilities and other facilities as well as improve disaster prevention training and hazard maps based on the "disaster mitigation" concept; that is, when a highest-level tsunami occurs, we should reduce damage to a

minimum, even if it is impossible to reduce it to zero. Half the people who managed to escape from the tsunami after the Great East Japan Earthquake used cars to evacuate. However, it is preferable to evacuate on foot if one can walk 500 m or farther. Therefore, better town planning is required to enable people in densely built-up area to take refuge within five minutes on foot. In addition, people are required to take refuge promptly and voluntarily without hesitation before receiving evacuation recommendations. Those who successfully evacuated after the earthquake had always participated in evacuation drills. This means that people risk their lives if they do not participate in evacuation drills.

We have made proposals to acquire highly accurate data for tsunami by positioning GPS wave gauges offshore, to improve hazard maps and to conduct disaster prevention training to enhance awareness of disaster prevention. We have made these proposals with a long-term view that our efforts would be successful when the children receiving disaster prevention training become adults in the future and pass on this knowledge to their own children. We believe that disaster training and other long-term measures should continue to be conducted. As we can see in the so-called "miracle in Kamaishi", students of Unosumai Elementary School and Kamaishi Higashi Junior High School in Kamaishi City successfully took refuge from the tsunami by changing their location and evacuating three times to safer places. This is the result of continued efforts to conduct disaster prevention training. We need to introduce disaster prevention training throughout the nation.

We should have the recognition that large-scale earthquakes can occur anywhere in Japan, including a possible magnitude 7.3 earthquake with an epicenter directly below the capital. The Great East Japan Earthquake affected manufacturing plants, so supply chains were paralyzed throughout Japan. Flooding in Thailand in 2011 caused damage to 420 Japanese companies. Disruption of supply chains caused by a natural disaster can be a global problem. We are required to establish a disaster mitigation system with multiple protection measures to cope with various kinds of disasters. It is also important that tsunami experts, rather than earthquake researchers, make suggestions about the scale of tsunamis based on several fault parameters, and these suggestions should be reflected in the designs of cities.

The Edo shogunate (1603-1867) became impoverished due to not only political

factors but also a complex disaster involving a series of three natural disasters: the Ansei-Tokai Earthquake (1854), the Ansei-Edo Earthquake (1855) and Ansei-Edo Storm (1856). These natural disasters gradually deprived the government of power. We should recognize that our nation can be paralyzed if a Japanese metropolitan area is flooded by a tsunami after a metropolitan earthquake, the so-called Tokai earthquake, Tonankai earthquake or Nankai earthquake.



### **Speech 1**

## **The Great East Japan Earthquake: lessons and recovery efforts**

**Mr. Shigeru Sugawara**

Mayor, City of Kesenuma, Miyagi Prefecture

First, I would like to express my appreciation to all people throughout the nation for your kind consideration during the aftermath of the Great East Japan Earthquake. I would especially like to deeply thank Hyogo Prefecture and the Union of Kansai Governments for the great support they extended to Miyagi Prefecture and Kesenuma City.

The damage caused by the Great East Japan Earthquake to Kesenuma City includes 1,030 people dead and 338 missing as of yesterday (January 18). Since there are 102 unidentified bodies, the total number of fatalities is estimated to have reached about 1,260. It is estimated that about 9,500 households were affected by the disaster. The number of residents and households in the city decreased by 3,990 and 1,018 respectively, including people who moved outside the city after the earthquake.

In images of the sea in front of the Kesenuma fish market shot amid the disaster, ships were trying to evacuate to positions off the coast but were unable to move. Although Oshima Island usually serves as a natural seawall, huge waves surged over the coast. All oil storage tanks on the coast were swept away and completely devastated. Heavy oil spilled from the tanks into the ocean, causing another large disaster. Waves entered the bay and circulated there. The oil caught fire at night, and the fire spread all around the bay area, burning houses and even the mountainsides.

The traffic lights were dead and the narrow roads leading to higher ground were awash with cars whose owners had tried to evacuate. Many people thought that they could not escape without their cars. The traffic was in a state of chaos, being

backed up in both directions because many people had used their cars to evacuate with their family or to pick up family members.

Although about 3,000 people successfully took refuge at 15 designated shelters or in other buildings, they were not able to move from these sites because the roads were blocked by debris and water. Search and rescue activities were also disrupted by lack of means of communication. Wireless communication facilities had collapsed, and cellular phones did not work because of depleted batteries. In a dangerous situation where no one knows when another earthquake or tsunami may strike, people were trying to evacuate themselves or rescue other people. The reclaimed land on which the Kesenuma fish market is located was swept away, so that most of fishery marketing and processing facilities at the port and on the coast were destroyed. Over 80% of fishing vessels were swept out to sea or destroyed and all 38 fishery ports in the city were damaged by the tsunami. The whole city sank almost 70 cm. In the area flooded by the tsunami, 3,314 workplaces equivalent to 80.8% of all workplaces in the city, were inundated. Workplaces of 25,236 workers, affecting 83.5% of all workers in the city, became non-operational. Against this backdrop, reconstruction efforts have been hampered. The land underneath Kesenuma moved more than 4 m southeastward in addition to the subsidence of the ground.

Up to about 1,600 people took refuge at Hashikami Junior High School, where students and alumni, who had received disaster prevention training, worked hard together with volunteers and officers of the Self Defense Forces of Japan. At a junior high school used as a shelter, a graduation ceremony was conducted with evacuees in attendance, and images of the ceremony were broadcast on TV news programs. A graduating student made an address in tears saying, "We had conducted emergency drills to prepare for earthquakes. However, I realized that human beings are weak against the forces of nature. It mercilessly deprived us of many things precious to us. It is too severe to consider our suffering as a divine test. I can't stop feeling pain and anger. However, I believe that it is our mission to live by helping each other without blaming God in spite of our difficult predicament." Listening to this address, I felt a lump in my throat.

I have reviewed the earthquake from different aspects and have found five points to improve: (1) response to power failures, (2) location of oil storage tanks and other hazardous facilities, (3) collection of detailed data about evacuation

methods and countermeasures, (4) understanding of the status of evacuees and victims, and (5) maintenance of tide barrier facilities and the safety of workers.

We regret having not been able to establish a disaster countermeasures office due to the small capacity of the power generation system at city hall. As a countermeasure against power failures, we have decided to introduce power generators with this year's budget. During the disaster, we were concerned about dialysis patients at hospitals. However, hospitals were able to produce electricity with their own on-site power generators, and the power supply to hospitals was restored three days after the earthquake. We realized that our lives depend on a sound energy supply.

All oil storage tanks located at the edge of ports were destroyed. The Ministry of Land, Infrastructure, Transport and Tourism is investigating where the tanks are to be located. While it is desirable to bury them under the ground or place them in a higher location, they should be located on an estuary or some other coastal location for convenience of transportation. Kesenuma City has to solve the dilemma of a fishery city in which facilities with safety issues needed to be located on the coast.

We need to set up new rules for evacuation routes by taking evacuation by car into account. Members of the local fire brigade used to close the seawalls and flood gates. In the earthquake, six firefighters were killed when they were leading evacuees to safety after closing the gates. There is a plan to construct seawalls that can respond to a level 1 tsunami. Given the need to ensure the safety of the fire brigade members who close water gates and the required increase in the size and number of these facilities, it seems very difficult to realize the plan.

I hope that the government, research institutions, and other authorities concerned will examine the following four issues: (1) extensive application of offshore GPS wave gauges (2) practical use of an emergency tsunami warning system (3) improvement of cellular phone systems (4) the structure of automobiles.

During the last great earthquake, municipal governments were not able to see the data collected from observations made by offshore GPS wave gauges,



despite the fact that they were working properly. Comparing the estimated flooded area calculated based on data collected by the gauges with the actual flooded area, we found that the estimate agreed almost entirely with the actual flooded area. I am very sorry about this, because if the data had been sent to us, we could have estimated when and what size tsunami would come and informed the residents as to how many minutes were left to evacuate. Seven wave gauges are currently set in a line in the Pacific Ocean. Duplicating the line to observe waves from multiple points would make it possible to identify epicenters more accurately and collect more detailed tsunami data.

Offshore GPS wave gauges can be used for observation of tsunami. Using them, we may quickly respond to tsunamis in cooperation with the Japan Meteorological Agency and other authorities concerned. I believe that duplication of the offshore GPS wave gauges system would be highly effective in acquiring accurate and detailed information swiftly, and thus ensuring appropriate backup activities.

An emergency tsunami warning system to issue tsunami alerts via TV, radio and mobile phone in the same manner as the emergency earthquake warning would be very useful. It would be possible to reduce the number of people who try to go back home out of concern for their family if they can easily contact their family members. To secure mobile phone connections, measures to give priority to calls within areas affected by a disaster, to set a limit on the duration of each call and to enhance the power sources of base and relay stations by introducing solar panels would be effective.

Among those who evacuated by car after the earthquake, not a few people survived because their cars did not sink even when they were caught up in the tsunami. I hope that automobile manufacturers will reflect on the knowledge gained from this experience in terms of vehicle design, by making vehicles more airtight and enhancing their buoyancy. Both features are remarkably helpful in saving passengers' lives. In addition, to prepare for the breakdown of power windows in flooded cars, one window should be left able to be opened manually so that passengers can evacuate from the window even if there are no tools to break it. An "Evacuation Manual" needs to be provided for each car.

The subtitle of the Kesenuma Earthquake Disaster Reconstruction Plan is

“Coexist with the sea.” If a tsunami strikes our city, we have to reconstruct it, thanking the sea for its blessings as our predecessors have done. Seawalls designed by Miyagi Prefecture to respond to level 1 tsunamis have a height problem in terms of landscape, function and amount of space taken up by ports. Nevertheless, we will address these problems by searching for better locations and shapes to build reliable seawalls that can protect our assets and lives.

There were many volunteers who came to the city to help us. However, we were not able to accept all of them due to lack of a system to accept them. Establishing a system to accept volunteers is also needed. A total number of 48,476 people – a huge number - have registered with the Kesenuma volunteer center as of December 15, providing great support. There was encouraging news for the fishing industry. At the end of August, Pacific saury were brought ashore at Kesenuma Port and the fish market returned to life. Bonito fishing was resumed in June and at the end of the season, Kesenuma has achieved the largest catch of fresh bonito in Japan, a title it has held for 15 consecutive years.

We will also address the development of industry and securing employment. Lastly, I would like to express my deep gratitude to all of you throughout the nation and around the world for your great support and cooperation. I cordially ask you to watch over our reconstruction efforts and thank you in advance for your continued support.



## **Speech 2**

### **Lessons from the Indian Ocean Earthquake and tsunami and efforts for reconstructions**

#### **Mr. Eddy Purwanto**

Deputy of Governance, Office of the Indonesian Vice President, Former Chairman of the Aceh-Nias Rehabilitation and Reconstruction Agency (BRR)

In December 2004, the Northern Sumatra Earthquake occurred on the western side of Aceh, causing a huge tsunami in India, Sri Lanka, Thailand, Malaysia and a number of African countries. About 500,000 people had lived on Nias Island, Aceh Province. However, a huge tsunami hit the area and smashed everything on the ground. A coastal area 800 km long and 1-6 km wide was destroyed, and the landscape was devastated as in the area affected by the Great East Japan Earthquake.

The damage caused by the tsunami included 120,000 completely collapsed houses and 70,000 damaged houses. It also affected 14 ports and harbors, 120 bridges, 3,000 km of roads, 1,052 government buildings, 2,000 schools, 114 healthcare centers, 20,000 ha of aquaculture ponds, 60,000 ha of farmland and 100,000 small- and medium-sized companies. A total of 167,228 students lost their schools and 2,500 teachers were killed.

Aceh had been the fourth poorest province in Indonesia and a site of a prolonged conflict when it was hit by the tsunami. Therefore, there were many difficulties in reconstructing the area. We made every effort to reconstruct Aceh by adapting our plans in line with the real situation.

Let me explain our reconstruction efforts in phases. For the first two weeks, we received international support from the US and Australian militaries. Emergency relief operations were successfully conducted by them. While armies, the Red Cross and other organizations provided aid, the government established the Rehabilitation and Reconstruction Agency (BRR) and new laws, aiming at the nation's recovery within four years. The government needed to establish an

authority to arrange different ministries and agencies during the period of reconstruction. We received donations from NGOs and the Government of Indonesia. While the amount of donations made by NGOs was at the same level as other disasters, the government covered one third of the funds for reconstruction for the first time.

To facilitate reconstruction, we need to learn from the similar experiences of other countries and have discussions with residents. Without citizens' agreement and involvement, the government can create and develop nothing useful for reconstruction. People who want to continue to live in a village should be the master of their own destiny. Citizens in Aceh made a hazard map in cooperation with facilitators who were sent from our agency. We have supported citizens' reconstruction efforts in every sector including housing, infrastructure, land acquisition, development of human resources and economic growth.

Evacuees first lived in temporary housing consisting of tents, then shacks, and then houses provided by the International Red Cross. Since it will take three years to provide evacuees with apartments, we need to continue to provide temporary housing. Although there were only mosques still standing immediately after the tsunami, a total of 140,000 residents and other facilities have now been constructed in these four years.

Whenever an area is hit by a disaster, donors promise to construct buildings. However, in many cases, there is a problem in that the number of buildings actually constructed is smaller than that they have promised. This is because donations may be cut off if corruption arises in the process of development and reconstruction. We had estimated the amount of damages caused by the disaster at \$4.9 billion. However, then US President Bush said that \$7.1 billion would be necessary to reconstruct Aceh better than before the disaster. In some disasters, the amount of donations actually made can diverge from the original estimate. Fortunately, 93% of the funds necessary for reconstruction were covered by donations from NGOs and aid organizations that paid the same amount as they promised.

BRR was a temporary agency. However, the number of staff members increased in 2007 and reached 700 in 2009. The agency consisted of officers from the government and directors in charge of each field. The chairman was engaged in

coordination of departments. Since BRR integrated thousands of projects and donations to support, we employed a one-stop service that allowed all procedures needed to acquire permission for visa extensions, tax exemptions and purchase of materials to be completed in one day.

Municipal governments and many other organizations provided BRR with logistics support to facilitate its activities to coordinate donors and the staff of international organizations who worked in Aceh. We did this using a database system. While allotting donations to various fields, we achieved accountability for the management and transfer of assets by using a GPS geographical information system.

Reconstruction should always be made with a sense of crisis. Speed is most important in the beginning phase and quality is the second. To meet the needs of communities, victims need to be involved in the reconstruction efforts. It is also important to advance structural reform of the organization in accordance with the phases of reconstruction. The most important things are not allowing the recurrence of the same mistakes, a high level of transparency in a dynamic organizational structure, and giving the authority to make decisions and respond to various issues to local communities. Being faithful to our word, we will strive to gain public trust by proving our honesty and integrity in our work to reconstruct fishing villages and take countermeasures against infectious diseases without corruption.



### **Speech 3**

## **Lessons from major tsunami disasters in catastrophic disaster risk management**

### **Dr. Srikantha Herath**

Senior Academic Programme Officer, United Nations University

We have learned the lesson that it is difficult to prepare for a disaster that rarely occurs but has a huge impact from the experience of Sri Lanka after the Indian Ocean tsunami in 2004. Although there are many differences between the Indian Ocean tsunami and the earthquake and consequent tsunami disaster in Japan, we can find a similarity in the size of damage between the two. Today, I would like to talk about lessons on sustainable risk management based on my experiences in the disaster and reconstruction in Sri Lanka.

Of the people killed by natural disasters in 2004, 94% were victims of the Indian Ocean tsunami. The huge tsunami affected 35% of the land area of Sri Lanka. Over 31,000 people were killed, 4,100 people went missing and a total of more than 1 million people were affected by the tsunami. A high rate of 1,809 per 1 million residents were killed and half of the victims lost their jobs.

It is estimated that the tsunami caused direct economic losses of about \$1 billion, equivalent to 7% of the GDP of Sri Lanka, and this loss caused \$330 million of indirect losses, equivalent to 1.5% of GDP. Economic growth is estimated to have decreased by 1% from 6% to 5%.

While the southeastern area where the highest tsunami hit did not have a large population, the west coast, an area with dense economic activity, incurred severe damage, and almost all the people in wildlife refuges at the time, including many tourists, were killed. On the eastern side of Sri Lanka, the coastal area was almost completely destroyed.

People in Sri Lanka had not experienced any tsunamis in the past. Although a

reference in a historical material suggests that a tsunami might have occurred in the past, it was too old for the government to utilize the information when they faced an actual tsunami. They could not understand what had happened. People in Sri Lanka only started using the word "tsunami" since the year when the tsunami struck them.

After the Indian Ocean tsunami, the government tried to construct 100,000 houses. However, they were able to build them only at the pace of 5,000 residences a year because of conflicts and antigovernment campaigns in the country. At this pace, it will take 20 years to build 100,000 houses.

In the Great East Japan Earthquake, some 20,000 people died or are missing. The tsunami that hit Japan was far larger than that in Sri Lanka. If a tsunami had hit Sri Lanka on the same scale as in Japan, many more people would have died or been injured. On the other hand, if a tsunami had hit Japan on the same scale as the 2004 Indian Ocean tsunami, it would have had a smaller impact on Japan.

The frequency of disasters affects the degree to which we can prepare for them. We can mitigate the damage caused by the kinds of disasters that occur frequently, however, a disaster that rarely occurs causes severe damage. Even if a particular kind of disaster rarely occurs in a certain place, large-scale disasters occur around the world every year. Therefore, we need to have a global perspective in order to share experiences and information with areas affected by disasters.

We cannot protect safety perfectly in an unexpected disaster. To deal with unexpected disasters, we should introduce a "fail-safe" structure into the social infrastructure that prepares for the occurrence of failure, instead of a protective structure designed to keep the system functioning without any failure.

Learning from nature is also important. According to an ecological research study conducted by the United Nations Environment Programme (UNEP) in Sri Lanka after the tsunami, the ecosystem in the area was affected little by the disaster and has already been rapidly recovering. Salinized water in wells has been improving by the effect of rainwater. I think that introducing the resiliency of the ecosystem into disaster control measures as a safety valve is important.

The largest problem in reconstructing Sri Lanka was to acquire land for housing. With the funds for reconstruction raised mainly by NGOs, houses were built in locations away from coastal areas. However, in some cases, most residents left these houses because of the lack of infrastructure and jobs. The central authority did not have sufficient experience or ability to lead the reconstruction efforts. Sri Lanka should have established an agency with stronger authority. In Sri Lanka, newly established organizations with authority over land acquisition and development planning obtained successful results in large-scale irrigation and electric power generation projects. However, this experience was not utilized in reconstruction efforts after the tsunami in 2004.

The Great East Japan Earthquake and consequent tsunami showed us new problems concerning disaster control. Given the fact that unexpected disasters can occur due to climate change, management of large-scale disasters is becoming more important. I hope that Japan will be a disaster mitigation model that can prepare for both frequently- and rarely-occurring disasters. Resiliency of the ecosystem has so far not been taken much into account as a disaster mitigation measure. However, it may play a role in reducing risk that exceeds the capacity of the infrastructure. Moreover, a strong organization with sufficient authority and ability needs to be established based on the experiences of past large-scale disasters, in order to promote reconstruction efforts.





#### **Speech 4**

### **Tsunami damage and reconstruction from the Great East Japan Earthquake**

**Dr. Fumihiko Imamura**

Professor, Tohoku University School of Engineering

I have been engaged in disaster prevention measures since before the Great East Japan Earthquake. Therefore, as a person working at a university in an area affected by the disaster, I was really disappointed to see severe damage in this area caused by the earthquake. Today, ten months after the disaster, I would like to consider how we should reconstruct the damaged area and what kind of city we should create.

We had developed various disaster control measures following an assumption that a huge earthquake and tsunami could hit Miyagi Prefecture in 30 years with a 99% probability since before the Great East Japan Earthquake occurred. The scale of the earthquake that actually occurred was far different from our assumption. A magnitude 7.5 earthquake may cause a 2-3 m movement in faults while a magnitude 9 earthquake has more than 20 times the energy of the former. In the Great East Japan Earthquake, an unexpected amount of energy was released at one time and caused a large-scale earthquake in an area spreading 500 km from north to south. The seismic energy distribution was uneven, and it is said that magnitude 7-8 aftershocks are likely to occur after a magnitude 9 earthquake. Even today, in places where energy was not completely released, or areas surrounding points where the tectonic plates did not break, aftershocks are occurring frequently.

Although we were not able to forecast the earthquake, there have been advances in science and technology in this area. Even if we cannot forecast the scale of a coming earthquake, we can forecast the scale of a tsunami by observing wave forms on a real-time basis. Ordinary tsunamis have a long one-hour cycle with a 30-minute elevation period and a 30-minute descent period. However, in the

Great East Japan Earthquake, we found that a second “tsunami earthquake” occurred at a point 1,500 m below the surface of the sea after the first tremor through real-time observation. The Japan Meteorological Agency issued an additional warning that was different from the one issued immediately after the earthquake, but this information did not reach residents properly.

Experts investigated the actual conditions after the tsunami. Initially, only 400 points were covered by the investigation because it was difficult to reach the area affected by the earthquake and tsunami. Today, we have data of the distribution of the tsunami for 4,000 points, mainly from Hokkaido to the Sanriku region. The height of the tsunami that reached an area near Hokkaido was 5 m while the tsunami that hit the coastal area near the epicenter in the Sanriku region exceeded 39 m.

Miyagi Prefecture had never experienced a 5 m or higher tsunami. The height of the tsunami on March 11, 2011 exceeded 10 m. Usually, tsunamis do not change their height even after reaching land. However, the tsunami that hit the Sanriku shoreline increased its height due to the topography of the coast, causing very serious damage.

Minamisanriku Town was equipped with water gates and seawalls and had prepared for a tsunami in terms of both “hardware” and “software” based on lessons that they had learned from the Valdivia Earthquake in 1960. Nevertheless, with an over 15-m-high wave entering the coastal area and the ground sinking 1 m there due to the severe shaking, the land itself was eroded and swept away by the tsunami with a strong destructive power. Although railway stations were swept away, train passengers were able to safely evacuate thanks to the conductors’ directions.

We are now studying how to create a resilient city. Through comparison with other reconstruction efforts in history, we are trying to clarify the limitations of the resistance of facilities against earthquake and tsunami and to design a city with established disaster control measures in terms of both “hardware” and “software.” The Sanriku shoreline had been struck by tsunamis twice in 1893 and 1933, affecting more than 3,000 people. Therefore, this area had taken various countermeasures against tsunami.

For instance, Taro Town in Iwate Prefecture constructed a seawall, spending a large amount of money. There were some people who insisted on moving the town to higher ground to prepare for a tsunami. However, the residents of the town decided to build an L-shaped seawall because the plan to move the town faced a land-use problem. The L-shaped seawall was completed a few decades after 1934 and protected the town from the tsunami caused by the Valdivia Earthquake in 1960.

Unfortunately, this experience became counterproductive, generating another risk. When the town planned to increase the number of seawalls, designers proposed an L-shaped structure to prevent waves from coming inland. However, the town prioritized effective utilization of land and employed a design with an inverted-L-shaped structure based on the experience of the tsunami caused by the Valdivia Earthquake. However, the inverted-L shape had an adverse effect in the Great East Japan Earthquake. The so-called “best seawalls in Japan” were destroyed because of the shape, which concentrated waves in the bay. We should learn from these results. To cope with massive tsunamis, we need to take various countermeasures based on the concept of “multiple protection.” Moreover, not only technologies but who and how use them are also important.

Goryo Hamaguchi, famous for an incident called “Inamura no hi (Burning rice field),” was a respected figure who dedicated himself to disaster prevention and education in his home town, Hiromura, in Kishu (present-day Wakayama Prefecture). After the Ansei-Edo Earthquake and consequent tsunami struck Hiromura in 1855, more and more residents left the village in spite of Hamaguchi’s efforts to provide various support. In the chaotic era when Commodore Perry and his black ships came to Japan, Hamaguchi launched the construction of an embankment at his own expense and paid wages to villagers who participated in the construction work to support themselves. The embankment with a double-layered structure and pinewood was able to serve as a multiple-protection facility against tsunami. In addition, he planted wax trees on the embankment to establish a sustainable system for raising funds by selling the trees.

To remember Hamaguchi’s achievements, Hiromura Village has held the “Tsunami Matsuri (festival)” on November 5 every year since 1903. We can learn many things from Hamaguchi’s work, especially concerning reconstruction of the

village.



### **Panel Discussion**

#### **Learning from the tsunami experience to prepare for major disasters**

#### **Coordinator:**

#### **Dr. Kuniyoshi Takeuchi**

Director of the International Centre for Water Hazard and Risk Management (ICHARM), Public Works Research Institute (PWRI)



#### **Panelists:**

#### **Dr. Fumihiko Imamura**

Professor, Tohoku University School of Engineering

#### **Mr. Eddy Purwanto**

Deputy of Governance, Office of the Indonesian Vice President

#### **Dr. Srikantha Herath**

Senior Academic Programme Officer, United Nations University

#### **Dr. Yoshiaki Kawata**

Executive Director, Disaster Reduction and Human Renovation Institution (DRI)



**Takeuchi:** Following the establishment of the Reconstruction Agency in February, activities to recover from the damage caused by the Great East Japan Earthquake will start on a full scale. I look forward to having a deep discussion with you here on how we should reflect on the lessons and knowledge that we have learned in the reconstruction efforts.

Dr. Kawata gave us a suggestion as to what we should do to prevent the same damage as occurred in the Great East Japan Earthquake if a triple interlocked earthquake occurred again. Kesenuma Mayor Sugawara has devoted himself to reconstruction of the city, focusing on communication with citizens. Mr. Purwanto

talked about his efforts as a person in charge of the Reconstruction Agency in Aceh. Dr. Herath has specifically explained the concept of “fail safe.” Dr. Imamura has explained the importance of multiple protection measures and the necessity of a system of people and operations to maintain these measures by presenting the example of Goryo Hamaguchi.

In relation to these topics, first I would like to ask panelists for their brief comments about what is important for reconstruction.

**Imamura:** We are creating a digital archive of data of the damage caused by the tsunami disaster and the actual situation of evacuees, like Kobe University’s “Great Hanshin-Awaji Earthquake Disaster Materials Collection.” We are aiming at establishment of an intellectual infrastructure containing abundant information about disaster control including news images, records of ordinary people’s experiences and blogs that we collect on the Internet, as well as information on the progress of the current recovery and reconstruction. We would like to disseminate this knowledge to not only the nation but also throughout the world.

**Purwanto:** It is important for all of us to be ready to respond promptly and in unity to a disaster that has occurred anywhere in the world and to reduce risk and damage. We are preparing a 300-400 page practical manual to help people respond to disasters, in cooperation with member countries of the Association of Southeast Asian Nations (ASEAN) with similar experiences of disasters. We are aiming at preparation of a curriculum and a manual to be used for training that we are planning to conduct at training centers of our regional offices in Bangkok and Kobe, in order to share disaster mitigation knowledge with other countries in the world.

**Herath:** The level at which we can prepare for disasters depends on resources, the situation of the area and the frequency of the particular type of disaster. We need at first to conduct appropriate risk analysis, take measures against what is likely to occur as far as possible, and consider how to reduce loss. It is important to establish a risk reduction system in which risk is diversified among the region, the nation and the world, ensuring that additional risks are reduced. Introducing the resiliency of ecosystems that Dr. Imamura talked about into the system enables us to create a system in which any remaining risks can be absorbed by nature.

**Kawata:** Since the damage caused by the Great East Japan Earthquake was almost twice as severe as that caused by the Great Hanshin-Awaji Earthquake, the reconstruction process may be more complicated. How victims will contribute to city-rebuilding efforts will decide the direction of reconstruction. An innovative vision of reconstruction is needed now.

We also need to disseminate information because very few researchers are visiting Japan from overseas due to the nuclear accident following the earthquake. Dissemination of information from the World Bank and research institutions is also important. We can also disseminate information thoroughly by continuing efforts to hold many symposiums like this forum.

**Takeuchi:** Due to the limited time, I will ask you about three major points. First, how should we create an innovative reconstruction vision by overcoming the problem of raising funds? Next, how should we establish an international cooperation system that Mr. Purwanto talked about? Lastly, how should we pass on our experiences in digital archives and other forms?

**Purwanto:** Many people were killed and property was severely damaged by the tsunami in Indonesia. I think that if proper measures had been taken, the damage caused by the Great East Japan Earthquake would have been smaller because the Japanese knew that a tsunami could come after the earthquake. We should consider reconstruction and disaster mitigation in combination, based on lessons from that experience.

**Herath:** Since Sri Lanka's main industry is tourism, building a town 200 m away from the coast is difficult. On the other hand, if mangrove jungles are lost, tourism will suffer. Therefore, we need to draw up a compromise between disaster control and city development. One solution is to utilize public parks and other recreation sites for disaster control.

**Kawata:** Fixing priorities for what we should protect is important when we develop a vision for the reconstruction. Protecting residents' lives from an external force must have the highest priority. In Japan today, with the problems of depopulation, the aging society and lack of financial resources, we need to revitalize fishing, agriculture and tourism, and devise a reconstruction plan to enrich society.

**Imamura:** Investing in what is truly necessary for designing a growing city is important. There are two criteria to investigate; one is whether the investment will protect facilities without which we cannot reconstruct the town, such as administrative offices and schools, and the other is whether the investment will

help protect residents' lives.

**Kawata:** At reconstruction conferences, these points are also discussed. In the Sanriku region, tourism has grown to become larger than the marine products industry. The Sanriku Expressway will be opened by 2014. Revitalization of tourism by innovative means, including utilizing this expressway, is needed to attract people to the Tohoku region.

**Takeuchi:** Devastation of manufacturers' facilities in the Tohoku region affected the whole world because the region has served as a center of high tech industries. However, in most regions, factory districts are still planned to be located in the coastal areas.

**Kawata:** Sharp's factory complex in Sakai is located high enough to avoid damage from tsunamis and storm surges even if the so-called Nankai earthquake occurs. Companies invest in what generates profit. An aggressive strategy that focuses on the potential profitability of businesses in Tohoku may attract companies into the region. Then they would take disaster control measures in the region.

**Takeuchi:** Mr. Purwanto said that Aceh was successfully reconstructed thanks to abundant aid from overseas and the citizens' united efforts to establish a social structure without corruption. Do you have any ideas about effective regional cooperation in Japan?

**Purwanto:** I propose to strike a balance between benefit and cost. Since Aceh is a farming community, moving people to a high place is easier and more beneficial than building seawalls. Meanwhile in Japan, if seawalls can protect factory complexes on the coast, companies would cover the cost of building them. If you construct toll roads on the seawalls and embankments and connect them with other roads, the development cost may be covered by the tolls.

**Takeuchi:** Dr. Herath, what ideas do you have regarding regional cooperation for reconstruction?

**Herath:** Various organizations should cooperate with each other to collect information and share knowledge. Japan has established many new organizations. I think that Japan can take effective disaster control measures with a global view by linking existing organizations and sharing information.

**Imamura:** To cooperate with each other, the parties concerned should share the same purpose and play individual roles. Within a country, people can easily cooperate with each other because they share the same goal of controlling natural disasters. We can see an example of organic cooperation in a project to create a digital archive. We collect and classify basic information in Japanese.



Universities in the US and Europe translate the information and post it on Yahoo! and Google.

**Kawata:** International cooperation is important. The National Diet Library was allocated ¥2.7 billion in the third supplemental budget for a project to establish an archive. Without cooperation in analyzing the data from universities and academic research institutions, the collected information cannot be used effectively. At our institution, expert researchers are engaged in the processing of data. Such works are indispensable for making data usable.

**Takeuchi:** Today, disasters occur around the world and have an impact on multiple countries. Some people say that disasters are no longer the problem of one country, and international standards of reconstruction and development are needed to protect the safety of the world. What do you think of this opinion?

**Herath:** I think that this is very important. Moreover, we need an indicator of resiliency showing what degree of risk can be absorbed. Although the severity and frequency of disasters are different depending on the country, proving resiliency is important.

**Purwanto:** When Aceh was hit by the tsunami, other countries provided medical, food and pharmaceutical aid. On the other hand, Japan accepted only medical support teams from developed countries after the Great East Japan Earthquake. Due to the high standards for water quality in Japan, we were not allowed to send even water. Developed countries cannot always respond quickly. I think that if there are international standards, neighboring countries can help each other.

**Takeuchi:** Although there was a problem in the acceptance criteria, Japanese people deeply thank you for your generous support from around the world.

**Kawata:** International cooperation for a prolonged tragedy caused by a disaster tends to fade gradually, while many countries provide aid immediately after the disaster. When Mount Pinatubo erupted in 1991 as one of the world's largest scale in the 1990s, support from the international community was given only immediately after the eruption. International cooperation aiming only at disaster relief support would be difficult to maintain. If economic recovery of the nation affected by a disaster is included in the aims of the cooperation, donor countries would find it advantageous in continuing their support. I believe that international cooperation should be established in a manner in which each country can contribute according to their strengths with a long-term view.

**Takeuchi:** The United Nations Office for the Coordination of Humanitarian

Affairs (OCHA) collects a huge amount of money in the category of humanitarian support. I think that support for reconstruction from disasters should be included in support for development so that reconstruction projects can gain sufficient financial resources. To avoid the "hydroillological cycle," in which people gradually lose interest in an event that once attracted much attention, experts should play a role. In this respect, I think that the Disaster Reduction and Human Renovation Institution and other organizations in Kobe have performed well. Now, we would like to invite comments and questions from audience.

**Questioner 1:** I stayed in an area affected by the Great East Japan Earthquake for two weeks after the disaster occurred. Before going to the site, I searched for the archives of the Disaster Reduction and Human Renovation Institution and found no suggestion of the possibility of a magnitude 9.0 earthquake off the coast of Miyagi Prefecture. The city of New Orleans has not yet recovered from the damage caused by Hurricane Katrina because of the US government's unfavorable policies. I think that it is meaningless to decide whether a recipient country accepts aid or not depending on whether the donor country is a developed country or how high the donor countries' technological level is. We should respond to natural disasters with humility and use the knowledge of not only natural science but also the humanities and social science when we devise a vision of reconstruction.

**Questioner 2:** There was a comment about lack of international cooperation in medical services. However, the Japan International Cooperation Agency (JICA) and NGOs have developed cooperative activities in Sri Lanka and Aceh in Indonesia. In international cooperation, we may face a language problem and lack of people with whom we can work together in the recipient country. In Sri Lanka and Indonesia, we were able to develop successfully international cooperation because we were able to find people who had studied in Japan and could speak Japanese.

**Questioner 3:** I heard of "Tsunami Tendenko," a tradition that teaches that people should protect their own life by themselves when a tsunami comes, from a fisherman in the Tohoku region. The important thing is to understand where we should take refuge. I ask governments to develop reliable hazard maps.

**Questioner 4:** I have worked with Mr. Purwanto in Aceh. I know that there is a problem that people may not come back to the area affected by the disaster even after it has been reconstructed. However, I think that in Indonesia, people would come back if there is a school. This idea can be applied to reconstruction in Japan. One of my friends from another country said that Japanese must

seriously accept the fact that Japan's disaster prevention measures were imperfect. Sharing the analysis on past disaster prevention measures in Japan is also important to prevent people in developing countries from thinking that they cannot achieve what Japan had not been able to do, and thus losing their confidence in preparing for a disaster.

**Takeuchi:** Do you have any comments on these opinions?

**Imamura:** We are becoming able to forecast earthquakes and other recurring disasters with advances in technology and science. On the other hand, for one-off disasters, we have to respond instantly to each situation. It is difficult for individuals to obtain tsunami hazard maps for all locations. However, if the elevation and the height of each location and building are shown at each site, it must be helpful for people to know where they should evacuate when an earthquake or tsunami occurs.

**Purwanto:** In Aceh, there are many buildings constructed by Japan with a capacity of hundreds of people. We should designate relatively high buildings as shelters. Thank you for the compliment from Questioner 4. Although researchers are said to be able to forecast disaster with their abundant knowledge, their forecasts are often wrong. We should recognize that we do not know everything and be aware of what we should do in the future.

**Herath:** To take measures against a disaster that we have never experienced before is difficult. In Sri Lanka, development of necessary technologies is commissioned to the army on the President's initiative. To protect people's lives, a multiple-layered system enabling the government and local authorities to collect information on a real-time basis is important.

**Kawata:** Some 20,000 people were killed as a result of the Great East Japan Earthquake. To honor the memory of the victims, the survivors should live our lives to the full. I know that it is difficult to integrate the opinions on reconstruction of all people affected by a disaster. However, without accomplishing this work, we cannot create a good city. The role of local government is to employ a new framework to offer people opportunities to discuss the matter thoroughly.

**Takeuchi:** BRR was engaged in town building with the participation of citizens in Aceh. Their mindset is in common with the idea of honoring the memory of the victims that Dr. Kawata mentioned. Dr. Herath said that although there might be a huge number of victims in a disaster that we have never experienced before, advances in science and observation technology make it available to reduce damage from disasters. Dr. Imamura said that a system to

offer accurate information will be developed through revision of hazard maps. I strongly think that we should establish a solid system that can prevent a recurrence of the same tragedy, based on the idea of individual disaster control, or "Tsunami Tendenko," as well as science and technology.

I hope that this symposium can contribute to disaster control and mitigation throughout the world. Thank you.