Actions which should be taken to reduce the damage caused by natural disasters

YAMASHITA Masaru,
Director of the Research Center for Disaster Risk Management

(Key words) Natural disaster, disaster risk, warning and evacuation, technical guidance, Sediment Disaster Prevention Act

1. Introduction

The history of the postwar growth of Japan has also been a history of a battle with natural disasters. An examination of changing numbers of fatalities and missing from natural disasters [1)] shows that from 1945 to 1960, earthquake disasters such as the Fukui Earthquake and wind and flood disasters such as the Ise Bay Typhoon struck the national land while core disaster facilities were being constructed, claiming between about a thousand to several thousand victims each year.

After later progress in the construction of levees on major rivers, by about 1983, the numbers of fatalities and missing was down to a few hundred each year. During this period, damage caused by large-scale flooding fell, while a relative increase was seen in the percentage of fatalities and missing as a result of sediment disasters caused by torrential rainfall, volcanic eruptions, and earthquakes.

Since that time, the numbers of fatalities and missing persons has fluctuated between several tens of people to between 100 and 200 as a result of aggressive implementation of non-structural measures such as the establishment of warning and evacuation systems in addition to the construction of disaster prevention structures. But, during the same years, the Hokkaido Southwest Offshore Earthquake, the Kobe Earthquake, and the Niigata-Chuetsu Earthquake and other sudden large-scale disasters caused severe damage, while responding to disasters caused by guerilla type concentrated torrential rainfall triggered by climate change and supporting elderly people and others requiring protection during a disaster are now urgent challenges.

2. Natural disasters and their changing environments

As stated above, natural disasters and the environment surrounding them are changing constantly.

Sediment disasters which occurred in July 2010 in Shobara City in Hiroshima Prefecture caused severe damage including one fatality in a range limited to about 5km square where rainfall was concentrated in an extremely short time. A rainfall gauge at the site recorded 173mm in 3 hours, but it is assumed that even heavier rainfall fell at the actual disaster location. In recent years, floods and sediment disasters caused by such extreme climate phenomena have tended to increase, and it is vital that in the future, we take action in response to rising disaster risk accompanying the decline of regional disaster prevention capabilities caused by depopulation and aging etc. in addition to this climate change.

When the Central Chili Coastal Earthquake occurred on February 27, 2010, tsunami warnings were issued over a wide area centered on the Pacific coastline. More than 24 hours passed between the announcement of a warning at 9:33 a.m. on February 28, and the cancellation of all precautionary warnings, while on trunk highways along the Pacific Ocean coastline, travel restrictions were enforced over long distances for long periods, causing confusion including severe congestion.

Evacuation advisories were issued to about 1.69 million people living in a total of 189 cities, towns, and villages throughout Chili, but fewer than about 40% of the people actually evacuated, even in regions warned of a large tsunami [2)], leaving problems concerning the people's evacuation awareness and information dissemination including that performed at normal times.

On January 26, 2011, full-scale volcanic activity began after about 300 years of inactivity at Mt. Kirishima (Shinmoedake), spewing vast quantities of volcanic ash during repeated eruptions. In regions where ash fell heavily, the danger that future rainfall will trigger debris flows has increased, so in addition to physical measures such as emergency removal of rock from existing sabo dams, it is vital to clarify and to provide information directly relevant to the evacuation of the residents: critical rainfall for warnings and evacuation, hypothetical debris flow inundation areas and so on.

3. Initiatives by the Research Center for Disaster Risk Management

Below, characteristics of natural disasters in recent years and initiatives taken to resolve challenges are introduced.

(1) Response to rising risk of disasters accompanying climate change

It is difficult for conventional observation systems to clarify the actual state of recent guerilla type

concentrated torrential rainfall, posing a major obstacle to implementing measures. So in upstream regions where this has delayed river improvements and the installation of observation equipment, and in cities where severe disasters are predicted, X-band radar will be used to boost the precision of rainfall forecasts and water level predictions.

And technologies to provide real time information revealing the state of inundation of cities by both outer waters and inner waters is being developed as the construction of a framework for the sharing of information among concerned organizations is being studied.

(2) Support for damage mitigation by reliable warnings and evacuation

At the same time as public investment falls and social infrastructure facilities deteriorate, the establishment of reliable warning and evacuation systems is an important pillar of disaster prevention and mitigation measures.

A review of proper procedures for restricting traffic in anticipation of tsunami has been initiated in response to the earthquake tsunami which struck Chile, but technical knowledge related to traffic restriction measures to prepare for tsunami which should be included in this review, and general knowledge necessary for employees to take appropriate action in the field will be compiled to ensure road users' safety and improve their response.

In order to urge appropriate evacuation activities to prevent human loss when runoff or other disasters occur, the most appropriate evacuation methods for each form of residence and disaster situation will be studied along with methods of transmitting information based on residents' acceptance of disaster prevention information.

And by focusing on social capital in each region, methods of continually improving regional disaster prevention capacity according to its characteristics are being studied.

(3) Technical guidance at disaster scenes

Technical guidance on the sites of large-scale disasters is one of the major roles of the National Institute for Land and Infrastructure Management. The NILIM dispatched an employee as a member of TEC-FORCE, an emergency disaster countermeasure team, to Shobara City in Hiroshima Prefecture in response to the torrential rainfall disaster of July 16, 2010 caused by the early summer seasonal rain front, and another employee as a member of the same team to Amami in Kagoshima Prefecture in response to the rainfall disaster of October 18, to survey the state of damage and provide technical support and advice concerning restoration policies, etc.

The NILIM sent one more employee as part of a government support team to the eruption of Mt. Kirishima (Shinmoedake) which started in January 2011 to provide technical advice concerning the preparation of measures which need to be taken quickly, the enactment of an evacuation plan in anticipation of predicted debris flows for example.

4. Conclusions

The Sediment Disaster Prevention Act (Act on Sediment Disaster Countermeasures for Sediment Disaster Prone Areas) was revised and enforced in May 1, 2011. Under this revision, when a large scale sediment disaster is imminent, the national government or prefecture provides information about districts and time periods when a disaster is predicted to cities, towns, and villages in order that their officials can make correct judgments concerning the issuance of evacuation orders appropriate to their residents.

Providing information which is directly linked to the lives of residents requires advanced technical skills and superior judgment at the same time as it is a heavy responsibility.

The Research Center for Disaster Risk Management has, in order to prevent or lighten natural disasters, helped promote facility provision under the revision of the standards, develop disaster mitigation support technologies for use during disasters, and research disaster information which will contribute to appropriate evacuation and methods of providing this information. In the future, we must accompany these activities by actively working to improve technical capabilities so that employees of the Ministry of Land, Infrastructure, Transport and Tourism can make suitable judgments at disaster sites and to do all in their power to respond to increasingly diverse and severe natural disasters.

[Sources]

1) 2010 White Paper on Disasters: Cabinet Office
2) Emergency questionnaire survey of residents concerning tsunami evacuation following the earthquake with its hypocenter on the coast of central Chile: Cabinet Office, Fire and Disaster Management Agency