

NILIM's disaster prevention, disaster mitigation and crisis management initiatives

■ Initiatives for advancement of disaster response based on NILIM's mission and recent R&D

Planning and Research Administration Department, Administrative Coordination Department

Utilizing technologies cultivated in research and development, the NILIM is carrying out various disaster site relief activities, including information transmission concerning the extent of damage, or dispatching specialists, as soon as disasters occur. The NILIM is also working to enhance disaster response by fulfilling duties such as revision of the operational plans for disaster prevention.

The NILIM, Japan's only research institute in the field of housing and public capital, is striving to fulfill its mission to create a safe, vigorous and attractive land and society, with technology as the driving force.

In our research and development regarding disaster prevention, disaster mitigation and crisis management, we are developing "Disaster Perception Technology" that estimates and ascertains the situation of a disaster as soon as it occurs.

Also, in the event of a disaster, we utilize the technology mentioned above to gather information on the disaster situation and to conduct information analysis, after which this information is transmitted to the headquarters of the Ministry of Land and Infrastructure, Transport and Tourism or regional development bureaus, etc. In addition, we conduct disaster recovery assistance through dispatching personnel with specialized knowledge in the various related fields (specialists) to disaster-affected areas to prevent secondary disasters and to implement emergency response measures. We have been steadily developing the practical application of information transmission technologies since the Kumamoto

Earthquake Disaster of 2016.

For the smooth and appropriate implementation of these disaster response measures, policies including an "Operational Plan for Disaster Prevention" are outlined by each phase of disaster relief activities: disaster prevention, disaster response, and disaster recovery/restoration. Starting from the previous fiscal year, we have been updating these to reflect recent R&D trends as well as their practical applications.

Moreover, in July this year the "Business Continuity Plan (BCP)" was revised, having been established in preparation for a massive earthquake striking the Tokyo metropolitan area where our organization itself is affected. We have reinforced the environment for us to continue to fulfill the response duties without delay even in the event of a disaster that could bring the functions related with our assignments to a standstill.

The NILIM will continue working on the advancement of disaster response measures by striving to develop/maintain the system for performing quick and precise assistance in the event of future disasters.

Details ▶ NILIM website: "Research Policy"

<http://www.nilim.go.jp/lab/bcg/busyoukai/kenkyuhoushin/00index.html>

■ Disaster response measures during FY2018

Planning and Research Administration Department, Administrative Coordination Department

In the event of a disaster, we provide the disaster site with assistance through dispatching specialists, as well as technical support, sharing information sharing with and cooperating with related organizations.

During FY2018, major disasters struck Japan, including the "Heavy rain of July 2018" and "The 2018 Hokkaido Eastern Iburi Earthquake", resulting in extensive devastation.

In cases where there is concern that a disaster may seriously affect society, the NILIM starts working under an emergency system together with the Ministry of Land, Infrastructure and Transport. We endeavor to share information regarding the damage in each area by holding meetings of the Emergency Disaster Response Headquarters, and we launched the emergency system when the above-mentioned disasters occurred.

We sent specialists to the disaster site in cooperation with the Public Work Research Institute, Building Research Institute, and Port and Airport Research Institute, etc., to survey the causes of damage, which contributed to the

discussion of countermeasures to be taken.

THE survey result was reported to the leadership at local governments in the affected regions as advisory information based on technical knowledge for the recovery of the affected facilities.

The table below shows the dispatches of specialists in the outstanding disasters of the 2018 fiscal year.

Details ▶ NILIM website: "Disaster-related Information"

NILIM's Disaster Survey/Technical Assistance for Heavy Rain of July 2018

<http://www.nilim.go.jp/lab/bcg/baiu2018/baiu2018.html>

NILIM's Disaster Survey/Technical Assistance for the 2018 Hokkaido Eastern Iburi Earthquake

http://www.nilim.go.jp/lab/bcg/hokkaidou/saigai_hokkaidozishinn.html



NILIM Meeting of Emergency Disaster Response Headquarters (Hokkaido Eastern Iburi Earthquake, Sept. 6)



Advising a head of local government (mayor of Atsuma Town) (Hokkaido Eastern Iburi Earthquake, Oct. 2)

Dispatched specialists (Unit: Number of experts/day)

Field	Heavy rain in July	Hokkaido Eastern Iburi Earthquake
Sewage	2	
River Management Facilities	8	
Sediment Disaster	58	25
Road Facilities	5	3
Buildings		5
Port and Harbor Facilities		2
Liquefaction		7
Total	73	42

(As of Oct. 31, 2018)

NILIM's activity report on the heavy rain of July 2018

Disaster restoration assistance for damage to expressways in Hiroshima and Kochi prefectures Road Structures Department

Based on a request from Chugoku Regional Development Bureau, we provided technical assistance in Hiroshima Prefecture and conducted a survey of damage situations as well as participating in the “Technical Committee for the Disaster Restoration of Kochi Expressway” in Kochi Prefecture.

In the heavy rain of July 2018, roads were also damaged, resulting in a prolonged suspension of traffic on some seriously-damaged parts, which caused a considerable hindrance to the traffic network.

On Matsue Expressway (Shobara City, Hiroshima Prefecture), where the a cut slope was damaged by a landslide, in response to a request from Chugoku Regional Development Bureau, we conducted an on-site survey on July 14 and provided technical assistance on safety check methods and restoration toward the resumption of traffic.

We also dispatched our staff to Tajikawa Bridge, where the upper part had broken away due to the collapse of a mountain slope (Otoyo Town, Kochi Prefecture) on July 20, and we carried out a damage survey and provided the expressway company with advisory points to consider in the restoration procedures from a technical point of view.

Even after dispatching our staff, we are continuing to provide technical assistance, including participation in the “Technical Examination Committee for the Restoration of Kochi Expressway”.



Survey conducted in the vicinity of Takano IC of Matsue Expressway



Damage survey on Tajikawa Bridge of Kochi Expressway

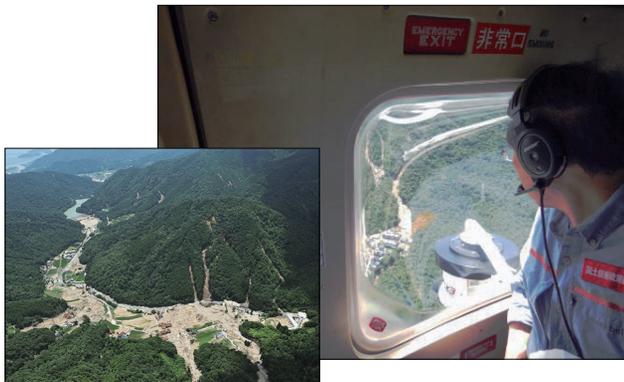
Details ▣ NILIM website: “Disaster-related Information”
Activities in the field of road facilities during the heavy rain of July 2018 - Emergency support activities <http://www.nilim.go.jp/lab/bcg/baiu2018/katsudoujokyou/douro.pdf>

Technical assistance provided for sediment disasters in Hiroshima, Ehime and Kyoto prefectures Sabo Department

We carried out technical assistance in relation to the sediment disaster that occurred in Hiroshima, Ehime and Kyoto prefectures by dispatching our staff to those disaster sites.

Due to the heavy rain of July 2018, 2,512 cases of sediment disasters occurred in 31 prefectures.

On July 10, immediately after the disasters began, the NILIM dispatched staff to the sites in cooperation with the Public Work Research Institute. We conducted a survey using a helicopter in 3 affected prefectures: Hiroshima; Ehime, where 200 or more sediment disasters occurred; and Kyoto, where natural dams were formed. We provided technical advice to regional development bureaus and the relevant prefectural institutions regarding the extracted points that needed to be focused on, urgent examinations, emergency response measures, precautions against the continuous rain, and evacuations. We also carried out a survey of the actual status, including debris/water flooding and measurement of peak debris flow rate, etc. We will continue to research this disaster through extraction/classification of technical subjects based on the actual damage.



Conducting a survey using a helicopter, and the disaster-affected area seen from above

Details ▣ NILIM website: “Disaster-related Information”
Activities in the field of sediment disaster during the heavy rain of July 2018 – Emergency support activities
<http://www.nilim.go.jp/lab/bcg/baiu2018/katsudoujokyou/dosya.pdf>

Analysis of causes of levee breach of Oda River in Takahashi River-System, and support for consideration of restoration method River Department

The day after the levee broke, we dispatched our staff to the disaster spot and conducted a survey and analysis of the damage, and provided the Committee for Oda River of Takahashi River-System Levee Investigation with technical assistance.

In the heavy rain of July 2018, Mabi Town, Kurashiki City, located along Oda River in the Takahashi River-System, suffered considerable damage due to a river overflow, with the flooded surface area reaching approximately 1200ha.

The NILIM dispatched its staff to the area on July 8, the very next day after the disaster occurred. Together with the Water and Disaster Management Bureau of the Ministry of Land, Infrastructure, Transport and Tourism, and the Public Work Research Institute, we surveyed the damage conditions of the breach points of the river levees.

Also, to analyze the causes and consider how to go about restoration, Chugoku Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism launched the “Committee for Oda River of Takahashi River-System Levee Investigation” (with Professor Shiro Maeno of Okayama University as its chairperson) on July 10, and NILIM participated in the Committee by



Field survey

sending the Head of its River Division as a participating member.

Infrastructure, Transport and Tourism launched the “Committee for Oda River of Takahashi River-System Levee Investigation” (with Professor Shiro Maeno of Okayama University as its chairperson) on July 10, and NILIM participated in the Committee by sending the Head of its River Division as a participating member.

From the middle of July to the end of August, after holding four sessions of meetings, the Committee concluded that the principal cause of this damage was an overtopping of water. In addition to carrying out a measure to counter overtopping, a restoration method in consideration of seepage was to be examined, since the Committee could not rule out the possibility that the seepage had weakened the levees.

We will continue to examine countermeasures against water/sediment disasters and to support efforts to build a society that is aware of flood disaster prevention, in which the whole of society works together to mitigate hazards in preparation for floods.

Details ➤ Chugoku Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism website
 “The Committee for Oda River of Takahashi River-System Levee Investigation”
<http://www.cgr.mlit.go.jp/emergency/odagawateibochosa.htm>



Committee meeting session

Restoration assistance for Mabi Purification Center and examination of city flooding countermeasures

Water Quality Control Department

In response to Kurashiki City, we sent TEC-FORCE to Mabi Town and participated in the “Study Group for Countermeasure against City Flooding” that responds to flooding disasters, including the heavy rain of July 2018.



Conducting a damage survey of Mabi Purification Center

During the heavy rain of July 2018, river levee failures led to flooding with a depth of 4.2 meters, causing Mabi Purification Center in Kurashiki City to suffer a functional breakdown. In the sewer system of the Mabi area, two spans of sewer pipe (approx. 20 meters) were flown out due to scouring.

On July 11, the next day after entering into the disaster area became possible, in cooperation with the Sewerage Department of the Water and Disaster Management Bureau of the Ministry of Land, Infrastructure, Transport and Tourism, the NILIM surveyed the damage situation, and provided advice regarding emergency restoration and gradual restoration, as well as water quality monitoring, etc.

Also, based on the viewpoint of securing the function of sewerage systems in response to the lessons learned from the heavy rain of July 2018, the Sewerage Department of the Water and Disaster Management Bureau launched the “Study Group for Countermeasure against City Flooding” in September to discuss the prospect of city flooding countermeasures utilizing sewerage. The NILIM participated in this Study Group by dispatching the Head of its Wastewater and Sludge Management Division as a participating member.

Details ➤ MILT website: “Study Group for Countermeasures against City Flooding”
http://www.mlit.go.jp/mizukokudo/sewerage/mizukokudo_sewerage_tk_000587.html

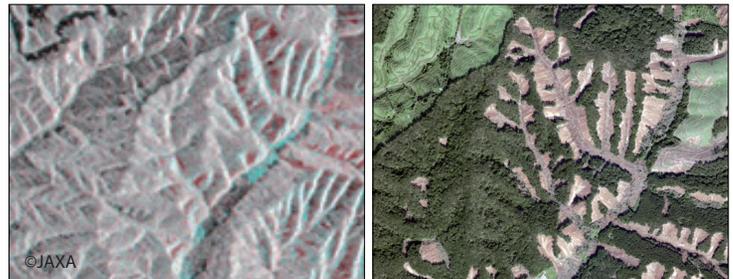
NILIM’s disaster response to the 2018 Hokkaido Eastern Iburi Earthquake

Advice on secondary disaster countermeasures after sediment disaster occurred in Atsuma Town Sabo Department

We swiftly provided technical assistance concerning sediment disasters for the affected local communities and Hokkaido Regional Development Bureau.

With regards to the 2018 Hokkaido Eastern Iburi Earthquake, the NILIM analyzed the state of slopes around the focal region of the earthquake based on satellite SAR image taken both before and after the occurrence of the earthquake. As a result, we grasped the fact that a high density of ground deformations that are presumed to be denudation of mountain forests or sedimentation from collapsed slopes occurred on the day of the earthquake, which struck on the evening of September 6. These observations showed the possibility that a significant number of slope collapses had occurred across an extensive area. We provided this information to the institutions concerned through the Water and Disaster Management Bureau of the Ministry of Land, Infrastructure, Transport and Tourism.

Also, with the transportation support of Japan Coast Guard, and in cooperation with the Public Work Research Institute, we dispatched our staff to the disaster area immediately on the day when the earthquake struck. Using the “Hokkai” helicopter of Hokkaido Regional Development Bureau, we surveyed both from the sky and on the ground, in which we confirmed the collapses of many slopes mainly in Atsuma Town. Subsequently, based on the results obtained through a continuous survey by staff dispatched to the area, we provided information to Hokkaido Prefecture and Atsuma Town, including an explanation of the occurrence of damage caused by the sediment



SAR image (left) and an image provided from the Geographical Survey Institute (right)

disaster, and advice regarding warnings/evacuations. We also advised Hokkaido Regional Development Bureau regarding risk assessment of secondary disasters, development of warning/evacuation systems, and emergency response to the natural dam formed in Hidaka-Horonai River.

Going forward, we will move from the emergency countermeasures phase to the permanent measures phase; however, we will continue to provide technical assistance aimed at the prevention of secondary disasters.

Details ➤ NILIM website: “Disaster-related Information”
 Activities in the field of sediment disasters during the 2018 Hokkaido Eastern Iburi Earthquake – Emergency support activities
<http://www.nilim.go.jp/lab/bcg/hokkaidou/katsudoujokyou/dosya.pdf>

■ Early transmission and analysis of damage to buildings

Building Department

After the earthquake struck, in cooperation with the Building Department and Hokkaido Research Organization, we surveyed the damage mainly to wooden buildings.

Concerning the 2018 Hokkaido Eastern Iburi Earthquake, the NILIM conducted a building damage survey on September 11 in three towns where the earthquake intensity reached upper 6 on the scale, causing considerable damage to buildings in Mukawa Town, Abira Town, and Atsuma Town.

Based on the results of quick post-earthquake inspections of damaged buildings provided by each town office, we implemented the survey in various ways, determining which buildings were damaged, carrying out visual inspection, measurement and photography, and interviewing local residents, etc. We also carried out confirmation of the locations and the installation conditions of seismometers in the vicinity in order to analyze the relationship between the seismic motion and the damage caused to the buildings. We responded to media inquiries in our survey location, and an overview of the survey results was reported on TV within the day. Also, we made the survey report public on our website on October 2. In this survey, we often observed that relatively old two-story houses combined with stores were particularly susceptible to collapse or significant deformation. We will continue to analyze the damage to these buildings.



A collapsed dwelling combined with store (Mukawa Town)

Details ☛ NILIM website: "Disaster Report (Japan)" Survey Report on Damage to Buildings Caused by the 2018 Hokkaido Eastern Iburi Earthquake (Published Oct. 2)
<http://www.nilim.go.jp/lab/bbg/saigai/h30/iburi.pdf>

■ Ascertaining situation of damage to harbor facilities in Tomakomai Port, and technical assistance

Port and Harbor Department

In response to the partial damage that occurred in Tomakomai Port, we dispatched experts to ascertain the damage to the port facilities and to provide technical assistance.

Due to the liquefaction caused by the 2018 Hokkaido Eastern Iburi Earthquake, the port and harbor facilities of Tomakomai Port, including the container yard of the central pier in Tomakomai East Port, were damaged.

In response to a request from Hokkaido Regional Development Bureau, NILIM dispatched staff along with members of the Port and Airport Research Institute to Tomakomai Port on September 7 to ascertain the situation of damage and provided technical support.

As a result of an on-site survey, we observed many cases of sand jet traces, inundation and subsidence, etc. that are thought to have resulted from the liquefaction of the ground.

Based on this survey, we conducted technical assistance including providing advice on the survey policy for the cavities formed in the liquefied ground, restoration methods, and regarding the progression of liquefaction.

Also, Tomakomai Port Management Union announced on September 10 that the container terminal where we conducted our survey had been provisionally restored and is now available for use.



The state of on-site survey

Details ☛ NILIM website: "Dispatch of Specialists for the 2018 Hokkaido Eastern Iburi Earthquake (Report)"
<http://www.ysk.nilim.go.jp/oshirase/press-release20180913.pdf>

● Receive information on research performed at NILIM

• NILIM email service

Twice a month, we deliver the latest information introducing various research activities conducted by NILIM and lecture meetings, etc. Register here (URL and QR code) ☛ <http://www.nilim.go.jp/lab/bcg/mailmag/index.html>



• 2018 Annual Report of NILIM

This website introduces NILIM research activities and achievements, as well as details of the latest research activities to be formally initiated in the future. Go to this website: ☛ <http://www.nilim.go.jp/lab/bcg/siryou/2018report/index.htm>

Please take our reader survey: <http://www.nilim.go.jp/lab/bcg/siryou/newsletter/nwsltr.htm>



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