

Messages from Departments and Centers of NILIM

Countermeasures against Sediment-related Disasters and Research Activities Facing New Development Opportunities

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1. Introduction

In April 2014, the Sabo Department, consisting of 2 divisions, was founded by adding Research Coordinator for Sediment Disaster Prevention and the Sabo Risk-Management Division to the present Sabo Planning Division.

Main responsibilities of the Sabo Planning Division include planning of erosion and sediment control, project evaluation, and comprehensive sediment management in order to solve / mitigate issues related to sediment movement, as well as researches on appropriate facility arrangement and design methods.

The Sabo Risk-Management Division is responsible for researches on methods of survey / observation by remote sensing, control methods such as risk assessment of slope failure, methods for effective information transmission in case of sediment-related disaster, etc.

2. Occurrence of sediment-related disasters and challenges

In fiscal 2014, 1,184 sediment-related disasters occurred and 81 persons were killed. In particular, the debris flow that occurred in Hiroshima in August caused human damage never seen in recent years.

This disaster killed about several tens of people, as in the 2013 sediment-related disaster that hit Izu-oshima, and triggered discussion among society about the way of watching and evacuation for sediment-related disasters. This disaster occurred soon after when the Sediment-related Disaster Prevention Law was quickly revised in order to establish measures for ensuring transmission of required information by administration to local residents in case of sediment-related disaster. However, in view of the facts that the two disasters above occurred at midnight / before dawn and that both areas suffered local heavy rain in a short time, we have to recognize a limit on the current way of watching and evacuation for sediment-related disasters only based on rainfall information. Therefore, efforts are expected to use any and all information available to ensure watching and evacuation at an early stage.

Meanwhile, large-scale sediment-related disasters successively occurred, including the deep-seated landslide in Kii Peninsula and the eruption of Mt. Ontake,

and one of the important missions of NILIM is to support the Regional Development Bureaus in survey and study, which engage in urgent investigation under the Sediment-related Disaster Prevention Law. Researches and technical development that are helpful for effective crisis management using limited time, data, and resource are eagerly anticipated.

3. Technical support

In case of a large-scale sediment-related disaster, NILIM provides technical guidance in cooperation with the Public Works Research Institute ("PWRI") on the site for prevention of secondary disasters according to request from the municipality, etc. In fiscal 2014, the Sabo Department dispatched a total of 93 man-days for inspection of sediment-related disaster hazard areas, safety check after rainfall for prevention of secondary disasters, and technical advice for emergency measures, etc. In recent years, request has been increasing for activities using the expertise for measures against sediment-related disasters. In the above-mentioned Hiroshima disaster, where search operation was frequently interrupted due to rainfall etc., NILIM provided information on investigation results to police, fire department, and the Self-Defense Forces at the on-site coordination center etc., conducted investigation in their presence, and supported the establishment of a temporary watching and evacuation system as well as search operation.

Moreover, NILIM has started a practical human resource development program, which utilizes the personnel concurrent service system, from last fiscal year in order to support the quality improvement of personnel in Regional Development Bureaus who engage in the advanced measures against sediment-related disasters. In fiscal 2014, a total of 7 persons from local Regional Development Bureaus joined this program, and the personnel of the Regional Development Bureaus in concurrent service have engaged in on-site technical support activities including the aforementioned Hiroshima disaster together with the personnel of NILIM and PWRI.

In view of the aforementioned Hiroshima disaster, etc, the revised Sediment-related Disaster Prevention Law

was enforced in January 2015, requiring the Minister of Land, Infrastructure and Transport to endeavor to provide necessary advice, information, and other assistance to prefectures and municipalities. In response, we would like to strive to accumulate and utilize necessary findings and technologies so as to conduct technical support activities more appropriately in case of a disaster etc.

4. Research on large-scale sediment-related disasters

For deep-seated landslides, which may cause natural landslide dams and large-scale debris flow, focused research is going on, triggered in part by the 2011 Kii Peninsula flood disaster. Since systematic organization of scientific findings and countermeasure technologies concerning deep-seated landslide was insufficient, "Technical guideline for countermeasures against deep-seated catastrophic (rapid) landslide" was completed in fiscal 2014 as Technical Note of NILIM, describing the concept of classification of disaster events resulting from deep-seated landslide and of the method of assuming disaster scenario, systematization of and considerations for countermeasures, etc.

Further, the Kinki Regional Development Bureau installed "Technical Center for Large-scale Sediment-related Disaster Countermeasures" in April 2014, which is based on Nachi-katsuura, Wakayama, with the aim to conduct surveys, researches, and technical development concerning mechanism identification and countermeasures for deep-seated landslide and large-scale debris flow in academia-government collaboration. NILIM is considering participation in "Research Organization for Large-scale Sediment-related Disaster Countermeasures," in which the aforementioned Center serves as executive office, aiming to achieve successful results in research and development of the relevant field.

5. Effort for early detection of sediment-related disaster

The successful launch of "DAICHI-2," JAXA's Advanced Land Observing Satellite (ALOS), in May 2014 has enabled "regular health check (routine observation)" and "emergency diagnosis (urgent observation)" using Panchromatic L-band Synthetic Aperture Radar (PALSAR-2). We aim to develop technologies for locating the sites of deep-seated landslide and a natural dam by monitoring areas vulnerable to landslide or deep-seated landslide at "ordinary times" and grasping signs (slope movement) of landslide etc. from the data observed by PALSAR-2 so as to undertake measures at an early stage in case of detecting any abnormality, and by conducting emergency observation quickly and efficiently in combination of

aircraft-mounted SAR (synthetic aperture radar) etc. with PALSAR-2 at the "first response stage" of a large-scale sediment-related disaster caused by heavy rain and or big earthquake.

It has become possible to detect precursory phenomena of sediment-related disasters, which are important criteria for judging watching / evacuation from sediment-related disaster but were difficult to collect and share among the local community, by analyzing "Twitter" information posted unintentionally on the network. We would like to advance the development of technologies that support determination to evacuate in "urgent stage" by complementing the information issued by users of SNS (Social Networking Service), which is also called "social sensor," with the rainfall observed by radar such as XRAIN etc. to enhance reliability.

Meanwhile, the early detection method using a physical sensor is considered effective. The Sabo Department has a policy of focusing on research of methods, as a new challenge, for forecasting sediment-related disasters with high accuracy using real-time observation / monitoring data, and plans to examine monitoring / observation information on flow rate, sediment discharge, etc. in connection with the occurrence of sediment-related disaster and study methods for setting up standard values to determine the urgency of occurrence of sediment-related disaster using such information. Ultimately, we aim to be able to provide the information concerning the risk of occurrence of sediment-related disaster, which has higher forecast accuracy and communicates urgency more easily than conventional approach based on rainfall information only.

6. Conclusion

Other topics not discussed here, such as examination of various technical standards, measures against driftwood, and comprehensive sediment management, are the fields for which NILIM has to lead activities as a national institution. In collaboration with universities concerned, government and private research institutions, etc., we will advance researches and activities with a sense of speed and a presence and respond to request and expectation from society.

[Reference]

- 1) 2014 Sediment-related Disasters in Japan (Sabo (Erosion and Sediment Control) Department, MLIT)
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