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NILIM News Letter
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The 2017 Restructuring and Opening Ceremony for the Kumamoto Earthquake Restoration Countermeasure Laboratory

Planning and Research Administration Department, Planning Division/Administrative Coordination Department, Planning and Coordination Division/Research Center for Infrastructure Management/Kumamoto Earthquake Recovery Division

The NILIM has established the Kumamoto Earthquake Recovery Division to provide rapid on-site technical support for projects to restore damage caused by the Kumamoto earthquake. It also strengthened necessary survey and research systems.

As part of its 2017 reorganization, the NILIM has established its first laboratory in an affected area in order to speed up the restoration projects after the Kumamoto earthquake. The Kumamoto Earthquake Recovery Division is located in the same building as the Kumamoto Reconstructing Project Office established under the Kyushu Regional Development Bureau. The Office and the Laboratory will work together to rapidly resolve joint projects. On April 24, they began works with an opening ceremony held at an administrative office building in Minamiasomura.

In addition, the NILIM has established the Road Safety Division in the Road Traffic Department in order to reduce annual traffic fatalities to below 2,500 to achieve the safest road traffic in the world by 2020, by using big data to eliminate potential dangers. It also improved the research system concerning large-scale interruption of road transport by heavy snowfalls that have occurred in recent years.

The Ministry of Land, Infrastructure, Transport, and Tourism designated 2017 as the "Year of Advance of the Productivity Revolution," and has been promoting "i-Construction" which will improve productivity by incorporating ICT into all stages of public works projects. The NILIM newly created the post of "Research Coordinator for Information and Construction Systems" in the Administrative Coordination Department in order to improve productivity in building ports and airports. The NILIM also created the new post of "Research Coordinator for Coastal and Marine Disaster Prevention" in the Coastal, Marine and Disaster Prevention Department in order to minimize the growing risk of damage by storm surges, in addition to its existing research on tsunami countermeasures.

Photo 1: Unveiling of the Building Nameplate after the Opening Ceremony

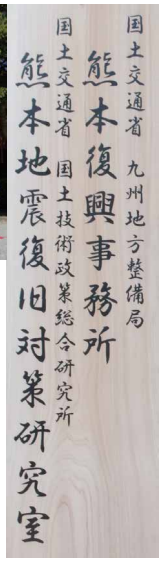


Photo 2. Building name plate

Details ☛ NILIM Website (Outline of restructuring)
http://www.nilim.go.jp/lab/bcg/kisya/journal/kisya20170331-1.pdf

Details ☛ NILIM Website (The opening ceremony)
http://www.nilim.go.jp/lab/bcg/topics/topics20170426.html

Successfully photographing the process of breaching without overflow — Inundation failure test of a full-size river levee model—

River Department, River Division

A full-size river levee model (2.6 m high) was used to successfully photograph the process of seepage failure that breaches levees without overflow.

It is assumed that a major cause of the breaching of a levee in July 2012 on the Yabe River in Northern Kyushu was 'piping', which is one type of seepage failure phenomenon: soil directly below the levee runs off accompanying the extension of water paths. Many aspects of the process of occurrence of piping are unclear. To quantitatively evaluate its course in order to identify locations where it is likely to cause breaching, joint industry-academia-government research is being conducted to clarify the mechanisms of seepage failure of levees. Based on the results of such research, conditions that encourage piping were set and hydraulic model testing using full-size levee models was performed.

During the testing, water paths formed by piping advanced to the water side of the levees, and the slopes on the water side caved in and formed pipe-shaped connections between this location and the foot of the land side slope, permitting the seepage failure process that caused the levee to be rapidly breached to be photographed (Photo, URL). Similar smaller models have also confirmed the same phenomenon, but because tests using full-sale models are rarely performed, this provided valuable data.

This research will continue and its results will be reflected in design standards and inspection rules, to improve the safety of levees.

Details ☛ NILIM Website (River Division website)
http://www.nilim.go.jp/lab/fbg/download/movie/movie.html

Photo: View of sudden breaching

Design Guideline for Buildings at Disaster Bases (Draft) published

Building Department

The NILIM drew up and published the Design Guideline for Buildings at Disaster Bases (Draft) in March 2017.

In the Great East Japan Earthquake, some local government buildings suffered severe damage caused by the tsunami. Other buildings, which were not destroyed or toppled, suffered partial but serious functional damage, such as ceiling collapse etc. as a result of seismic vibration.

In response, the Ministry of Land, Infrastructure, Transport and Tourism conducted the General Technology Development Project, Development of Functional Continuance Technology for Disaster Preparedness Facilities' Structures (FY2013–2016), and the NILIM has developed and examined various technologies needed to maintain the functions of buildings following disasters.

This Guideline has, based on the outcomes of this research work, brought together considerations during design to ensure that buildings that serve as bases for emergency disaster response, such as disaster countermeasure headquarters of regional governments, can continue to function in the event of a disaster. Local government departments concerned with disaster protection and with buildings, plus private companies and designers participating in the planning and design of disaster base buildings, will be able to refer to this Guideline to supplement existing related standards. It also contains reference documents concerning technologies that have been developed, and sample plans and designs of disaster base buildings constructed by using these technologies.

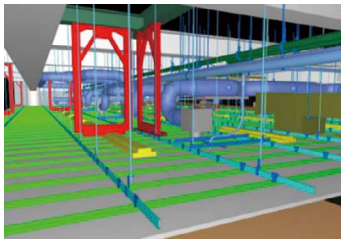


Figure: Perspective image of a ceiling cavity with strong and stiff members provided for flexible equipment installation.

Photo: Loading test of a full-size 5-floor RC building using walls to reduce damage during earthquakes.

Providing disaster base buildings designed in accordance with this Guideline will help the buildings to continue to serve as bases following large-scale disasters and permit rapid and appropriate emergency disaster response.

Details ☛ NILIM Website (Design Guideline for Buildings at Disaster Bases (Draft))
http://www.nilim.go.jp/lab/hbg/saigai/saigaikyotenn.htm

Guideline on technologies to reduce inundation damage to assist facility operation in urban areas

Water Quality Control Department, Wastewater Systems Division

The NILIM has enacted a Guideline (Draft) to the introduction of technologies to operate existing wastewater treatment facilities effectively in order to reduce urban inundation damage caused by Guerrilla Rainfall, which has occurred often in recent years.

In order to reduce urban inundation damage caused frequently by 'guerrilla rainfall' in recent years, it is necessary to develop technology to construct a centralized system that applies ICT to the real-time collection, prediction, and provision of information such as the state of rainfall and water level in sewage pipes and to effectively operate existing wastewater system facilities in cities. The NILIM has been conducting research to validate this technology since FY2014 in the Eba District (329 ha) of Hiroshima City as a B-Dash Project (Breakthrough by Dynamic Approach in Sewage High Technology Project). The research studied differences in inundation damage between cases where the existing pumps were operated as usual and cases where their operation was modified using this technology. The results confirmed that in the district studied, it is possible to reduce the inundated area by about 14% in the case of rainfall equivalent to about 1/3 of the annual probability of exceedance.

These research outcomes were summarized and used to compile the Guideline for introducing an operation support system for inundation measure facilities utilizing ICT(Draft) in December 2016. Introducing this technology will help mitigate urban inundation damage which has occurred frequently in recent years.

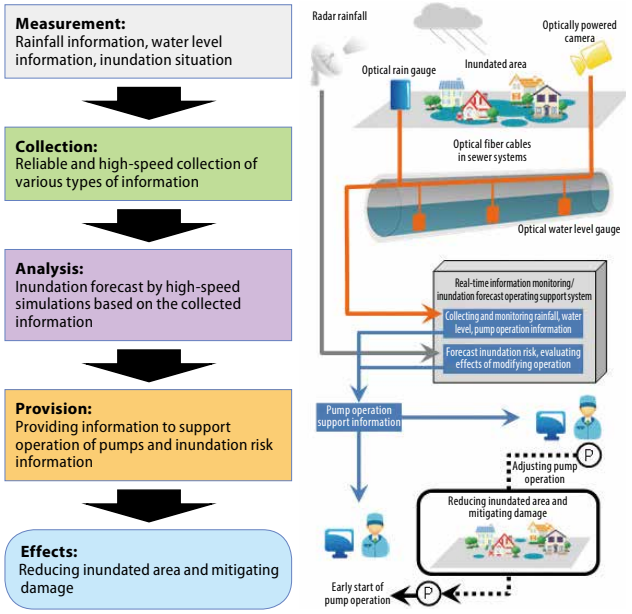


Figure 1. Outline of the technology

Details ☛ NILIM Website (Wastewater Systems Division website)
http://www.nilim.go.jp/lab/ebg/b-dash.html

Starting Joint Research to Develop New Sediment Disaster Sensors

Sabo Department, Sabo Planning Division

The NILIM and the National Institute of Advanced Industrial Science and Technology (AIST) began joint research in December 2016 with the goal of developing new sediment disaster sensors featuring the latest artificial intelligence (AI) and IoT* technology. The purpose is to resolve problems with conventional sediment disaster sensor technologies, and the target date for completion is the end of March 2018.

Conventional sediment disaster sensors have been plagued by various problems. They are not only expensive, but also are time-consuming and labor-intensive to install and maintain. Wire sensors, which have been widely used to detect debris flows in particular, are difficult to use repeatedly because once it has detected a debris flow, it is difficult to reset the sensor. Therefore, even where there is a high risk of sediment disasters, the number that can be installed is limited and their range is restricted, and it is time-consuming to install and reset them. As a result, they may fail to detect a debris flow that has occurred.

This research sought to make the sensors more compact and reduce their cost by taking advantage of technical progress in related fields in order to resolve past problems with sediment disaster sensors.

Detection precision and detected information transmission methods will be improved using advanced technologies such as AI or IoT. This research will improve detection precision compared with conventional sensors, greatly reduce their costs, and simplify installation and maintenance. This will enable a system for monitoring sediment disasters to be built more quickly and sensors to become more widely used, thus assisting appropriate judgments of the situation and evacuation activities.

The research has been conducted jointly by the NILIM Sabo Department whose members are experts on mechanisms of sediment disasters and hard and soft countermeasures, the AIST's Research Center for Ubiquitous MEMS and Micro Engineering and its Artificial Intelligence Research Center which have expertise on sensors and artificial intelligence technologies. This joint research by the NILIM and AIST is the first such initiative in areas such as sediment disaster countermeasures.

Sensor development is now progressing and on-site testing will be conducted after development is completed. The future goal is to follow repeated on-site testing that has confirmed safety and reliability, by widely introducing the sensors to sediment disaster countermeasure sites.

* IoT (Internet of Things)

Linking "things" other than IT equipment to the internet, so that people can monitor and operate "things" remotely.

Enacting standards to promote i-Construction —Making attractive construction sites through improved productivity—

i-Construction Promotion Headquarters

In order to make attractive construction sites by promoting i-Construction, the NILIM is conducting research on standards to regulate the use of ICT or CIM (Construction Information Modeling/Management) on construction sites.

The Ministry of Land, Infrastructure, Transport, and Tourism is working to improve the productivity of construction sites, make attractive construction sites and promote i-Construction.

Last year, ICT earthwork was introduced; to further improve productivity this year, ICT paving technology, CIM etc. will be introduced to ICT construction sites. The NILIM has been studying measurement methods and control precision for more efficient control of finished works using laser scanners and total stations for paving work. Based on this, the Ministry of Land, Infrastructure, Transport, and Tourism announced ICT paving work standards in March 2017.

To permit contractors to smoothly introduce CIM, in March 2017, the Ministry of Land, Infrastructure, Transport, and Tourism also published the CIM Introduction Guideline, which provides guidelines for preparing CIM models and examples of their use.

Figure. Completed work measurements using a laser scanner (left) and acquired point group data (right)

The NILIM will continue research on improving productivity at construction sites.

Details ☛ i-Construction Promotion Headquarters website
http://www.nilim.go.jp/japanese/organization/ic_honbu/indexicon.htm

Damage in South Korea due to Storm Surge and Waves Caused by Typhoon Chaba in 2016

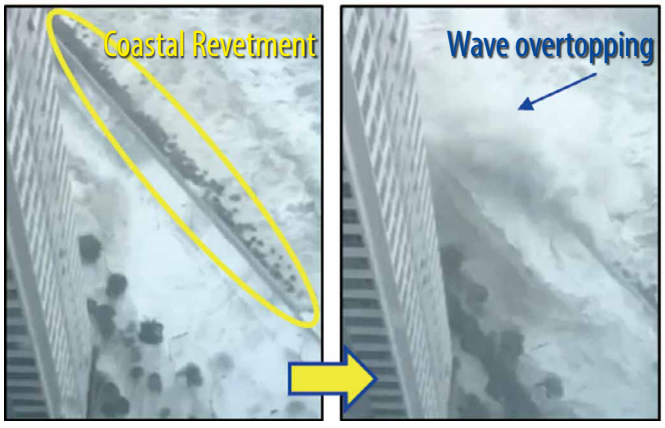
Coastal Disaster Prevention Division, Coastal Marine and Disaster Prevention Department

Typhoon Chaba (Typhoon 1618) struck southern Korea, generating storm surges and high waves in early October 2016. The NILIM conducted field surveys of the inundation in coastal urban regions and typhoon damage to breakwaters.

On October 5, 2016, low atmospheric pressure and strong winds of Typhoon Chaba generated not only a storm surge along the coast of southern Korea but also high waves offshore, which then propagated to the coast.

In Marine City in Haeundae District of Busan Metropolitan City, seawater rapidly flowed into urban regions passing through roads, because high waves over the storm surge of 90 cm overtopped the coastal revetments. In two ports located in southern Busan Metropolitan City, breakwaters slipped and/or were overturned by the storm surge and high waves. The NILIM conducted field surveys of the damage caused by the storm surge and waves.

These results of the field surveys will contribute to future studies on countermeasures against storm surge and waves.



View of Overtopping in Marine City
(Provided by Prof. Do-Sam Kim, Korea Maritime and Ocean University)

Schedule of Principal Events

Scheduled Dates	Event Name
July 22	"Summer Open House" at the Port and Airport Research Institute (Yokosuka)
July 28	Tsukuba Child Professors Open House

Publication (research achievements) < March, 2017-May, 2017 >

Download from here ☛ http://www.nilim.go.jp/lab/bcg/siryou/index.htm

PROJECT RESEARCH REPORT of NILIM

No.	Title of Paper	Project Leaders
56	Research on Climate Change Adaptation in River & Coastal Management - With focusing on the results of Project Research titled "Development of base technology to support forming a portfolio of management alternatives for large-scale water-related disasters under climate change" -	Research Coordinator for Integrated Water Disaster Management

RESEARCH REPORT of NILIM

No.	Title of Paper	Names of Divisions
58	Model Development and Policy Analysis of Intermodal International Container Cargo Shipping Focused on South Asia	International Coordination Division

TECHNICAL NOTE of NILIM

No.	Title of Paper	Names of Divisions
928	Development of the Supporting System on Making Harmonious Rules for Rebuilding in Densely Built-up Areas	Urban Development Division
931	Considerations of Level 1 Reliability Design Method for Vertically Pile-Supported Wharves under Berthing Condition (Part 2)	Port Facilities Division
932	Basic Study on Strengthening of Collaboration among Design, Construction and Maintenance of Port Facilities	Port Construction Systems and Management Division
933	Technical Note on Strategic Maintenance of Port and Harbour Facilities～Evaluation of Inspection and Repair Techniques～	Port and Harbor Department
934	Numerical Simulations on Inundation due to Storm Surge for Port Areas in Tokyo Bay	Coastal Disaster Prevention Division
938	B-DASH Project No.14 Guideline for introducing a technology with ICT for efficient nitrification control	Wastewater and Sludge Management Division
939	B-DASH Project No.15 Guideline for introducing ICT-based advanced process control and remote diagnosis technology for efficient wastewater treatment plant operation	Wastewater and Sludge Management Division
941	Landscape and Ecology Division, Annual Research Report (31th)	Landscape and Ecology Division
942	Analysis of the Dimensions of Emergency Relief Ships and Corresponding Berthing Facilities after Large-Scale Disaster - Examples of the Great East Japan Earthquake and the 2016 Kumamoto Earthquake -	Port Systems Division
943	A Route Selection Model of Japanese International Maritime Container Cargo Flow with Asia and Europe / North America	Port Systems Division
944	Study on Considerations in Design Work for Reformation of Existing Port Facilities ～Protective Facilities and Mooring facilities in Port Areas～	Port Facilities Division
945	A Guidebook to Preservation and Reproduction of the View from Parks and Green Spaces	Urban Disaster Mitigation Division
947	Report of the 1st Evaluation Committee of NILIM in FY 2016	Research Administration and Evaluation Division
948	Report of the Lecture Meeting of NILIM (2015)	Planning Division
949	B-DASH Project No.13 Guideline for introducing energy-saving sewage treatment system using highly-efficient solid-liquid separation technology and dual dissolved oxygen control	Wastewater and Sludge Management Division
950	FY2015 Annual Report of Wastewater Management and Water Quality Control	Wastewater Systems Division, Wastewater and Sludge Management Division
951	B-DASH Project No.12 Guideline for introducing a Technology for Advanced Pre-treated Trickling Filter System	Wastewater and Sludge Management Division
952	The technical note about "Technical Standards for Installing Humps, Narrowings and Chicanes"	Road Division
967	Report on Damage to Infrastructures by The 2016 Kumamoto Earthquake	Planning and Administration Research Department, Water Quality Control Department, River Department, Sabo Department, Road Traffic Department, Road Structures Department, Research Center for Infrastructure Management

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