

■ Contributing to the recovery of the road bridges damaged by the 2016 Kumamoto earthquake by the extensive knowledge of technology

Research Center for Infrastructure Management, Kumamoto Earthquake Recovery Division

The NILIM contributed to the early restoration of damaged road bridges in Minami-Aso village due to the 2016 Kumamoto earthquake with combining its technical knowledge.

At the NILIM immediately after the occurrence of the 2016 Kumamoto earthquake, we have been providing technical assistance on restoration of damaged infrastructures. In April 2017, Kumamoto Earthquake Recovery Division was newly established in Minami-Aso village where the restoration sites are located, and research staffs began residing there. By doing so, we can quickly establish a system for providing technical assistance timely, to promote the rapid restoration in conjunction with the Kumamoto Reconstruction Office, MLIT which is responsible for the project management.

In August 2017, the interrupted road route managed by Minami-Aso Village was reopened by emergency restoration conducted by MLIT (see photo).

Upon this recovery project, the comprehensive knowledge of technology through collaboration with Kumamoto Earthquake Recovery Division and other related division in the NILIM was utilized fruitfully.

In the bridge shown in the photo, the abutment supporting the end of the bridge girder was greatly subsided due to the collapse of the slope accompanying the earthquake.

In the restoration of the abutment, we adopted the rigid frame-structure so that the structure of the abutment as a whole is hard to submerge even if the slope collapse on the front side occurs again.

Furthermore, in order to make it less susceptible to the influence of the slope collapse, and in order to make the linearity of the road more distant from the slope, and also to make it less susceptible to the influence of the slope collapse, we set the linear line of the road away from the slope.

Thus, even if the same large earthquake occurs in the future, technical consideration is given so that the influence on the bridge is minimized.



Photo Road bridge in Minami-Aso village reopened in August 2017

Also, the RC pier suffered from significant cracks penetrating the hollow section.

In the repair, a method of filling the hollow part with concrete was adopted, and in the technical advice, knowledge about the seismic damage mechanism of the hollow RC column accumulated in the NILIM was utilized.

Furthermore, paying attention to the fact that the way of shaking of the bridge changes before and after filling concrete, vibration measurement is carried out using ICT technology (high-performance accelerometer), and the repair effect is also confirmed.

The NILIM will continue to strongly promote restoration and reconstruction from the 2016 Kumamoto earthquake.

Details ■ The website of Kumamoto Earthquake Recovery Division
<http://www.nilim.go.jp/lab/pgg/index.htm>

■ Field Operation Tests (FOTs) of automated driving service based at road-side stations in rural depopulated areas has started nationwide.

Road Traffic Department, Intelligent Transport Systems Division

At the two road-side stations in rural depopulated areas, we have started the FOTs of automated driving service.

The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) aims to secure human flows and logistics for revitalization the region by utilizing automated vehicles in rural depopulated areas where rapidly-aging population, and plans FOTs of automated driving service based at "Road-Side Station".

This fiscal year, FOTs is going to be conducted at 13 places nationwide. In each place, the Regional Development Bureau etc. will set up the regional councils for FOTs including experts and local governments, and they are supposed to do the formulation of the experimental plan and the operation of FOTs.

NILIM participates as a committee member of the regional councils and take charge of technical support for the implementation of FOTs and verification.

For automated vehicles to be used in those FOTs, NILIM made a public offering of experimental vehicle collaborators, and four collaborators were chosen after reviewing automated driving technologies, safety measures, and experience of public roads in February 2017.

In this September, the first FOT was conducted at the road-side station "Nishikata" (Tochigi Prefecture). The automated vehicle of level 4 (the system conduct all operation tasks) was run at dedicated space. We conducted a social acceptability questionnaire survey about introduction of automated driving service to the riding monitor of the surrounding residents and verified

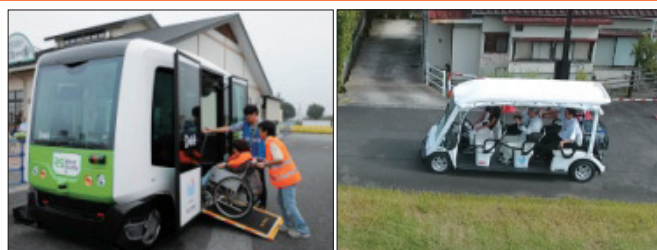


Photo FOTs at the road-side station
(Left: Nishikata Right: Ashikita Dekopon)

the road management level required for automated driving.

In addition, at the Road-Side Station "Ashikita Dekopon" (Kumamoto Prefecture), we had conducted FOT in a mixed space with pedestrians and general vehicles using the automated vehicle of the road-vehicle cooperation type in October.

We are going to continue to conduct FOTs across the country, and plan to examine how to utilize road space corresponding to automated driving and how automated driving technologies should be based on the needs in rural depopulated areas.

Details ■ Official website for automated driving service FOTs
<http://www.mlit.go.jp/road/ITS/j-html/automated-driving-FOT/index.html>

■ Development of tools to visualize the risk of falling outside walls of buildings on townscape scene

Housing Department, Housing Stock Management Division

NILIM has developed a set of tools named "Buildings' External Risk Visualizer" (BERV.dll) to visualize the risky area on townscape scene, through analysis of the data of dangerous outer walls inspected and diagnosed.

For the prevention of falling accident of the outer wall which became a problem in recent decades, the exterior wall diagnosis surveys are carried out by the owners/managers of the buildings and reported following Building Standards Law. We developed these tools in order that the obtained data should be effectively used to raise awareness of importance of maintenance/management and to contribute to safety of pedestrians.

The set of tools is used as a plug in to the "Landscape Simulation System", provided by MLIT (since 1996), both of which are freeware.

The operation outline is as follows.

Three dimensional model of walls of buildings and various structures as component of the townscape are provided by utilizing point cloud data measured with mobile provided with laser scanner (MMS), elaborated from 2 dimensional CAD drawings, or converted from 3 dimensional data such as BIM

Texture image showing the distribution of exfoliation hazardous areas in each exterior wall is provided from survey result for each wall.

Texture images are applied on the respective walls in the 3D model of buildings.

The 3D risky space or 2D risky area on ground as consequence from the fall of the outer wall can be displayed (Figure 1).

In the field, an Android based AR (augmented reality technology) application (by NILIM, 2012) is used to superimpose the 3D risky spatial range of danger of falling off of the outer wall on the real townscape scene taken with the rear camera of the tablet terminal, therefore, you can check while walking. (Figure 2)

Details ☛ Materials of press release

<http://www.nilim.go.jp/lab/bcg/kisya/journal/kisya20170830.pdf>

Details ☛ The website for downloading Landscape Simulation System

<http://sim.nilim.go.jp/MCS/download.asp>

Details ☛ Explanation of the "Buildings' External Risk Visualizer"

<http://sim.nilim.go.jp/BERV>

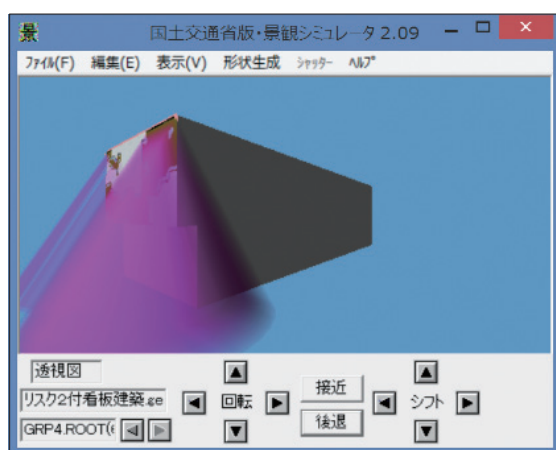


Figure1 Three-dimensional display of the range where the danger of falling of the outer wall reaches

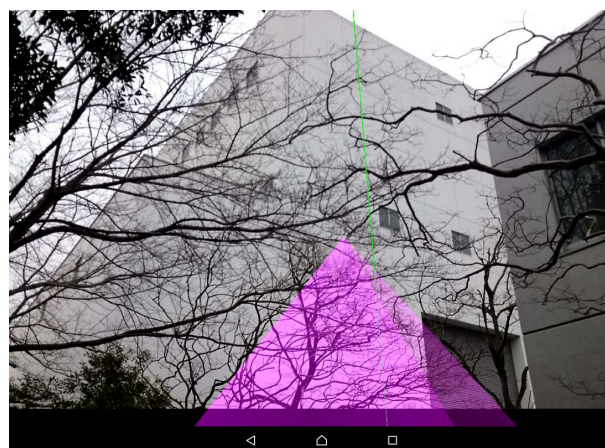


Figure 2 Superimposing CG image of risk on the real scene of the site

■ Publish guidelines that explain the ease of deterioration and measures of wooden houses

Building Department, Structural Standards Division

We provided technical information to builders and residents to protect our homes from rainwater infiltration and condensation.

According to Association of Housing Warranty Insurers, more than 90% of the defects of houses responded by defect insurance are attributable to waterproof troubles, rainwater intrusion and dew condensation measures are the extremely important task to ensure the durability of wooden houses.

In the NILIM, we have formulated and announced the following guidelines showing selection methods and construction methods for specifications of deterioration risk factors associated with rainwater infiltration, dew condensation and specifications of the outer skin (roof/ceiling, an outer wall, under the floor, etc. and the structure of the outer peripheral portion covering the living space).

Based on various tests such as degradation survey and raindrop verification test accompanying rainwater intrusion and dew condensation, they had cross-disciplinary discussions between academics and practitioners, these guidelines were organized by dividing the guidelines into "durable housing guidelines" for living persons, "risk analysis/evaluation guidelines" for manufacturers, "design and construction guidelines".

According to these guidelines, the designer can grasp the type and risk of rainwater infiltration from the outer skin, the risk of decay of the wood and construction of the wooden houses in advance, and can take countermeasures according to the recommended specifications.

Residents can examine these countermeasures before constructing a home,

and it will be possible to improve the durability of houses and reduce the LCC (life cycle cost). And, they can be used as technical data at maintenance and renovation of existing houses.

Currently, we strive to spread these guidelines.

Details ☛ NILIM website (Technical Note of NILIM No. 975)

<http://www.nilim.go.jp/lab/bcg/siryounnn/tnn0975.htm>



Photo Status of strong wind seepage test on outer wall and roof

■ "The 18th Tokyo Bay Symposium - Services of Coastal Region and Coastal Environment"

Coastal, Marine and Disaster Prevention Department, Marine Environment Division

"The 18th Tokyo Bay Symposium" was held at Osanbashi Yokohama International Passenger Terminal on Friday, October 20, 2017.

The Tokyo Bay Symposium is held annually to bring together the latest knowledge of research institutes, private companies and NPOs, to provide information to a wide range of people, and to consider the better environment and future of Tokyo Bay.

This year, we organized the main theme of reaffirming the wide range of services of the coastal area, and 282 people participated.

"Various ecosystem services and coastal environments in the coastal area" at Part 1, "Implementation of improvement of ecosystem services" at Part 2, and "the new viewpoint relevant to ecosystem service" at Part 3 as a sub-theme, were announced by 9 lecturers.

A poster session was held between Part 1 and Part 2. Students, researchers, companies, administration, and NPO had the active exchange of opinions about posters on Tokyo Bay revitalization, research, technology with

symposium participants.

Also on 21st, the Tokyo Bay Great Thanksgiving Day was held to get more people interested in the environment of Tokyo Bay at Yokohama Red Brick Warehouse as the theme of "Let's start good and easy things for the ocean!" by the Public-Private Cooperation Forum for Tokyo Bay Restoration. Nearly 25,000 people including families visited us despite the rain.

Through the Tokyo Bay Symposium and the Tokyo Bay Great Thanksgiving Day, many people enjoyed experiencing and discovering the charm and blessings of Tokyo Bay and we could provide the opportunity to act for the environment in Tokyo Bay. We will continue to strive to make many people interested in the environment of Tokyo Bay in the future.

Details ☛ Marine Environment Laboratory Website

<http://www.ysk.nilim.go.jp/kakubu/engan/kaiyou/kenkyu/tokyobay-sympo.html>



Photo The state of the lecture at the symposium



Photo The state of the Great Thanksgiving Day

■ 2018 fiscal year NILIM budget request

Planning and Research Administration Department, Planning Division

Administrative Coordination Department, Planning and Coordination Division

In the NILIM, we are pursuing research on the infrastructure that will make for the future of society and demand 18 issues (230 million yen) including seven new issues in three new areas (100 million yen).

○ Disaster prevention, disaster reduction, crisis management

— Study on Flood Damage Risk Reduction Measures Focused on Flood Block

We will organize the disaster prevention measure examination method to prevent human damage and regional devastating damage at the time of flooding that can not be dealt with by the disaster prevention facility, and propose how to use the flood risk information that contributes to the consensus formation of the region.

— Development of a pre-analysis method for sediment-related disasters caused by large-scale earthquakes

We will promptly estimate the occurrence situation of large-scale slope failures, which is the main cause of the damage expansion at the time of the large-scale earthquake, and conduct research to enable prompt emergency response.

— Study on an immediate damage estimation method of port and harbour facilities at a large-scale earthquake

Establish an immediate estimation method of damage at port and harbour facilities (mooring facilities) so that we can quickly determine an initial mechanism and a response policy for securing an emergency supply transportation route when a large-scale earthquake occurs.

○ Maintenance of infrastructure

— Study on comprehensive management for sewer pipeline

We will develop a selection method of checking survey technology

of sewer pipeline according to laying conditions and actual condition of the area, and conduct research to achieve efficient maintenance and cost optimization.

— Development of evaluation technology for existing RC members that contributes to renovation of long life of exterior and waterproof layer of buildings

In order to ensure the durability of the building by improving the quality of the exterior/waterproof layer, which is lower in durability than the structural framework, we will develop the surveying technology of the building necessary for the development and refurbishment of the evaluation technology of the existing member which becomes the base to be remodeled.

○ Productivity revolution (promotion of i-Construction, smart use, improvement of comfortable to live)

— Study on quantitative evaluation method of urban environment improvement effect by green space, etc.

Toward the formation of a good urban environment through conservation and creation of green, we will develop a method for quantitatively evaluating the multifaceted effects of urban green space, etc., focusing on green quality.

— Development of visualization method of barrier-free effect according to life stage

We will quantify the ease of activities (life, movement, assistance) in the residence and conduct research to promote comprehensive barrier-free conversion.

Details ☛ Press release materials to be announced on August 29, 2017

<http://www.nilim.go.jp/lab/bcg/kisya/journal/kisya20170829.pdf>

■ Collaborative research with the Institute of Road Engineering of Indonesia The mid-term conference of IRE and NILIM Joint Research

Planning and Research Administration Department, International Research Division

In collaboration with the Institute of Road Engineering (IRE) of the Republic of Indonesia, the NILIM conducted a mid-term conference of IRE and NILIM Joint Research on October 4, 2017, and there were 5 presentations of research progress from 5 fields.

The NILIM concluded a memorandum of understanding with the Institute of Road Engineering (IRE) of the Republic of Indonesia (concluded in 2009, updated in 2014). IRE and NILIM have conducted joint research in multiple fields related to roads.

Total of 53 people, including six researchers from the IRE, participated the conference.

First, there were keynote speeches by Director - General of NILIM and proxy of IRE's director.

Subsequently, research progress was reported by researchers of five fields: "Road-side station" "Traffic Data Collection" "Road Environment" "Pavement" "Tunnel & Underground Structures".

Until now, the research has been conducted in each field individually, so this time it was a valuable opportunity for cross-sectoral sharing of research situation and exchanging views.

In the Q & A session, information and opinions were actively exchanged by both Japan and Indonesia participants, and the situation, differences



Photo The mid-term conference of IRE and NILIM Joint Research participants

and challenges over infrastructure development in both countries were clarified.

In the future, we will develop research contents and cooperation system based on review of needs of both countries.

Details The detailed result of the conference will be uploaded on NILIM Website soon.

● Schedule of Principal Events

Scheduled Dates	Event Name
December 6	The Lecture Meeting of NILIM (2017)

● Publication (research achievements) <August, 2017-October, 2017 >

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

TECHNICAL NOTE of NILIM

No.	Title of Paper	Names of Divisions
976	Report of the Evaluation Sub Committee of NILIM in FY 2016 Evaluation Committee of NILIM	Research Administration and Evaluation Division
978	Long Term Changes in Sediment Conditions and Eelgrass (<i>Zostera marina</i>) in Miyako Bay - Changes for 5 Years after the Great East Japan Earthquake -	Marine Environment Division
979	New Equations for Calculating Design Seismic Coefficients for Deeper Gravity-type and Sheet Pile Quaywalls and Their Correction Based on Case Histories in Japan	Port Facilities Division
982	Report of the Lecture Meeting of NILIM (2016)	Planning Division
984	Guideline for planning, design and management of disaster prevention parks (2nd revised version)	Landscape and Ecology Division
986	Technical Note on Utilization of Natural and Regional Infrastructures in Regional Development for Tsunami Disaster Prevention	Coast Division

● We provide you with research information.

• 2017 Annual Report of NILIM

This web site introduces NILIM activities throughout the year, including research activities and achievements, future initiatives, etc.

Go to this web site <http://www.nilim.go.jp/english/annual/annual2017/ar2017e.html>



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