Ministry of Land, Infrastructure, Transport and Tourism

National Institute for Land and Infrastructure Management

# NILIM

Verification of the effects of the introduction of Green Slow Mobility (low-speed electric vehicles) as regional development measures (in city areas around Tsukuba)

Status of confirmation of the height of level difference removal in the restoration work for a manhole that was deformed by the Noto Peninsula Earthquake


Support of the water supply at the Nanao Port during the Noto Peninsula Earthquake


Field operational test of automated driving truck on the Shin-Tomei Expressway

## Research Institute that creates the society of the future

FY 2025

https://www.nilim.go.jp/

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→ Reference: P4. Efforts of the Noto Water Supply and Sewerage Reconstruction Support Division

(Bottom left) Scene of the support for water supply by the Japan Coast Guard and the Self-Defense Forces at a port facility (Nanao Port) the NILIM has determined can be used in the 2024 Noto Peninsula Earthquake (Port, Coastal and Marine Department)
* Provided by the 9th Regional Coast Guard Headquarters
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# Mission of the National Institute for Land and Infrastructure Management (NILIM)

As the only national research organization
in the social infrastructure/housing field,
our goal is to use technology as the driving force
to create an attractive country and society
that are safer, more secure, and more vigorous,
both now and in the future.

## NILIM research policy (excerpt)

### Basic stance

- ○ Participate in the policy development of the Ministry of Land, Infrastructure, Transport and Tourism as a technical specialist taking into account the administrative perspective among other aspects
- ○ Apply the advanced and comprehensive technical capabilities cultivated through research activities to the actual fields of work.
- ○ Connect to the creation of new policy using insight into the future image of national land/society and through the promotion of technology development.

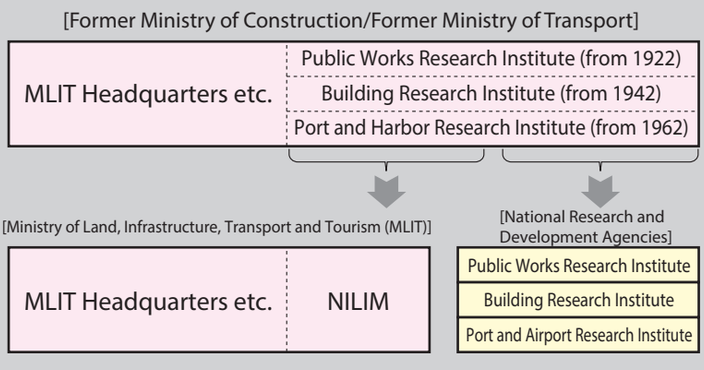
### Activities forming the basis

- ○ Research and development that supports planning, drafting, and spreading the policy for land, infrastructure, transport, and tourism (pp. 11–20)
- ○ Advanced technical support for response to disasters/accidents and improvement of countermeasure techniques (pp. 21–22)
- ○ Competence in new technologies of in-house engineers on the frontline (p. 23)
- ○ Collection, analysis, and management of data forming the technical basis of policy formation and return to society (p. 24)

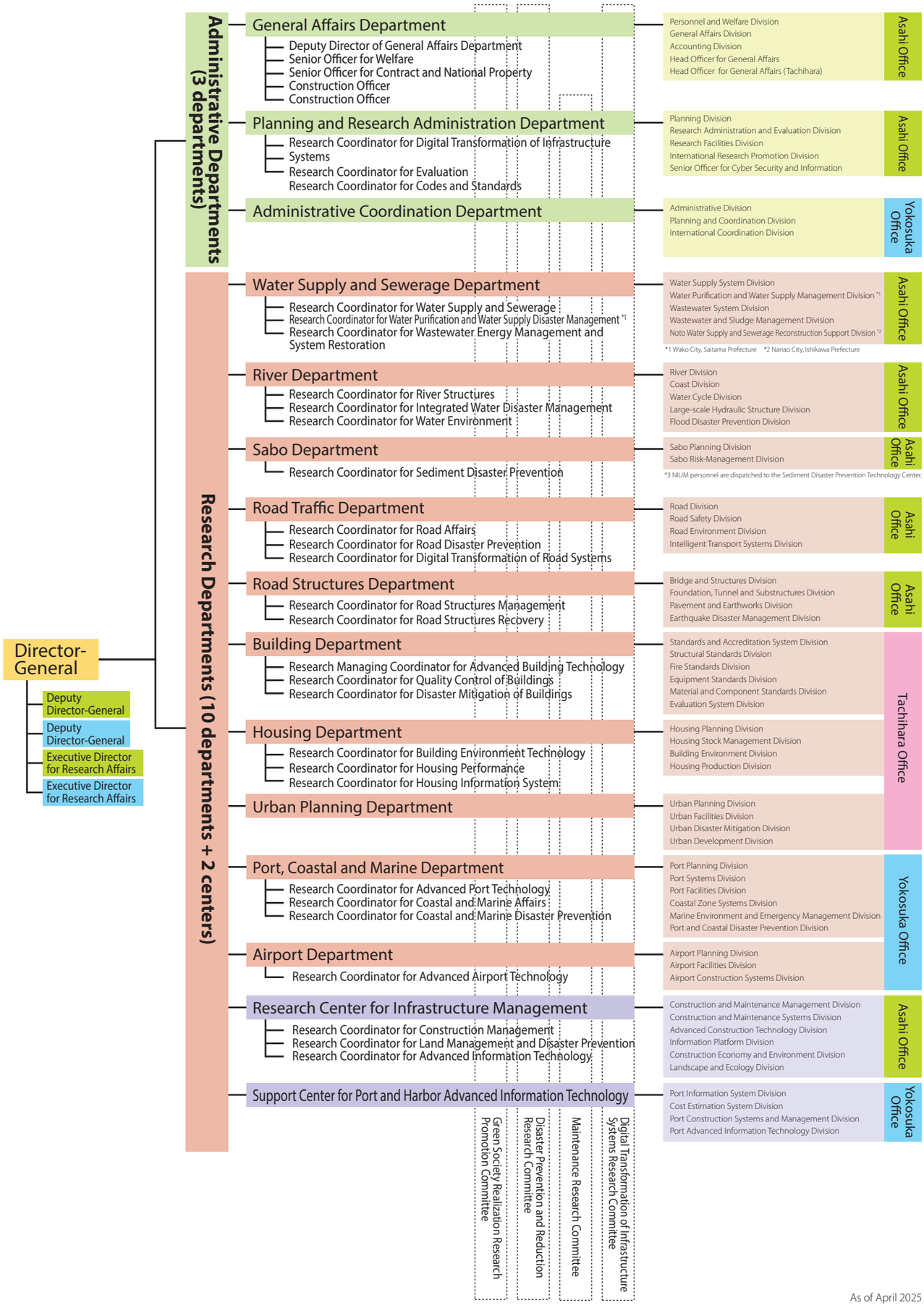
Click here for the full research policy. →

### ■ Establishment of the NILIM

● After the reorganization of ministries and agencies in January 2001, the NILIM was established subsequent to the establishment of the incorporated administrative agency system in April of that same year.
As an organization engaging in comprehensive investigation, research and development, etc. it is closely related to the planning and drafting of national land technical policies that are administered by the Ministry of Land, Infrastructure, Transport and Tourism. The NILIM inherited part of the operations of the Public Works Research Institute, Building Research Institute, and the Port and Harbor Research Institute.



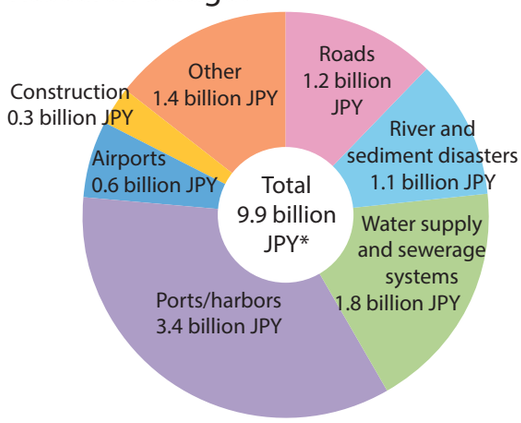
# Organization




As of April 2025

# Research budget and employees

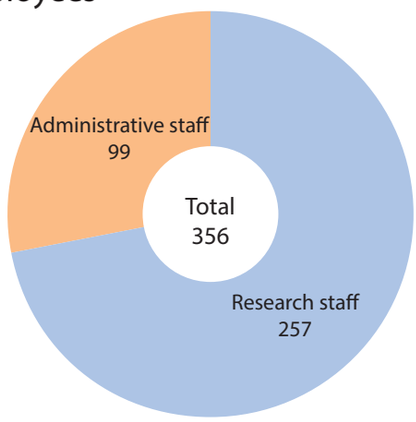
## ■ Research budget




Structure of the research budget (initial budget for FY 2025)

*The total and the breakdowns do not match because no adjustment is made to the decimal places after rounding.

## ■ Employees




Structure of employees (as of April 2025)

## For the purpose of the implementation of comprehensive business activities in the integrated water supply and sewerage systems

- Established the Research Coordinator for Water Purification and Water Supply Disaster Management as well as the Water Purification and Water Supply Management Division -

- In April 2024, the administration of water supply system improvement and management was transferred from the Ministry of Health, Labour and Welfare to the Ministry of Land, Infrastructure, Transport and Tourism, and the Sewerage Department was reorganized becoming the Water Supply and Sewerage Department, and the Water Supply System Division was established.
- Established the Noto Water Supply and Sewerage Reconstruction Support Division in Nanao City, Ishikawa Prefecture. It provides technical advice regarding early reconstruction and restoration for local governments, etc. that suffered damage in the Noto Peninsula Earthquake.
- The Water Supply and Sewerage Systems Department implements research and technical management that contribute to the planning, drafting, and execution of technical policies for water supply and sewerage systems, based on broad comprehensive viewpoints of the national government.
- Further advancement of water purification technology and strengthening of comprehensive disaster management are required.
- In April 2025, part of the organization and inspection equipment in the Water Management Research Laboratory of the National Institute of Public Health was transferred to the NILIM.


**FY 2023**

**Sewerage Department**
Research Coordinator for Sewerage
Research Coordinator for Wastewater Energy Management and System Restoration
Wastewater System Division
Wastewater and Sludge Management Division

Transfer of water supply system administration to MLIT

**FY 2024**

**Water Supply and Sewerage Department**
Research Coordinator for Water Supply and Sewerage
Research Coordinator for Wastewater Energy Management and System Restoration
Water Supply System Division
Wastewater System Division
Wastewater and Sludge Management Division
Noto Water Supply and Sewerage Reconstruction Support Division

**FY 2025**

**Water Supply and Sewerage Department**
Research Coordinator for Water Supply and Sewerage
Research Coordinator for Water Purification and Water Supply Disaster Management
Research Coordinator for Wastewater Energy Management and System Restoration
Water Supply System Division
Water Purification and Water Supply Management Division
Wastewater System Division
Wastewater and Sludge Management Division
Noto Water Supply and Sewerage Reconstruction Support Division

### [Efforts of the Noto Water Supply and Sewerage Reconstruction Support Division]

Implement the following efforts concerning water supply and sewerage facilities
(1) Technical support for local governments in the damaged areas
(2) Technical development that contributes to the reconstruction of the Noto Peninsula
(3) Establishment of disaster response techniques in integrated water supply and sewerage systems based on the disaster experiences

The Support Division member will also be in charge of the contact point for the administration of water supply and sewerage systems for local governments in the damaged areas, as one of the members of the Hokuriku Regional Development Bureau.

**<Examples of technical support>**

- Emergency rehabilitation response (water leakage survey, support for water flow), site survey of facilities damaged by an earthquake or heavy rain, support for drafting of a recovery plan (Wajima City, Suzu City, Uchinada Town, etc.)
- Communication and coordination with relevant organizations concerning disaster assessment, etc.
- Contact point for consultation concerning removal of sewers, area conversion, etc.

Discussions with the principal, staff, and water support business enterprise

Water intake facility in a water purification plant rehabilitated during the emergency (Suzu City)

# Disaster prevention and mitigation, national resilience - For increased strength and flexibility -

- Regarding national resilience, efforts have been promoted heretofore by means of the Three -Year Emergency Response Plan (2018 - 2020) and the Five-Year Acceleration Plan (2021 - 2025), etc.
- The Mid-term Plan for the Implementation of National Resilience is a mid-term statutory plan concerning the implementation of measures pursuant to the amended Basic Act for National Resilience (proclaimed and enforced on June 16, 2023), and the Fundamental Plan for National Resilience (revised on July 28, 2023).
- In April 2025, pursuant to the devising policy of the Mid-term Plan for the Implementation of National Resilience (Decision in the Meeting of Related Ministries and Agencies on February 14, 2025), the related ministries and agencies collaborated and put together the "First Mid-term Plan for the Implementation of National Resilience (draft)". The plan is expected to be devised by June 2025.

## ○ Five-year emergency measures for disaster prevention, disaster mitigation, and national resilience (FY 2021–2025)

Further acceleration and deepening of the following areas implemented under the three-year emergency measures with focused and intensive measures

1. Measures to address increasingly severe wind and flood damage and large-scale earthquakes that can happen any time soon
2. Acceleration of measures to address aging infrastructures to shift to preventive maintenance of the infrastructures
3. Promotion of digitization etc. for efficient implementation of measures to increase national resilience

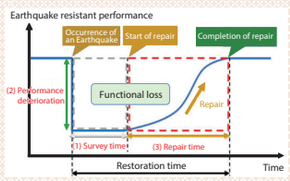
Example: Measures for river basin disaster resilience and sustainability by all

Prepared based on "About the Five-Year Accelerated Measures: Cabinet Secretariat website (https://www.cas.go.jp/jp/seisaku/kokudo_kyoujinka/index.html)"

## ■ Examples of measures implemented by NILIM

### To prepare cities to effectively deal with earthquakes

- No effective indicators are available for evaluating the post-earthquake functional use of RC
- No unified method is available for evaluating which technologies and techniques the best for damage controllability.



Seismic resilience performance curve

- To build a framework for securing post-seismic continued usability by assessing damage and repairability evaluation methods based on seismic response.

### Efforts to ensure the security of road transport functions against a large-scale earthquake

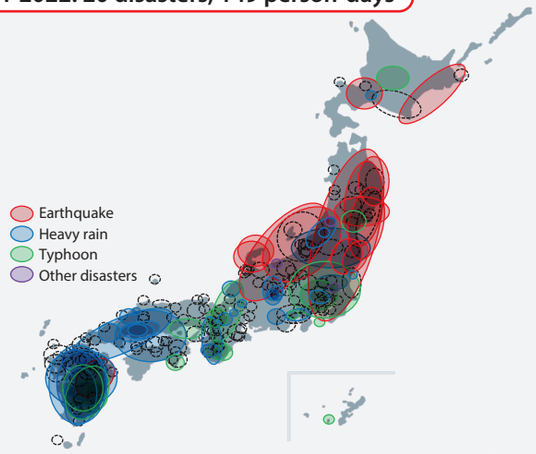
- Road transport functions were disrupted by tunnel lining collapse associated with the large-scale earthquake
- Establish the methods for preventive measures against collapse of lining during an earthquake in existing tunnels


Example of tunnel lining collapse in the Noto Peninsula Earthquake

# Disaster relief dispatches to various parts of Japan

- In the event of a disaster, the NILIM dispatches experts with advanced technical knowledge in various fields to the affected areas upon request.
- Particularly in the event of a serious disaster, TEC-FORCE* and other experts are dispatched to provide strong support to the prevention of secondary disasters and the restoration of disaster-hit areas.

**FY 2024: 28 disasters, 885 person-days**
**FY 2023: 17 disasters, 560 person-days**
**FY 2022: 20 disasters, 149 person-days**




* Technical Emergency Control Force: The system to dispatch expert teams established in FY 2008 by the Ministry of Land, Infrastructure, Transport and Tourism in order to respond to extensive natural disasters by surveying disaster damage and providing local governments and other organizations in the disaster-hit areas with technical assistance.

**○ Legend**
Solid line: Disaster-hit areas to which the NILIM dispatched the TEC-FORCE
Dashed line: Disaster-hit areas other than those mentioned above

**[Noto Peninsula Earthquake (efforts for reconstruction support)]**
Himi City, Toyama Prefecture

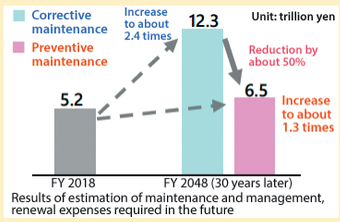
**[2024 Oku Noto Heavy Rain]**
Wajima City, Ishikawa Prefecture

**[Ofunato City Forest Fire]**
Ofunato City, Iwate Prefecture

## ○ Basic Plan for Life Extension of Infrastructure (November 2013)

## ○ MLIT's Plan for Life Extension of Infrastructure (Action Plans) FY 2022 - FY 2025

### Outlook for the costs of mid- to long-term maintenance and management, renewal, etc.



Results of estimation of maintenance and management, renewal expenses required in the future

- Reduction of maintenance and management, renewal expenses required in the future due to preventive maintenance type infrastructure maintenance

⇒ It is important to thoroughly implement the efforts for preventive maintenance type infrastructure maintenance.


Road cave-in accident in Yashio City, Saitama Prefecture (January 2025) Source: Saitama Prefectural Government

### I. Full-fledged conversion to "preventive maintenance" by a reliable implementation of systematic and concentrated repair.

- For infrastructure in a degraded condition below the management level of preventive maintenance, its functions are recovered early by implementing systematic and concentrated repair.

Accelerate the management efforts by means of the "Five-Year Accelerated Measures for Disaster Prevention, Disaster Mitigation, and Building National Resilience" (approximately equivalent to 1.5 trillion yen)


Bridge with internal steel rods exposed


Riverbank protection with cracking

Examples of facilities requiring early action

### II. Acceleration to improve the productivity of infrastructure maintenance by the promotion and distribution of new technology using public-private partnership methods

- Promote the introduction of new technology and public-private partnerships , in order to contribute to the appropriate and efficient implementation of infrastructure maintenance by local governments and other organizations


Inspection of facilities related to Sabo by utilizing drones

### III. Promotion of the optimization of infrastructure stock by aggregation and reorganization or renewal incorporating paradigm shifts, etc.

- Promotion of the aggregation and reorganization of infrastructure based on changes in social situations and users' needs, as well as the examination of paradigm shifts in the area of renewal in preparation for the coming era of expansive renewal.

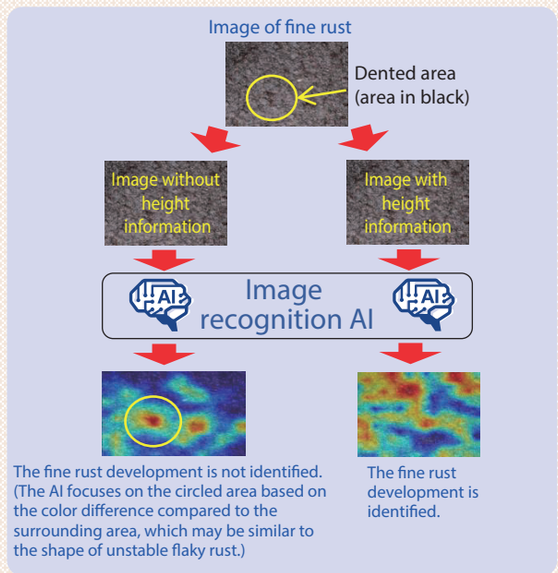
## ■ Examples of efforts implemented in the NILIM

### Improvement of the quality of road management utilizing new technology

By evaluating the condition of rust on weathering steel bridges by the utilization of AI technology as well, we contribute to the efficient implementation of preventive maintenance.

- Weathering steel protects thereof from corrosion, by the formation of fine rust layers on the surface.
  If abnormal rust is formed, preventive measures against corrosion are required after removing the rust.
- It is effective to ascertain, from the rust appearance, at which stage the rust is in the formation process, and to take preventive measures as necessary.
- In order to propose a classification technique that is more effective than before, classify the features of rust appearance using AI, by making it learn the stereoscopic images of rust in different conditions.

- In the existing experiential methods of the classification of rust, attention is focused on the particle size and color tone differences of rust.
  As a result of analysis, etc. by using AI, it is effective to focus attention on, in addition to those mentioned above, the unevenness and height information of rust as well.
- The results listed above are planned to be reflected in a review of the classification methods for rust that are used in inspection, etc.



The fine rust development is not identified. (The AI focuses on the circled area based on the color difference compared to the surrounding area, which may be similar to the shape of unstable flaky rust.)

The fine rust development is identified.

# Introduction to research activities aimed towards the realization of a green society

## [MLIT Environmental Action Plan] (December 2021)

- There are concerns about natural disasters becoming more severe and frequent due to the effects of climate change.
- In an effort to realize a sustainable and resilient green society that widely encompasses a decarbonized society, a society that adapts to climate change, a nature-harmonious society, and a recycling society, effective and efficient responses need to be taken by MLIT.
- By prioritizing the "MLIT's Green Challenge" as an important project, measures such as decarbonization, adaptation to climate change, biodiversity conservation, resources recycling, etc. will be deployed. The target date is 2050 and the period until FY 2030 specified as the planning period.

## ■ NILIM Green Society Realization Research Promotion Group (established in July 2023)

- The "Climate Change Adaptation Research Group" and the "Environmental Research Promotion Group" have been merged and enhanced in order to expedite the realization of a green society. The merger aided the steady execution of the MLIT Environmental Action Plan.
- NILIM will implement various efforts to aid the realization of a green society that encompasses a decarbonized society, a society adapting to climate change, a nature-harmonious society, and a recycling society as put forth in the MLIT Environmental Action Plan.

| Research field / Classification of measures | Homes and buildings | Urban development and infrastructure | The flow of people and goods. |
|---|---|---|---|
| Decarbonized society | Promotion of (1) Measures against the sources of absorption/carbon recycling, (1)(3) Decarbonization, (2) Energy saving, (3) Renewable energy | | Promotion of • Smart transportation and • Green distribution |
| Society adapting to climate change | Promotion of adaptation measures in the areas of • Natural disaster • Water resources and water environment and • People's life and urban life | | |
| Nature-harmonious society | | Promotion of • Green infrastructure, • Sound water circulation, (4) Sea conservation and restoration | |
| Recycling society | • Promotion of distribution and renovation of existing houses | (1) Promotion of high-quality construction recycling, etc. | |

* (1) to (4) in the table correspond to the "Examples of measures implemented by NILIM" described below.

## ■ Examples of measures implemented by NILIM

### (1) [Comprehensive technical development project] Research and development for promoting the introduction of new technology that contributes to carbon neutrality.

Technical development for overcoming technical obstacles to promoting the introduction of new carbon neutral technology (hereinafter called the "CN new technology") in the construction field

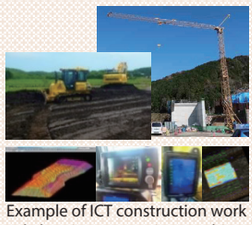
1) Development of unified evaluation methods of GHG emissions related to the CN new technology
- Calculation method for GHG emissions, etc. in the planning, design and service stage
- Unified method for the creation of "GHG emission intensity" for each process or type of work
- Unified method of obtaining fuel consumption or construction work data in the calculation of the "amount of activity" of construction materials, construction machinery, etc.

2) Development of a method for evaluating performance (structure, material performance, etc.) related to the CN new technology
- Structural performance evaluation method and material performance evaluation method for the members and rigid frame structures of environmentally conscious concrete
- Evaluation methods for the strength, deterioration degree, and soundness of reclaimed wood; and others

Example of environmentally conscious concrete


Example of specimens for material testing of new concrete-based materials

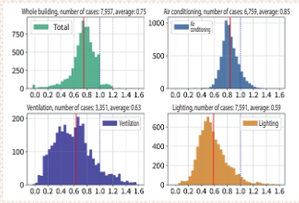

Reclamation of wood


Example of ICT construction work and electric construction machinery

### (2) Support for planning of energy conservation measures for buildings

- A mandatory system of compliance with building energy code is in operation under the Act on the Rational Use of Energy, which was revised to further improve the energy-saving performance of buildings.

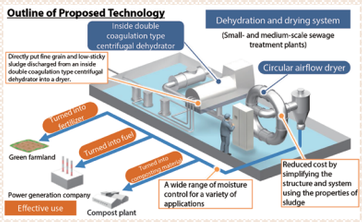
- A large amount of building energy code application data are analyzed to clarify actual energy conservation performance.
- The relationship between building design specifications and energy conservation performance is analyzed to support the formulation of energy conservation measures.



Distribution of energy conservation performance

### (3) Comprehensive study of sewerage technology aimed at carbon neutrality

- In the Energy Management Subcommittee of the Research and Development Committee on Sewerage, the trends of research and development related to the effective utilization of energy extracted from sewage and the reduction of greenhouse gas emissions from sewerage, etc. will be organized, and technologies that should be dealt with promptly will be selected.
- In addition, tools that are helpful to the study of decarbonization by local governments and survey manual drafts will be created.



An example of the effective use of sewage resources (technology of the B-DASH Project)

### (4) Development and promotion of blue infrastructure

- In order to take measures against the sources of the absorption of greenhouse gases in coastal areas, the development and promotion of green port structures (blue infrastructure) that are fit for the growth of seaweed are necessary.

- Development of devices for artificial seaweed substrates that promote the growth of seaweed
- Promote the efforts for blue infrastructure, by quantifying the multiple ecosystem services of blue infrastructure


Coastal structure where algae grow

# Infrastructure DX - Transforming society with digital technology -

## [DX in the infrastructure field]

In response to rapidly changing socioeconomic situations, the following goals are to be achieved in the infrastructure sector using data and digital technology:

- to transform social capital and public services based on the needs of the people, and
- to transform the operations themselves, organizations, processes, and the culture, climate, and work style of the construction industry and the Ministry of Land, Infrastructure, Transport, and Tourism, thereby improving public understanding of infrastructure and realizing safe, secure, and prosperous lifestyles.

## ○ Promotion of DX in the infrastructure field

### [Promotion system]

**MLIT Headquarters**

**DX Promotion Headquarters in the infrastructure sector**

- Promotion of policy on data utilization
- Establishment of implementation policy for promotion of BIM/CIM and others

Collaboration

**Regional Development Bureaus**

**Human Resources Development Center**

- Implementation of BIM/CIM training
- On-site demonstration of new technology and others

**Research facilities**

**DX Data Center, Construction DX Experimental Field**

- Centralized management and analysis of directly controlled BIM/CIM data
- Development of new technologies utilizing 3D data, 5G, etc. and others

**Structure within NILIM:**

**DX of Infrastructure Systems Research Committee**

- Promotion of research through cross-disciplinary collaborations

**Collaboration among research facilities**

- Cooperation agreement on DX concluded with the Public Works Research Institute (PWRI) and the Building Research Institute (BRI)


About the promotion of DX in the infrastructure field and the promotion system: created based on the "1st MLIT Infrastructure Sector DX Promotion Headquarters" material

## ■ Examples of measures implemented by NILIM

### Building the DX Data Center

- 3D data such as BIM/CIM and point cloud data are very large, making information sharing difficult.
- Since highly functional terminal devices and expensive software are required, it is difficult for small-scale contractors to make use of the data.

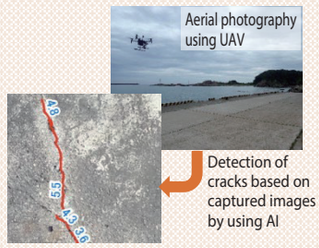
- The "DX Data Center" has been built as a system for storing 3D data and for the smooth sharing of information by the entity placing the order and contractor.


Conceptual image of utilizing the DX Data Center

### Development of efficient ways to inspect port facilities using AI

- Responding to aging infrastructure and a shortage of workers, it is necessary to save labor and shorten the time required for port facility inspections.

- Development of efficient methods to acquire data for port facility inspections
- Development of a system to detect cracks and/or other deformations from acquired data by using AI

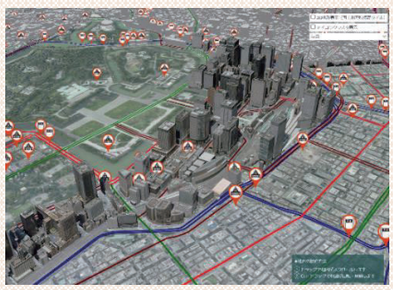



An example of crack detection

### Achieving a higher quality in the infrastructure and national land foundation by means of DX (BRIDGE measures*)

- Toward the goal of creating "future cities" aimed at in Society 5.0, achieving a higher quality in the infrastructure and national land foundation by means of DX is indispensable.
- The "DX promotion in the infrastructure sector," reform is being promoted in the following 3 fields: "how to make infrastructure," "how to use infrastructure" and "how to utilize infrastructure."

In this policy, i.e. the "promotion of DX in the infrastructure sector," digital technologies and data will be utilized, and the sophistication of MLIT DATA PLATFORM will be implemented.



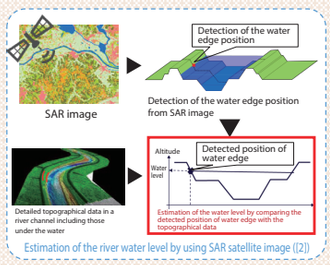
An example of data overlapping on MLIT DATA PLATFORM

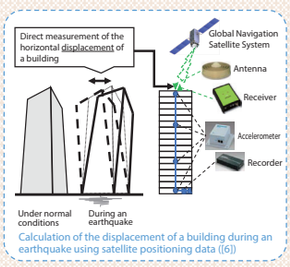
### Social implementation of remote sensing technologies utilizing satellites, etc. (BRIDGE measures*)

- At the time a disaster occurs, it is necessary to make a quick assessment of the situation and to take swift emergency action to open and restore roads as well as to take emergency measures to restore rivers and seacoast levees, while at the same time preventing the expansion of additional damage.
- Utilization of remote sensing technologies such as satellites

Implementation of research and development to enable the achievement of the following 3 goals

1. Development of techniques for grasping the overall condition of damage caused (to infrastructure, urban areas, and buildings)
2. Development of adaptation technologies to small SAR satellite constellations, etc.
3. "Technical standards" and "Reflection on standard specifications" that are directly linked with on-site work




An example of the research results and the current situation achieved.

*BRIDGE measures: Measures being implemented in the "programs for bridging the gap between R&D and Society 5.0" in the Cabinet Office

# Utilization of the joint research program - For the industry-academia-government collaboration -

The NILIM conducts joint research through collaboration with other organizations dealing with common challenges to efficiently obtain better results.

## ■ Flow to the start of joint research

NILIM
■ Planning of joint research

**Public application**

Co-researcher
■ Application for participation

NILIM
■ Screening
Relevance of the applicant as research partner
Transparency of reasons for selection
Fairness etc.

**Signing joint research agreement**

**Start of joint research**

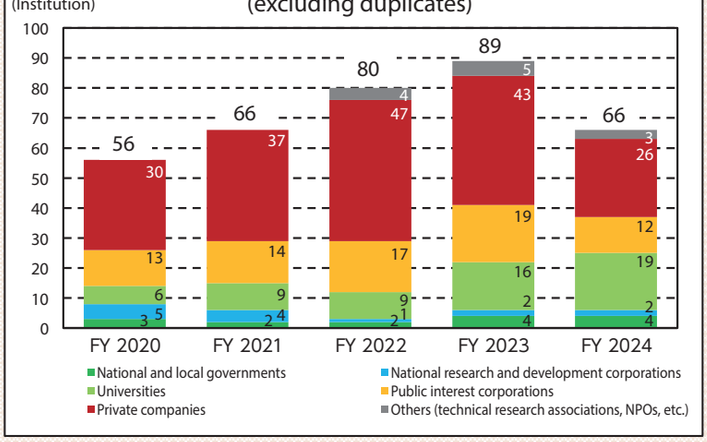
## ■ Results in recent years

- The NILIM has been conducting joint research in collaboration with various institutions, including the national and local governments, national research and development corporations, universities, and public interest corporations.
- The NILIM is collaborating and conducting joint research with more than 50 institutions every year.

Number of joint research projects conducted in the last five years.

| | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 |
|---|---|---|---|---|---|
| New | 3 | 3 | 9 | 6 | 10 |
| Continuation | 17 | 16 | 7 | 9 | 11 |
| Total number | 20 | 19 | 16 | 15 | 21 |

Number of collaborating institutions in the last five years (excluding duplicates)

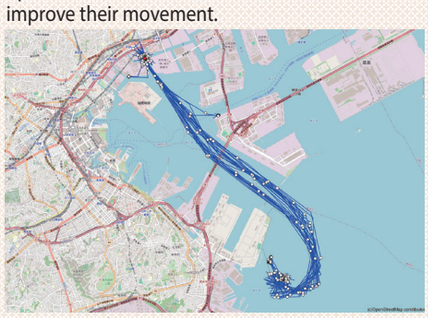



## ■ Examples of research

### Joint research on optimizing the operation, including carbon neutrality, of work vessels in offshore civil engineering work

[Collaborating institution] Specialists Center of Port and Airport Engineering
[Research period] April 2023 to March 2026 **(in progress)**
[Outline of the research]

Characteristics of the movement of work vessels that emit large amounts of $CO_2$ emissions in offshore construction work are analyzed using AIS data to study efficient ways to operate the vessels. Develop techniques to better understand the navigational status of work vessels not equipped with AIS, and examine measures for more efficient operation in order to better understand how to improve their movement.

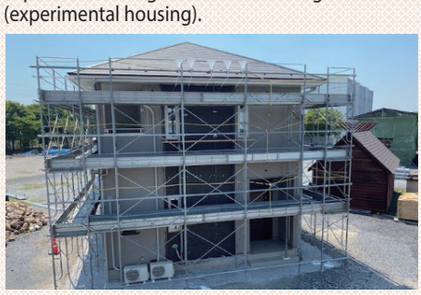


Example of how to understand the navigational status of work vessels not equipped with AIS

### Joint research on performance evaluation of exterior wall ventilation methods for wooden buildings

[Collaborating institution] Institute of Technologists and 11 others
[Research period] March 2022 to March 2025
[Outline of the research]

Increased use of wooden buildings and ensuring their long-term durability are positioned as important issues in achieving carbon neutrality goals.
This joint research examined performance evaluation techniques for the outer wall ventilation method and long-term durability of wooden buildings, by means of outdoor exposure experiments using a full-scale building (experimental housing).



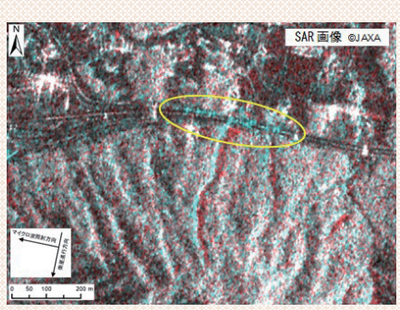
Experimental house

### Joint research on the development of sediment disaster monitoring method using the Daichi-2 satellite

[Collaborating institution] Japan Aerospace Exploration Agency (JAXA)
[Research period] July 2017 to March 2022
[Outline of the research]

Sediment disaster management requires technologies that can quickly identify the location and extent of a disaster in order to sophisticate initial responses after the onset of a disaster.

In this joint research, a method to acquire such information using synthetic aperture radar images acquired by the satellite *Daichi-2* in an emergency.

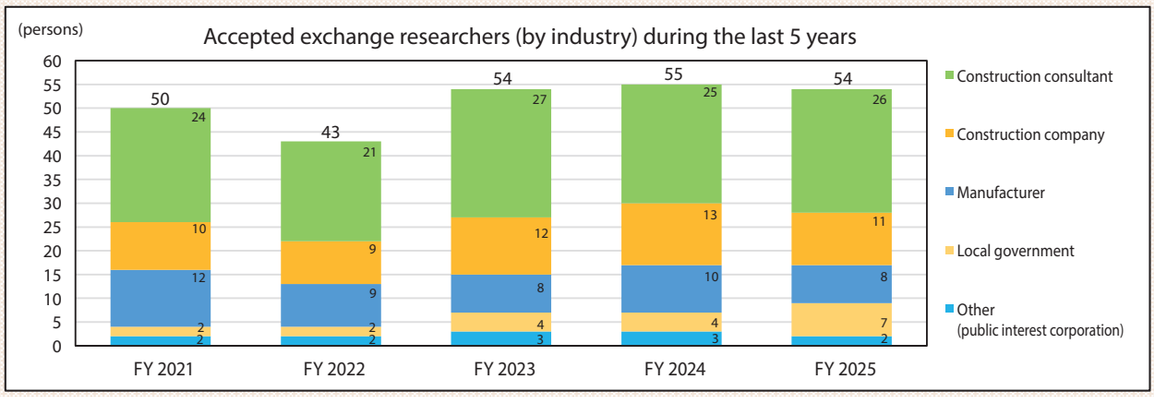



Sediment and driftwood generated by a mountainside collapse accumulate on the road.

# Introduction of researcher exchange program

- The NILIM is conducting [the researcher exchange program] to accept experts from outside organizations such as local governments and private companies as researchers.
- They can gain knowledge and experience in planning and drafting policies and technical standards related to housing and social infrastructure development under the guidance of the head of the research office and senior researchers.

## ■ Accepted experts




## ■ Comments from the alumni of the researcher exchange program

Shun Tsujimura
Enrollment period: FY 2024 -
Home organization: Hitachi Construction Machinery Co., Ltd.
Affiliation : Research Center for Infrastructure Management

I am engaged in research on the improvement of productivity of construction using earthmoving equipment.
Since this research laboratory conducts research related to i-Construction and information-oriented construction, I am in touch with the cutting edge trends on the client side.
Also, by learning the vantage points of the entire construction site including those of the contractor and client, I was able to obtain a perspective that was slightly different from that in the region where construction machinery is directly put into operation. My home organization is the construction machinery manufacturer.
In addition, by being involved in the preparation and operation of as-built management procedures, I was able to acquire knowledge about the procedures preparation process as viewed from the client's side. This has become a valuable experience.
With regards to the fields outside my area of expertise, through lectures and visits to facilities in the institute, I was able to exchange information and deepen my knowledge on a broad spectrum of fields related to the MLIT not only in the civil engineering field.
In the future, I would like to utilize the knowledge I gained from various viewpoints and incorporate it into operations in my home organization. This broader viewpoint is an asset that I have acquired from people inside and outside of the Institute through my position as an exchanger researcher.

Hironori Togawa
Enrollment period: FY2023 - FY2024
Home organization: Kyoto City Water Supply and Sewerage Bureau
Affiliation : Water Supply and Sewerage Systems Department

I am conducting research on technologies to achieve carbon neutral in wastewater treatment and sludge treatment.
In the sewerage sector, greenhouse gas emissions reduction is required, and at the same time contribution to sustainable recycling-oriented society is expected. Both are achieved by the effective utilization of wastewater and wastewater sludge such as conversion into renewable energy or into resources. At the Wastewater and Sludge Management Division, research concerning greenhouse gas emissions reduction, research and development of new technologies is being carried out. Also, empirical research on their commercialization, and others are implemented. I am studying planning and evaluation techniques while introducing technologies to achieve carbon neutrality. In one of those projects, I have conducted an investigation into the actual conditions of the occurrence of $N_2O$ from the wastewater treatment process. This is one of the global warming gases, and I plan to present the results of that research in a paper.
Also, through meetings with experts and the on-site observation of new technologies, I exchanged opinions with people from a wide variety of fields and was able to obtain a variety of viewpoints for addressing social problems beyond the borders of specific industries. This has been a great learning experience for me that I will be able to integrate into the work at my home organization.

Shintaro Mashiko
Enrollment period: FY2022 - FY2023
Home organization: Dia Nippon Engineering Consultants Co., Ltd.
Affiliation : Urban Planning Department (at that time)

I conducted research on technologies to improve the mobility environment focusing on "improving traffic services" within the greater framework of "developing technologies to revitalize suburban residential areas."
In the suburbs, the aging of the population and the decline in the level of service provided by the existing public transportation system have made it problematic for many residents to get around on a daily basis. I thus conducted a social experiment using Green Slow Mobility, a new type of mobility, to collect and analyze the data from vehicles actually driving on residential roads with passengers on board. Based on the data I collected, I clarified how the new type of mobility should be used according to regional characteristics, organized ideas into a paper, and submitted it to academic societies. This was a very di cult task for me because I had no such opportunity back at my company. However, I was relieved when I received the Excellence Award as a tangible achievement. I also gained the know-how of how to build consensus with relevant organizations and how to work on social implementation processes through the valuable experience from the standpoint of a client.

Yoshito Makinae
Enrollment period: FY 2023 - FY 2024
Home organization: Japan Port Consultants, Ltd.
Affiliation: Port, Coastal and Marine Department

Thank you for the support extended to me during my assignment at the Port Facilities Division of the Port, Coastal and Marine Department.
In my research, I examined the design techniques for breakwaters based on design wave height and rising tide levels caused by climate changes. Also, in the Noto Peninsula Earthquake disaster, I was engaged in part of the technical support for staff members.
In my research, into the full-fledged design that takes into consideration the effects of climate changes in coastal facilities, I gained a deep understanding of the research techniques and how to set conditions in both the previous researches and my own research. In addition, in the area of technical support, there were some instances in which my knowledge and experiences which had been acquired through practical business until the present were utilized. However, on the other hand when responding to a wide variety of structural types under the special conditions of damaged coastal facilities, I also realized the limitations in understanding the technical standards and design techniques.
During the research and technical support, I felt the importance of grasping things by taking more multifaceted approaches, through the exchange of opinions with research coordinators and exchange researchers. After returning to my home organization, I would like to tackle problem-solving challenges by making use of these experiences.

# Research and development that supports the planning, drafting, and spreading of the policy for land, infrastructure, transport, and tourism

## Main research themes of the NILIM in FY 2025

### 1. Research to improve national resilience and protect the life and livelihood of the people ••• 12 ~ 14



### 2. Research to increase the productivity and growth potential of society ••• 14 ~ 17



### 3. Research to support comfortable and secure living ••• 18 ~ 20

# 1. Research to improve national resilience and protect the life and livelihood of the people

## 1 Research on **persistent river levees against overflow**

Regarding the issue of "persistent river levees" that prolong the time until the levee is destroyed by overflow, even if they are only slightly damaged, such levees will be examined through Industry-Academia-Government Collaboration, thereby contributing to the securing enough time for evacuation and to reduce the flooding in the inundated area.

- There is concern about the possibility of the occurrence of floods exceeding the capacities of flood control facilities due to climate changes.
- In the 2019 East Japan Typhoon, the destruction of levees occurred at 142 locations, and of these, in 122 locations "overflow" is estimated to have been the major factor of the destruction.
- It is necessary to proceed with the improvement of the "persistent river levees" in order to prolong, even if only slightly, the time until the levee is destroyed by overflow.

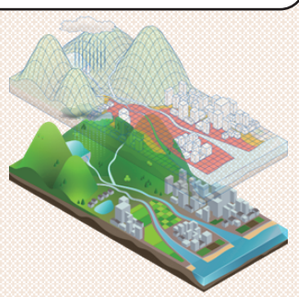
- The MLIT implements public invitation for relevant industrial associations, private businesses to collaborate in order to enact technical development of "persistent river levees".
- The NILIM implements large-scale levee model experiments that are close to full scale, under various conditions that model the sites, thereby improving reliability.

(River Department)

## 2 **Improvements of digital twin experimental sites** for the promotion of River Basin-wide Integrated water management

Developing Digital Testbeds, the experimental platform that reproduces river basins in cyberspace, contributes to the acceleration of technology developments for visualizing the effectiveness of flood control measures and next-generation flood forecasting through the public-private partnership.

- It is necessary to communicate risk among various stakeholders and to establish preparedness for disasters before a disaster occurs in order to promote River Basin Disaster Resilience and Sustainability by All.
- Risk communication requires visualizing the effectiveness of measures, and the establishment of the disaster prevention system in advance requires taking advantage of the forecast information.



- Improvement of a verification experiment platform that reproduces the basin in cyber space, by utilizing the open data such as three-dimensional data that has been improved in recent years (its operation is planned to be started within FY 2025)
- Using the experimental platform, this study aims to develop technology to visualize the effectiveness of flood control measures in the basin and next-generation flood forecasting technology through the public-private partnership.

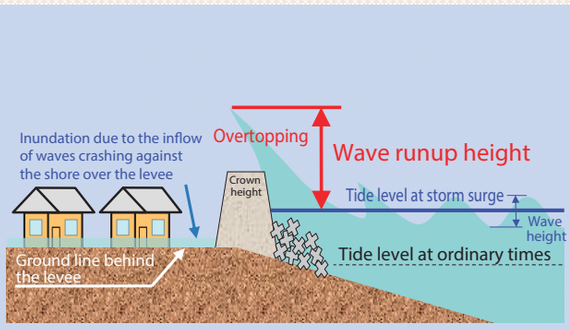
(River Department)

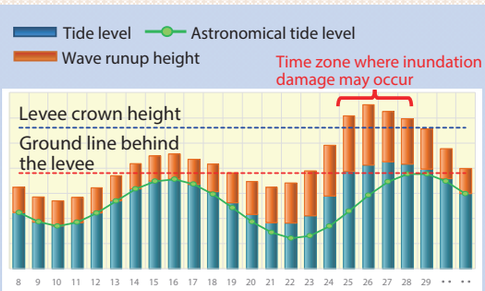
## 3 Development of a **wave runup height prediction system** to provide new storm surge warnings

Develop a system to predict wave runup heights along the coast and contribute to the establishment of a highly accurate storm surge information dissemination mechanism to support evacuation efforts.

- Inundation damage caused by storm surges and high waves occurs not only when seawater overflows the dike due to high tide levels, but also when waves overtop the dike. However, the current storm surge warning does not take the effects of waves into account.

- Develop a system that can indicate the wave runup heights at each coastal area in real time, based on forecasts of tidal levels and waves, and provide this data to the relevant organizations.
- Together with the development of observation technology enabling real-time detection of overtopping at coastal areas, the system aims to enhance storm surge prediction.




Results of runup height prediction (the graph is for illustrative purposes only)

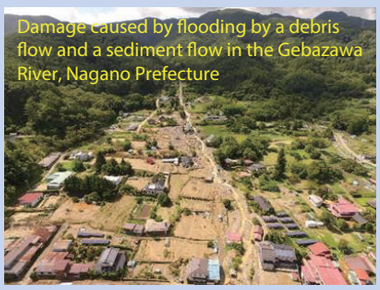
(River Department)

## 4 **Protecting lives** against sediment-related disasters by finding places that are even slightly safer.

A proposal for the numerical calculation method will be made that shows both the range and the areas at risk for flooding by using a debris flow. It will include the influence of houses and other structures in its calculation and contribute to an action plan for evacuation in the event of a disaster.

- A technique is required to calculate beforehand the relative degree of danger and the areas at greatest risk of a debris flow in a sediment-related disaster warning area.

- Study of a method for evaluating the influence of houses and other structures on the flood range by a debris flow
- Assumption of sediment production and outflow scenarios using a calculation of water and sediment outflow, and organizing points to be noted in the calculation
- Analysis of risk information obtained from the results of calculation and a study of the method used to provide such information

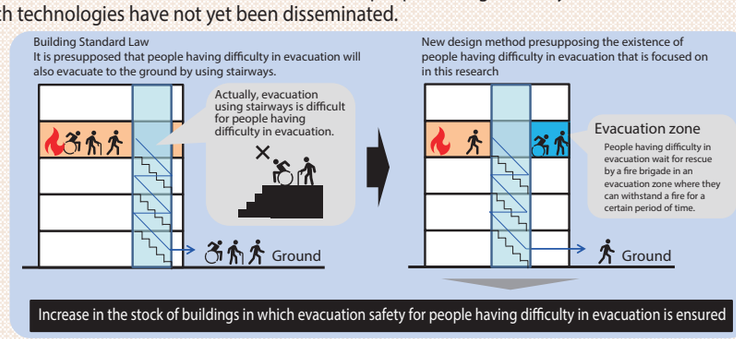

(Sabo Department)

## 5 Efforts to broaden participation **include people who have difficulty evacuating** by improving evacuation safety during a fire

In order to ensure the safety of the so-called "people having difficulty in evacuation" such as the elderly and wheelchair users during a fire, new evacuation safety designs will be developed for buildings on the premise that there are such people during a fire.

- In the Building Standard Law, evacuation of non-disabled people by using stairways to the ground is presupposed.
- There are cases where "people having difficulty in evacuation" whose vertical evacuation is difficult are left behind during evacuation during a fire.
- In recent years, fundamental technologies have been developed that can be utilized for safe evacuation of people having difficulty in evacuation, such as evacuation zones and evacuation using an elevator, but such technologies have not yet been disseminated.

- Building an evacuation behavior model (behavior model that represents the movement of evacuees) of people having difficulty in evacuation that utilizes VR (virtual reality)
- Preparation of evacuation safety design guidelines in which techniques for applying fundamental technologies, etc. are organized



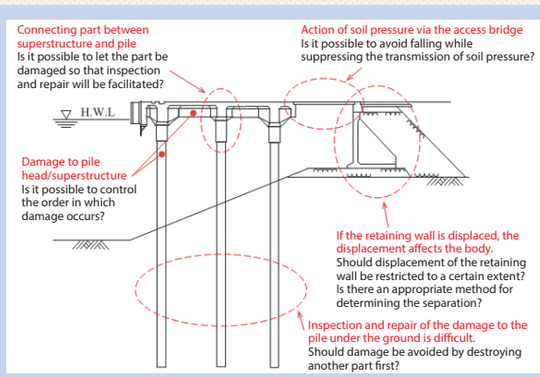

(Housing Department/Building Department)

## 6 Efforts to improve **the mooring facilities that can quickly be utilized after an earthquake**

In order to realize the improvement of mooring facilities with high responsiveness for the utilizing of facilities after an earthquake, a new seismic design method will be developed that would enable the mooring facilities to be utilized immediately after an earthquake, and enable emergency restoration to be achieved easily.

- In the Noto Peninsula Earthquake, some requests were made that regardless of the type of the mooring facility or water depth, the mooring facilities should be utilized immediately in various applications such as emergency transport of materials and supplies.
- If the integrity of a mooring facility has been compromised by an earthquake, judgment on how such facility can be used has a high level of technical difficulty, and response requires time.

- Standardization of the method for quantitatively evaluating the performance of a facility after an earthquake
- Examination of the evaluation method for the possibility of immediate utilization after an earthquake and the difficulty of emergency restoration.
- Development of a new seismic design method for mooring facilities




Look for a structure that facilitates inspection and diagnosis and emergency restoration after an earthquake

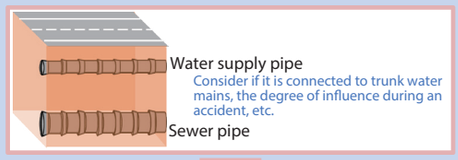
(Port, Coastal and Marine Department)

## 7 Efforts toward **stable provision of water supply and sewerage services**

Build a deterioration prediction formula that enables the deterioration rate of water supply pipes to be roughly predicted, and make a proposal for measures to devise a rebuilding, inspection and investigation plan for integrated water supply and sewerage systems, thereby contributing to the realization of efficient rebuilding, inspection and investigation of water supply and sewerage pipelines.

- Due to the fact that the inspection and investigation of water supply pipes are difficult, it is difficult to identify their deterioration rate.
- Although it is more efficient to carry out the rebuilding, inspection and investigation of water supply and sewerage systems integrally, techniques for determining their priority have not been established.

- Build a deterioration prediction formula that enables the deterioration rate of water supply pipes to be roughly predicted.
- Make a proposal for measures to devise a rebuilding, inspection and investigation plan for integrated water supply and sewerage systems.




Evaluate the priority comprehensively based on the results of an evaluation of the degree of deterioration and the importance of the pipeline, the degree of influence during an accident, etc.

Devise a rebuilding, inspection and investigation plan

(Water Supply and Sewerage Department)

## 8 Efforts to **improve efficiency and sophistication of airport pavement inspection operations**

The functions of the airport pavement patrol and inspection system, which has been developed and operated to improve the efficiency and sophistication of airport pavement inspection work, are improved. The improved functions will contribute to the improved efficiency of maintenance and management work.

- Preventive maintenance and management are necessary to ensure the safety and punctuality of aircraft operations.
- Build an inspection system for airport pavement patrol and implement the inspection registration function, regular inspection information (pavement surface properties investigation results) browsing function, repair information and registration function.

[Building a new inspection system for patrol, etc.]

- Conventionally, use of the system was limited to dedicated terminals only, but in light of its convenience, building a system by WEB app started from FY 2024.
- This will enable this system to be used from any smartphone or tablet, without depending on the terminals. (The new system is planned to be put into operation in FY 2026.)

<New inspection system for patrol, etc.: photos are for illustrative purposes only>


(Airport Department)

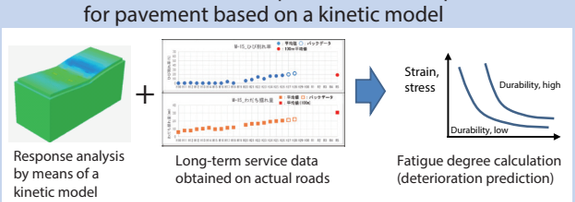
# 2. Research to increase the productivity and growth potential of society

## 1 Promotion of new technology by **developing new durability evaluation techniques in road pavement**

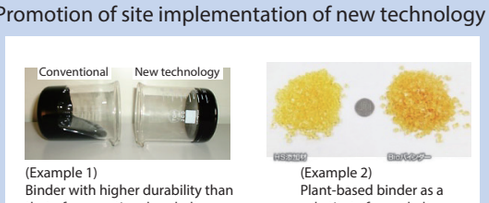
By developing new techniques for predicting deterioration based on kinetic models of road pavement, promote site implementation of new technology, and contribute to the reduction of life cycle cost as well as realizing carbon neutral outcomes.

- In recent years, a new technology for high durability and a new technology that will contribute to the realization of carbon neutrality, have been developed mainly by the private sector one after another. To help realize a sustainable society, it is necessary to proactively promote the implementation of sites with new technologies such as these.
- Instead of conventional designs based on experience, perform deterioration prediction by means of kinetic models based on the physical property values of materials, and newly developed design techniques that can evaluate durability. By building a framework new materials and new structures with no track record of construction can be proactively introduced into the site.

Build a deterioration prediction technique for pavement based on a kinetic model




Promotion of site implementation of new technology




(Road Structures Department)

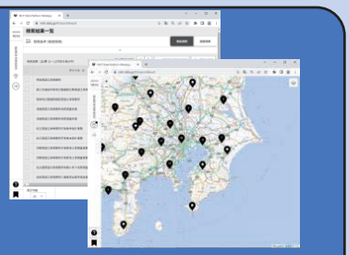
## 2 Production of innovation by developing MLIT DATA PLATFORM

A platform was built to enable the linkage of the various data held by the government and private sectors. This will contribute to the efficiency of operations, the sophistication of the MLIT policies, and the creation of innovations through industry-academia-government collaboration.

- In order to promote the utilization of data by the government and private sectors, it is necessary to establish a platform to realize a digital twin that reproduces physical (real) events in cyberspace by linking data held by the MLIT with data from the private sector and others.
- There is a need to promote technological development and R&D to link and utilize the various data held by the government and private sectors. This is to use the infrastructure data to improve productivity in the field of construction and non-construction fields such as disaster management and logistics.

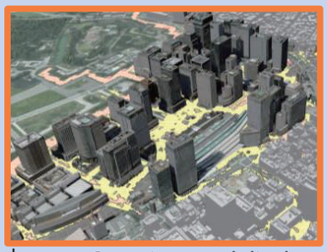
- We have built MLIT DATA PLATFORM with functions for searching, displaying, and downloading data across the board by linking APIs with the various databases owned by the government and private sectors.
- Proceed with the enhancement of linked databases. Also implement research and development for the advancement of data provision functions, improvements in convenience, such as the creation of standard specifications for automation as well as the standardization of data integration, and the development of API functions for users.

**MLIT DATA PLATFORM**



https://www.mlit-data.jp/
API linkage with various databases enables search and display of the data on 3D maps.

Search
Display
Download



Superimposed display of a 3D city model and flood inundation forecast data

Overlapping display with multiple three-dimensional data (point cloud data, etc.)

(Research Center for Infrastructure Management)

## 3 Improvement of productivity and work style reform at construction sites through the use of ICT

As a foundational technology for realizing "construction automation" in i-Construction 2.0, we examine the mechanisms of construction data linkage, thereby contributing to the improvement of productivity in the construction industry and work style reform.

- The i-Construction 2.0 announced in FY 2024 aims at 30% labor savings by "construction automation" and other initiatives.
  In construction automation, realizing optimum construction is one of the challenges. In order to efficiently obtain an optimum solution, it is necessary to devise common rules for the digitalization of construction site status, and for the aggregation and utilization of such data.

- When the "Implementation procedures concerning site management by data utilization" and the "Reference exemplifying materials on technology such as equipment, ver 1.0" for such procedures" (both of which are procedures for reference purposes), were formulated the relationships between the use cases of site management and construction data were organized.
- To achieve the goal of social implementation of construction data linkage techniques based on the site management, the results of research are utilized in the study groups consisting of the government and the private sector that have been established in the MLIT headquarters.

**Relationships between the use cases of site management and construction data**

| Use case of site management | Positional data of construction machinery and dump trucks, etc. | Construction work history data | Image data |
|---|---|---|---|
| (1) Optimization of construction work scheduling | ○ | | ○ |
| (2) Understanding and improving bottlenecks | ○ | ○ | ○ |
| (3) Budget and results management | ○ | ○ | ○ |
| (4) Others (safety management, etc.) | ○ | | ○ |

(*The mark ○ in the figure shows the data type with which the effectiveness of utilization can be expected.)

• Example of construction work history data
(as-built data generated from point cloud data of the blade tip loci of ICT construction machinery)

• Example of image data
(video of the status of construction work shot from a camera overlooking the construction site)

(Research Center for Infrastructure Management)

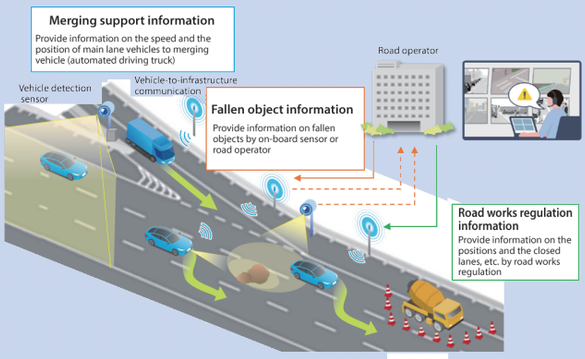
## 4 Initiatives for the implementation of **automated driving trucks** on expressways

It will contribute to an early implementation of automated driving trucks on expressways to develop a system that provides unseen traffic conditions on a main lane to merging vehicles.

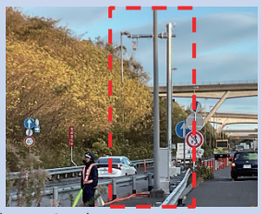
- Large vehicles need to travel longer for accelerating or changing lanes at a merging section compared to general vehicles.
- It supports safe and smooth automated driving to provide information on a road ahead that cannot be detected by on-board sensors of automated driving trucks.

- For Level 4 automated driving trucks, the field operational test has been fully conducted in FY 2025 in order to verify an effectiveness of merging support information provision and look-ahead information (fallen objects, road works regulation, etc.) provision on the Shin-Tomei Expressway.

Information provision to automated driving trucks by vehicle-to-infrastructure system (merging support information and look-ahead information)






Equipments for field operational test
(left: vehicle detection sensor, right: information provision unit)

Vehicle for field operational test
(automated driving truck)

(Road Traffic Department)

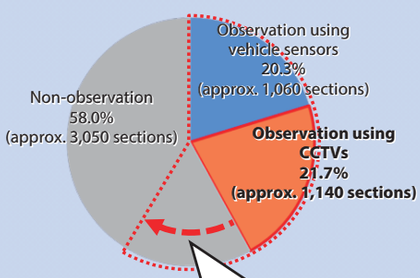
## 5 Sophistication and improvement of the efficiency of road traffic data acquisition using AI

The AI-based traffic volume observation method is developed to contribute to the improvement of road traffic services based on objective numerical values, by realizing efficient acquisition of a wide variety of road traffic data

- Although the construction of road networks is constantly progressing, there are various problems in improved roads, such as traffic jams and accidents, punctuality, aspects of disaster preparedness, etc.
- It is necessary to proceed with measures for improving road utilization services, by establishing techniques for efficient acquisition and analysis of road traffic data.

- Conventional traffic volume observation equipment was intended for obtaining data of vehicles only, and the areas of installation were also limited. Other problems that need to be addressed are the sophistication and cost reduction of the observation techniques.
- An efficient traffic volume observation method using AI analysis of the videos of existing CCTVs will be developed, and improvement of accuracy and expansion of survey targets (pedestrians, etc.) will be studied.

**<Ratio of sections where traffic is constantly observed in National Highways under jurisdiction of MLIT>**

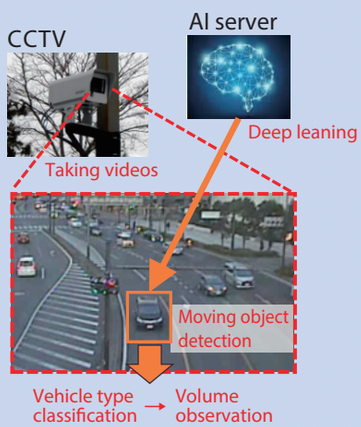



There is a plan to expand the sections where data can be obtained by improving the accuracy of the observation method.

* Aggregated data for the sections subject to the FY2021 Road Traffic Census

**<Observation method using AI analysis of CCTV images (image diagram)>**

*Introduction in all over Japan has been started since 2020.




**<Study of the improvement of accuracy of observation method>**


Change in the angle of view of the site CCTV, so that it is easier to capture the features of the vehicles on the lanes in the in the corner of the screen.


Verification of the improvement of the accuracy of traffic volume observation

*CCTV: Video cameras installed for road management (abbreviation for Closed Circuit TeleVision)

(Road Traffic Department)

## 6 Integrating visible greenery into **urban development to accelerate GX**

Make environmental improvements to the green visibility ratio. Visibility of greenery is becoming a growing concern and can be efficiently investigated by means of AI, etc., thereby contributing to the formation of good landscapes and the improvement of emotional well-being.

- As the demand for improved well-being has risen since COVID-19, urban greenery is expected to play a more significant role in Green Transformation for urban development.
- To effectively integrate greenery into urban development, we need technology that can measure and evaluate how greenery contributes to creating pleasant landscapes and improving quality of life.

- Developing an AI-powered survey tool for green visibility ratio to reduce labor and costs.
- Development of an evaluation method to set quantitative targets for visible greenery.
- Empowering local governments to conduct surveys of visible greenery (green visibility ratio), alongside traditional green space area surveys (green coverage ratio), for their Green Master Plans.

Developed an efficient AI-powered survey tool for green visibility ratio

Strengthen the readiness to various types of trees and seasonal changes, etc.

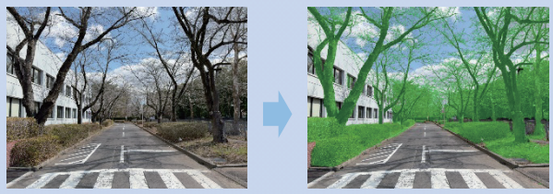


Photo　　Green visibility ratio 47.33%

(Urban Planning Department)

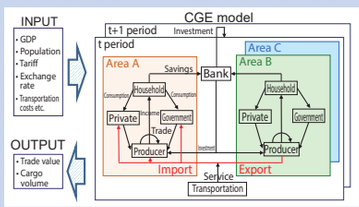
## 7 Efforts to **plan and propose port policies** that reflect future changes in the market

We developed future cargo volume forecasts that accurately reflect changes in the global economic and social conditions and the container transport market. This will support the planning and formulation of national port policies and the revision of port plans by port management bodies.

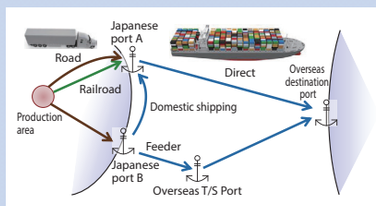
- Accurate estimation of future port cargo volumes is necessary for planning and formulating port policies and revising port plans.
- Currently it is difficult to foresee the future because of the movement toward a zero-emission society, etc.

- The forecasting model for Japan's overall foreign trade port cargo volume and the port and route choice model for foreign trade container cargo are continuously improved to calculate future forecasts.
- Quantitative evaluation that existing models cannot take into account the impact of recent rapid changes such as the movement toward a zero-emission society. The evaluation data is used to develop a method that will reflect these changes in future forecasts.

<Forecasting model for foreign trade port cargo volume>




<Port and route choice model for foreign trade container cargo>



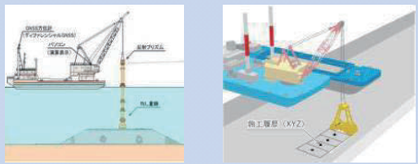

(Port, Coastal, and Marine Department)

## 8 Improvement of productivity in the port sector through **the use of ICT and BIM for infrastructure**

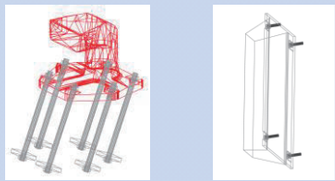
Methods and standards are developed and organized to facilitate the use of ICT and BIM for infrastructure in the development of port facilities. This contributes to increased efficiency and safety in design and construction sites.

- The as-built shapes of foundation works (rubble leveling) and floor digging works are measured by a diver or by multibeam echo sounding, and there is room for improvement in productivity and safety.
- Technical knowledge of BIM/CIM is not organized or shared sufficiently, and the creation of three-dimensional models is time-consuming.

- Regarding the as-built shape measurement using construction history data of mechanical leveling or grab dredging ship, verification of the accuracy is performed by on-site testing. As-built shape management procedures are created and publicized making it possible to partially omit the measurement work by a diver or by multibeam echo sounding.
- Analyze the effects and problems of survey, design, and construction utilizing BIM, and publicize the "Collection of BIM Cases, Port Part, Ver. 2".
- Create generic objects (standard parts) of mooring posts and fenders, etc., and publicize the data files of three-dimensional models in the IFC format that is not dependent on specific software.



As-built shape measurement by using construction history data
(left: mechanical leveling (foundation works),
right: grab dredging ship (floor digging works))



Examples of BIM generic objects
(left: mooring post, right: fender)

(Support Center for Port and Harbor Advanced Information Technology)

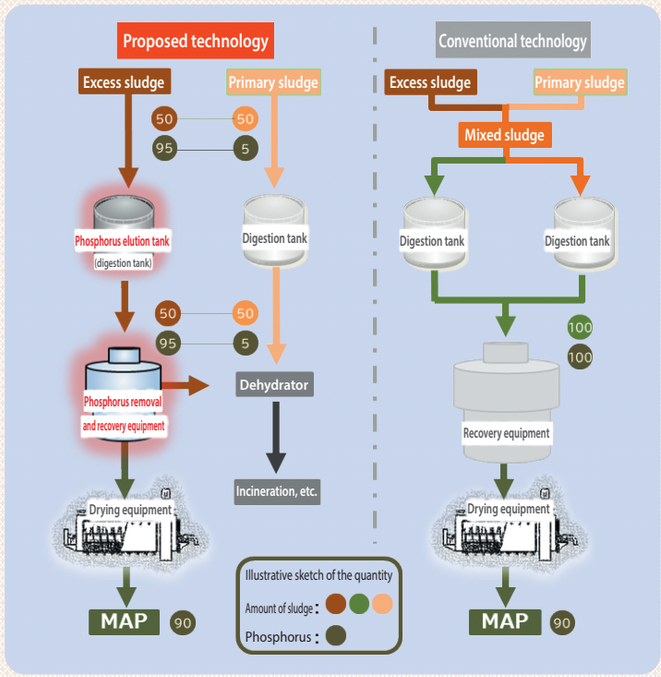
# 3. Research to support comfortable and secure living

## 1 Efforts toward **the conversion of sewage sludge into fertilizers**

By developing phosphorus recovery technology from excess sludge containing large amounts of phosphorus, it is possible to establish a phosphorus recovery process that is more efficient and can reduce life cycle cost, thereby contributing to the promotion of utilization of sewage sludge as fertilizers.

- Regarding the raw materials of chemical fertilizers, Japan is almost completely dependent on imports, and since mid-2021, the international prices of fertilization raw materials have soared.
- Sewage sludge contains a lot of ingredients necessary for fertilizers such as phosphorus.
- The expansion of the utilization of sewage sludge as fertilizers is expected to contribute to the sustainability of agriculture, forestry, and fisheries.
- Conversion of sewage sludge resources into fertilizers is implemented in basically 2 types: conversion into compost and recovery of phosphorus.
  - ➢ In the conversion into compost, there is a concern about the risks of sewage sludge containing heavy metals.
  - ➢ In the recovery of phosphorus, the treatment sites implementing the recovery are limited, due to problems such as the high cost of facilities.

- Implement technical development for phosphorus recovery from excess sludge containing large amounts of phosphorus (sludge after biological treatment), by means of the Breakthrough by Dynamic Approach in Sewage High Technology (B-DASH Project).
- Since the amount of sludge to be treated is decreased to about half and the construction cost of phosphorus removal and recovery equipment is reduced, cost reduction is expected.




(Water Supply and Sewerage Department)

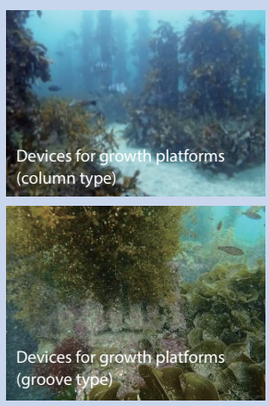
## 2 **Preventive measures against global warming and** efforts toward **the realization of coastal ecosystems**

Implement tactics for algae growth platforms in coastal structures and evaluation of the effects on the wide-range environments of blue infrastructure*, thereby contributing to the preventive measures against global warming and the realization of coastal ecosystems by utilizing blue carbon** ecosystems.

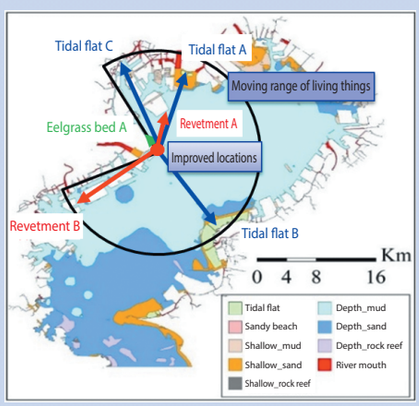
*Seagrass beds, tidal flats, etc. and green port structures, **Carbon captured in marine plants

- In order to realize sustainable socio-economic activities, it is important to recover habitat environments in sea areas.
- The environment within ports is not suitable for the growth of seaweed due to various factors inhibiting the epiphytism and growth such as an insufficient amount of light, deposition of fine particles, feeding damage, etc.
- From the vantage point of habitat networks, it is necessary to appropriately evaluate the effects of blue infrastructure such as artificial tidal flats and green port structures on wide-range environments.

- Development of devices for growth platforms that promote the growth of seagrasses and algae in various aqueous environments
- Development of evaluation techniques for habitats considering the effects of blue infrastructure on wide-range environments




Coastal structure with grown algae




Quantification of habitat networks

(Port, Coastal and Marine Department)

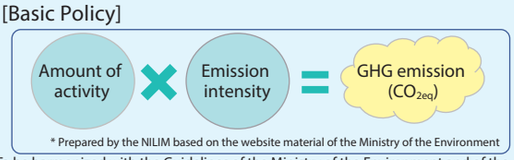
## 3 Promotion of **carbon neutral construction** by the "visualization" of GHG* emissions

Establish the method for quantitatively calculating the GHG* emissions from construction sites, and create a "fair and common ruler", thereby contributing to the promotion of carbon neutral construction. *GHG (Greenhouse Gas)

- In order to reduce the GHG emissions from construction sites, it is necessary to understand the current status in the first place.
- A "unified technique" for quantitative calculation is required. In order to put the calculation into practical use, "speeding up of work and burden reduction" are required.

- Break the barriers of construction GX, through the research and development of calculation "manual", "tools", and "a certain number of emission intensity databases" at the construction stage.

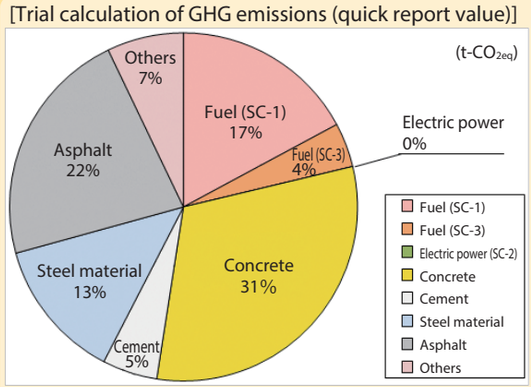
[Basic Policy]




* Prepared by the NILIM based on the website material of the Ministry of the Environment

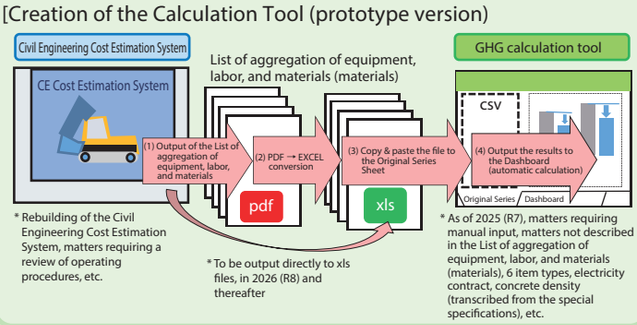
To be harmonized with the Guidelines of the Ministry of the Environment and of the Ministry of Economy, Trade and Industry, as well as with the GHG protocol and ISO.

[Trial calculation of GHG emissions (quick report value)]




Based on the results of trial calculation for the trial works of each of the Regional Development Bureaus all over Japan, it has been found that 90% or more can be captured in 6 major items. → [Features of the Calculation Manual, etc.] (4)

[Creation of the Calculation Tool (prototype version)]




* Rebuilding of the Civil Engineering Cost Estimation System, matters requiring a review of operating procedures, etc.

* To be output directly to xls files, in 2026 (R8) and thereafter

* As of 2025 (R7), matters requiring manual input, matters not described in the List of aggregation of equipment, labor, and materials (materials), 6 item types, electricity contract, concrete density (transcribed from the special specifications), etc.

[Features of the Calculation Manual, etc.]

(1) Utilize the concept of construction cost estimation, and grasp the amount of activity based on the construction cost estimation quantity of public works.
(2) Obtain structured data from the List of aggregation of the Civil Engineering Cost Estimation System, and by copying & pasting the data to the Tool, the result is output to the Dashboard
The Civil Engineering Cost Estimation System and the Tool perform information collaboration seamlessly.
(3) "Standard emissions" - "Emissions after applying decarbonization technology" = "Avoided Emissions reduction"
(4) From the results of trial calculation of trail works, calculation is made on the basis of the amount of materials for the 6 major items, and on the basis of the amount of money for the other items (raw materials, activity).

(Research Center for Infrastructure Management)

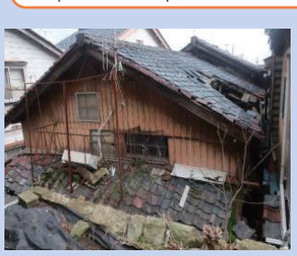
## 4 Promotion of **effective measures to deal with vacant houses** by using structural performance evaluation technologies

The development of evaluation standards will be used for the structural performance (risk of damage caused by a disaster) of vacant houses combined with a study assessing the application of reasonable reinforcement and renovation methods. This will contribute to an efficient assessment by municipalities on which vacant houses are poorly managed and how they can be effectively utilized.

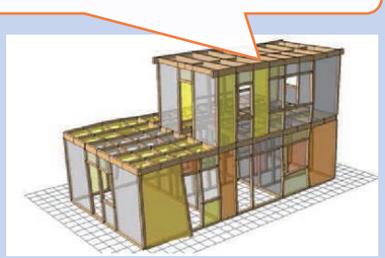
- The number of vacant houses that are no longer suitable to be lived in has doubled in the last 20 years. That trend appears to be continuing for the foreseeable future.
- In the Vacant Houses Special Measures Act amended in June 2023, a system of guidance and recommendation for poorly managed vacant houses was established.

- Utilizing simulation technologies, the risk assessment method of damage inflicted on a vacant house will be developed based on the appearance, etc. of the vacant house. (Research (1))
- The application of reasonable reinforcement and renovation methods of vulnerable portions of a vacant house will be studied by testing the integrity of the joints. (Research (2))

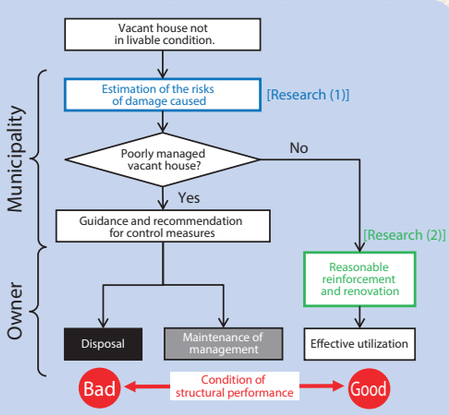
- Simulations will be implemented that assume structural failure during an earthquake or accumulation of snow.
- An effective way of showing the risks of damage caused will be studied, and reasonable judgment criteria for poorly managed vacant houses, will be organized that compensate for shortages of expertise of municipalities.



Example of a vacant house in a precarious condition in terms of security



Example of collapsing simulation (Wallstat) of a wooden house




Flow of measures dealing with the problems of vacant houses and how they relate to the research.

(Building Department)

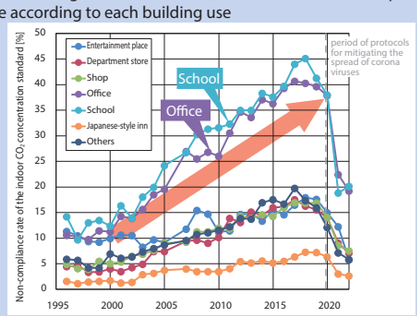
## 5 Efforts to **secure the indoor environment of a building and to promote energy saving**

Secure an appropriate indoor air environment in buildings such as office buildings and schools, and at the same time control the dissemination of energy and promote energy saving technologies to reduce consumption. We will prepare technical guidelines for air conditioning ventilation equipment plans and develop techniques to evaluate the energy saving effects of advanced ventilation systems.

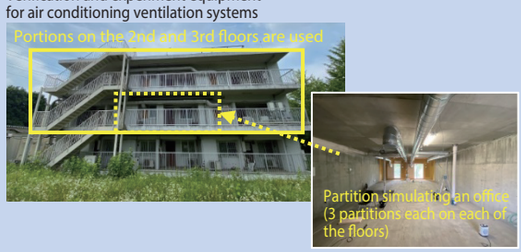
- The periodical inspection pursuant to the Building Sanitation Act has revealed that 1/3 or more of the office buildings are non-compliant in terms of indoor $CO_2$ concentration (the situation has changed for the worse about 3 times in 20 years).
  * Excluding the period of taking measures against the COVID-19 Pandemic (excluding 2020 and thereafter)
- In order to become carbon neutral by 2050, the introduction of energy saving technologies concerning air conditioning ventilation should be promoted. However, in the Building Energy Efficiency Act, energy saving technologies such as advanced ventilated air volume control are not evaluated yet.

- Together with the investigation and grasping of the actual status of ventilation, prepare the following technical guidelines and develop the evaluation techniques for energy saving effects, based on the verification experiments related to advanced ventilated air volume control ($CO_2$ concentration control) that realize energy saving while securing an appropriate indoor air environment.
  (1) Technical guidelines for an air conditioning ventilation equipment plan to secure an appropriate indoor air environment
  (2) Evaluation techniques for energy saving effects of an advanced ventilation system, presupposing the securing of an appropriate indoor air environment

Secular change in the indoor $CO_2$ concentration non-compliance rate according to each building use




Verification and experiment equipment for air conditioning ventilation systems



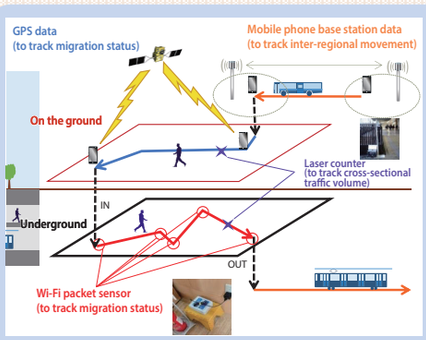

(Housing Department)

## 6 Initiatives **to make cities smarter** with digital technology

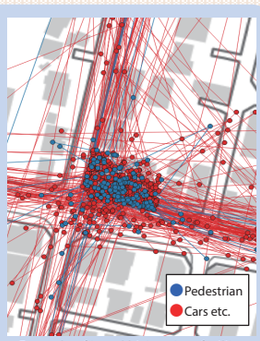
In urban planning, technologies for effectively using traffic and human mobility big data and 3D city models are developed to contribute to the development of smart cities.

- The use of digital technologies such as big data is effective for local governments to create urban planning and solve urban problems.

- Technology for effectively using big data (GPS and data from mobile base station etc.) that support person trip surveys is developed.
- Techniques for estimation and evaluation of traffic volume for each facility use are developed, by utilizing human mobility big data.



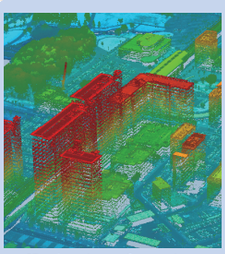

[Continuous tracking of human movement]
Integration of data with different spatial scales



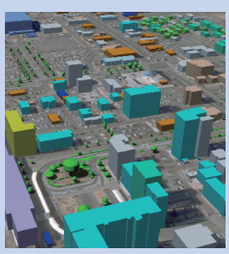

Example of travel history to a facility by mode of transportation (based on GPS data)

- Promotion of the development of 3D city models as basic data for smart cities is necessary.
- Challenges include the reduction of creation and update costs and development of diverse use cases.

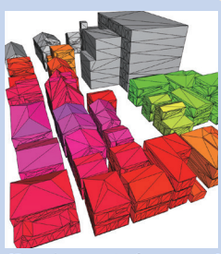
- A low-cost creation and updating method that uses existing data is developed.
- Use cases for running advanced simulation of urban environment, disaster prevention, etc. are developed by extending common specifications.



[Reduction of creation and update costs]
Use of 3D point cloud survey data etc.



[3D city model extension]
Creation of detailed specifications for buildings, trees, etc.
(The figure has been created by Plateau View 2.0.)



[Development of use cases]
An example of application to an urban fire (redder buildings show that the spread of fire occurs earlier)

(Urban Planning Department)

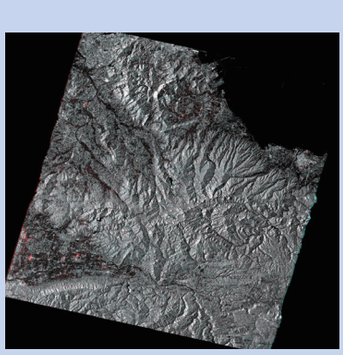
# Advanced technical support and countermeasures for

## ■ Study on ways to estimate a location of landslide based on satellite SAR images

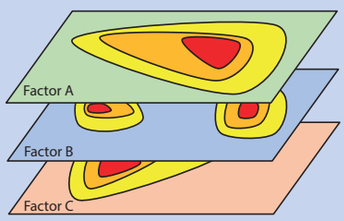
Satellite SAR images, which can be captured even at night and in bad weather, are used to quickly identify areas where landslides have occurred.

- The Daichi-4 (ALOS-4) satellite has been launched as a successor of the SAR satellite Daichi-2 (ALOS-2) that has been utilized heretofore for the survey of locations where sediment movement occurred, with an observation range 4 times as wide as that of the former , thus enabling a a wider range survey capability in a one-time observation.
- On the other hand, the conventional surveying techniques were based on a visual inspection, and consequently it was assumed that the time and trouble required to make a reading would increase, due to the enlargement of the one-time observation range.

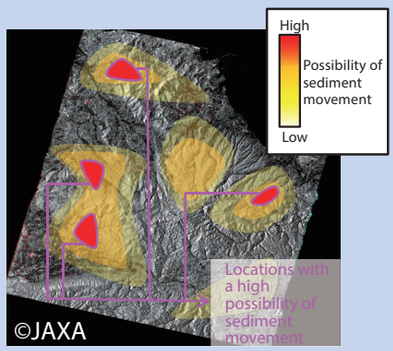
- Techniques for automatically extracting locations with a high possibility of sediment movement have been developed, by overlapping SAR images with a layer that expresses the probability of sediment movement for each factor such as a causal factor and a trigger factor.



SAR image




Layer that expresses the probability of sediment movement

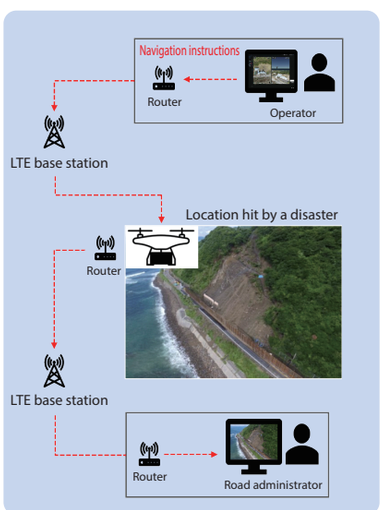



Automatic extraction of locations with a high possibility of sediment movement

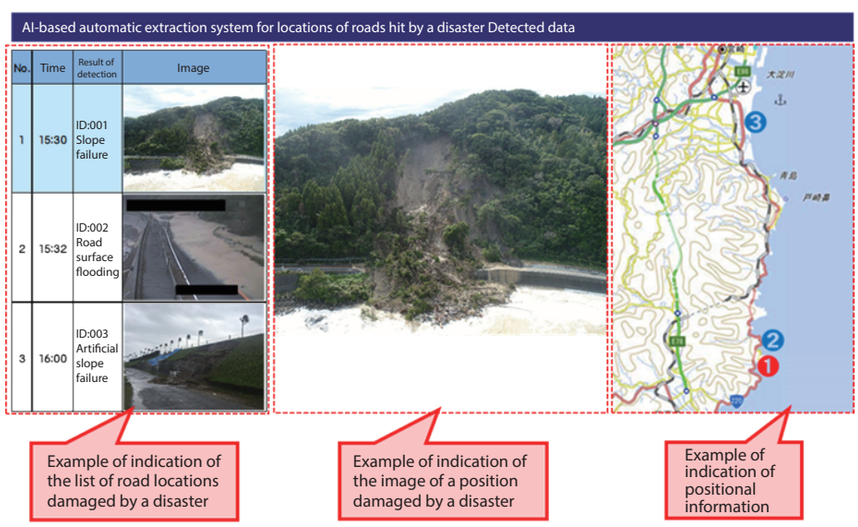
## ■ Development of an AI-based automatic extraction system for locations of roads hit by a disaster that utilize UAVs

By making Unmanned Aerial Vehicles (UAVs) automatically navigate during a disaster, information on the conditions of roads is grasped and shared speedily, whereby the realization of safe, efficient and effective road management is supported.

- By distributing and importing video footage taken by UAVs and processing the images on a real time basis using the AI processing devices on the UAVs, the locations of roads hit by a disaster are extracted, and the situations of roads by the disaster and their positional information are shared speedily.




Illustrative sketch of the system



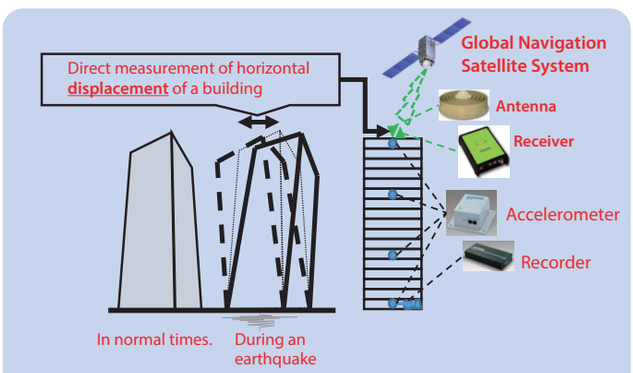

List of damaged locations and positional information (photos and sketch are for illustrative purposes only)

## ■ Disaster response technologies for buildings and cities utilizing satellites

During an earthquake, the response displacement of buildings is calculated based on the satellite positioning information. Technologies for expediting restoration are built by analyzing the earthquake resistant performance of the buildings.

### [1] Development of damage determination system technologies of a building using satellite positioning information

- Development of a system that enables the damage state of a building will be analyzed based on the satellite positioning data within a few minutes after the disaster occurs
- Verification and development of digital trust technologies using satellite information
- Identification of the verification of a displacement measurement technique for a building using satellite positioning information, and deployment of the technique to an actual building

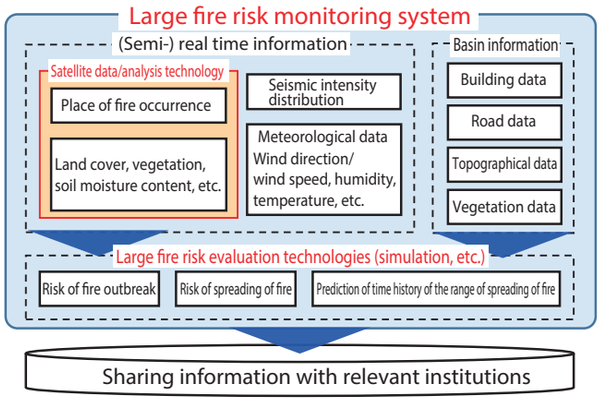



System for determining building damage state using satellite information

During an earthquake, etc., the overall situation of fire outbreaks is rapidly analyzed using satellite observation data, and it is shared together with the prediction of the potential of fire spreading. Support is provided for response to the disaster.

### [2] Development of monitoring technologies for the risk of large fire

- During a large-scale disaster, information vacuums occur, and it is extremely difficult to grasp the overall situation of damage such as city area fires, etc.
- Development of technologies for instantly acquiring in detail the situation of a fire that is changing every moment right after its occurs based on satellite observation data, etc.
- Development of technologies for predicting and evaluating risks of fire (risk of fire outbreak, risk of spreading of fire after the outbreak) and for sharing information based on the observation information.

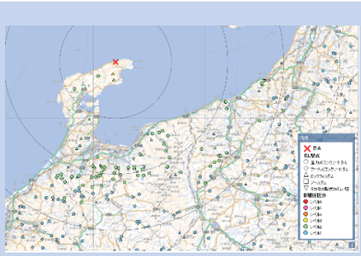



## ■ Technical development for verifying the safety of dams after a large-scale earthquake

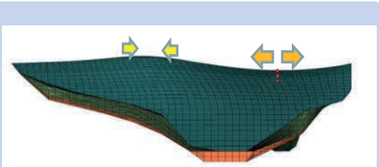
After a large-scale earthquake, the conditions of dams are grasped remotely, thereby supporting the technical aspects of dam management in times of emergency.

- In the 2024 Noto Peninsula Earthquake, deformation of the dams themselves was minor, but due to slope failures, etc. in the surrounding areas, access roads, commercial power supplies, and communication cables were disrupted, and consequently it was difficult to grasp the conditions of the dams, secure electric power for management, and communicate with the outside.
- The NILIM employs dam experts and is required to play a role of supporting dam management in times of emergency, such as ensuring the safety of dams under the circumstances as described above.

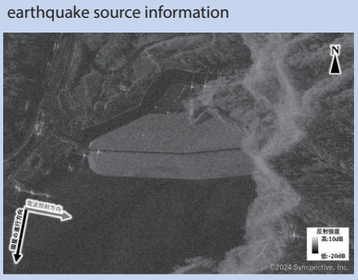
- Studying how the technical aspects of the backup that supports dam management ought to be in times of emergency
- Promoting the development and improvement of technologies that are effective for integrated technical support from the time of initial movement when limited information is available, through the local deployment, to the restoration thereafter
  - ➢ Reproduction and verification of dam behavior by means of numerical analyses during a large-scale earthquake (prior assumption of important locations to be checked, through the elucidation of mechanisms of deformation occurrence)
  - ➢ Improvement of technologies that assume deformation in order to build initial movement systems in the initial period of disaster occurrence (verification of the accuracy of instantaneous estimation of ground motion based on earthquake source information)
  - ➢ Grasping of the local conditions remotely and the development/dissemination of supporting technologies that assume a wide-area disaster as well (utilization of satellite data, remote technical support by means of image transmission, and others)



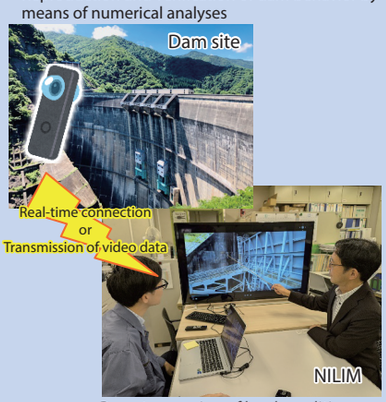
Instantaneous estimation of the accelerations and effects at dam locations based on earthquake source information



Reproduction and verification of dam behavior by means of numerical analyses




Utilization of satellite data
(example of observation by means of a small SAR satellite)




Remote grasping of local conditions and technical support
(utilization of 360-degree cameras, etc.)

# Competence in new technologies of in-house engineers on the frontline.

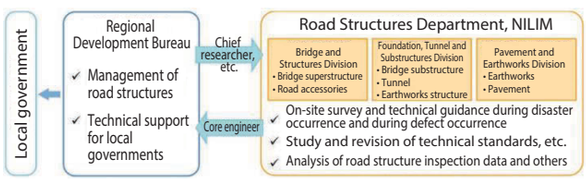
## Hosting of personnel

### ● Accepting people from local governments and private businesses

The NILIM is accepting people from local governments and private businesses as exchange researchers and supporting them in improving their technical skills through technical guidance and workshops. (Number of exchange researchers accepted: 54 as of April 2025)

### ● Accepting officials from Regional Development Bureaus

We accept officials from Regional Development Bureaus who have realized field issues through their work as researchers or staff holding two posts for a certain period to help improve their skills. The officials who have acquired technical skills would return to their Regional Development Bureaus and actively work as core technicians in their respective regions.




Training of human resources by accepting staff from each Regional Development Bureau to the Road Structures Department

Training assistance program for staff such as those of the Regional Development Bureau engaging in high-level sediment disaster prevention measures

## Completing and strengthening training

NILIM holds training sessions and lecture courses and sends out lecturers in order to spread and establish its technical policy and improve the technological level of society as a whole.
(Track record of dispatched lecturers in FY 2024: 325 cases)
(Track record of the number of training courses offered in FY 2024: 38 courses with 1,263 participants [Yokosuka Office No. 2])

Training scene

## Support for local issues

NILIM works with local offices and other local agencies to resolve issues that arise in the field.
NILIM dispatches personnel to the Sediment Disaster Prevention Technology Center of the Kinki Regional Development Bureau to perform research and technical development concerning large-scale sediment disasters.

## Technology consultation

NILIM constantly provides national government agencies, local governments, and other organizations with technical support of various kinds for policy implementation and project execution.

### ● Technical Consultation Office

Covering all fields over which NILIM is in charge, this one-stop service provides consultations regarding all fields and facilities.


■ Contact
Civil engineering field
E-mail: nil-soudanmadoguchi-gijyutu@gxb.mlit.go.jp
TEL: 029-864-4343 (Manager of the Planning Division, Planning Department)

■ Ports and airports field
[Investigation, design, and construction]
E-mail: ysk.nil-46port-tech5091@gxb.mlit.go.jp
TEL: 046-844-5091
[Maintenance and management]
E-mail: ysk.nil-46lcm-center2@gxb.mlit.go.jp
TEL: 046-844-5030

■ Website URL
https://www.nilim.go.jp/lab/bbg/tec-soudan (Civil engineering)
https://www.ysk.nilim.go.jp/kakubu/kouwan/sekou/lcmmadoguti_20230510.pdf (Ports and airports)

Civil engineering

Ports and airports

# Collection, analysis, and management of data forming the technical basis of policy formation and return to society

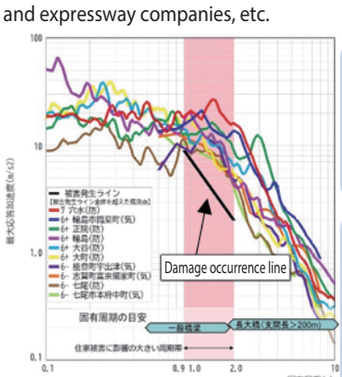
In addition to our initiative to promote infrastructure DX, the NILIM is reorganizing data related to housing and social capital collected for administrative purposes and using it for research and to support field operations.

## Spectrum analysis information during the occurrence of a large-scale earthquake

By evaluating the acceleration response spectrum of the earthquake using the damage occurrence line (line — in the figure) defined by past earthquake records, whether damage to structures has occurred, its size, and region are estimated immediately after the occurrence of the earthquake, and these are automatically distributed as "spectrum analysis information" within 8 minutes after the earthquake.

In an earthquake below the damage line, contributions are made to reduce the burden on the road administrator, such as efficiently performing road patrol after the earthquake.

It is planned in the future to provide spectrum analysis information for infrastructure administrators as well, including local governments and expressway companies, etc.




Spectrum analysis information on the 2024 Noto Peninsula Earthquake

Videos for the explanation of spectrum analysis information are available on YouTube.

Technical basis for estimating the scale of damage is posted on the website (Technical Note of the NILIM No. 1204)

## Support for the promotion of asset management of water supply and sewerage

The database of sewers deterioration, which collects the results of inspections by local governments and organizes information such as deterioration assessment results, is published. The database covers approximately 310,000 spans from 60 local governments as of May 2021.

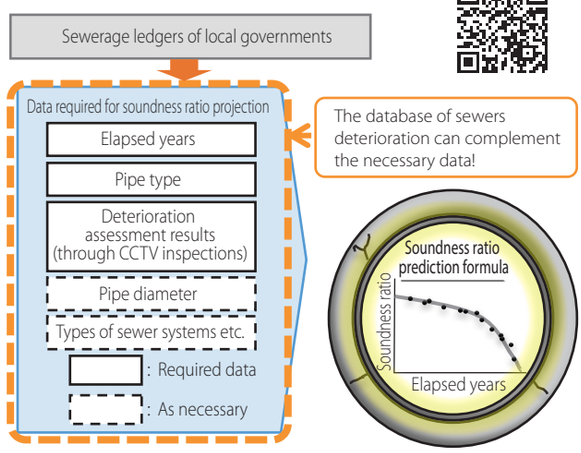


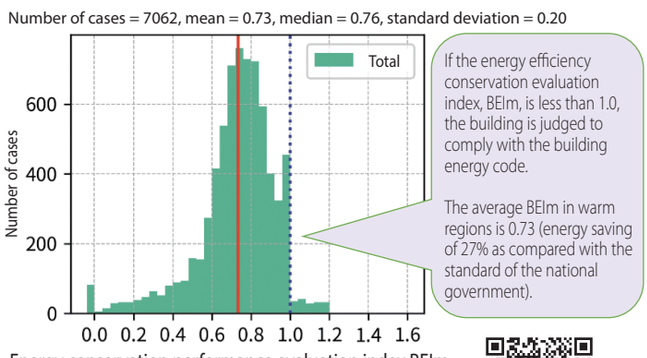

Image of the database of sewers deterioration

## Support for planning of energy conservation measures for office buildings etc.

Information related to applications for building energy code based on the Act on the Rational Use of Energy (12,000 cases/year).

Energy conservation performance and design specifications (heat insulation performance, efficiency of air-conditioning equipment, etc.) were organized for office buildings etc. and posted on the website as the NILIM Reference Data No. 1318.

The study also contributes to the promotion of the government's energy-saving measures established in response to the 2050 Declaration on Carbon Neutrality.

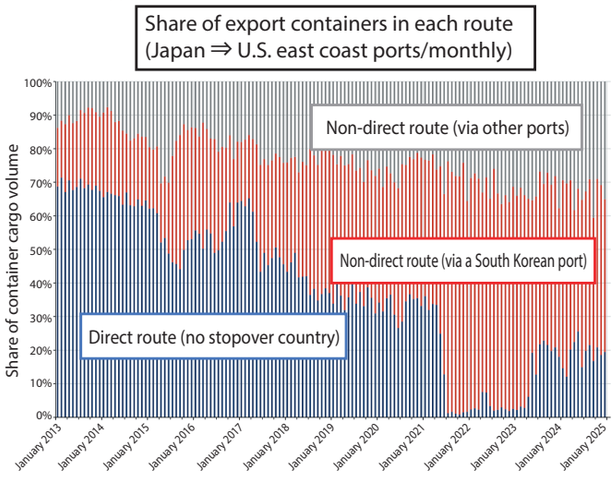



Examples of published data
Distribution of energy conservation performance evaluation index (warm regions)

## Support for port policies through the analysis of maritime meta data

Analysis, etc. of maritime meta data such as cargo flow data (Datamyne), global ship dimension data (Lloyd's, Clarkson), ship location data (land-based and satellite-based AIS data) is carried out regarding the ocean transport trends, ship specifications, and navigation situations, and the results will be publicized on the NILIM website, etc.

Example: Container cargo flow analysis of North American major sea routes




Source: Created by the National Institute for Land and Infrastructure Management from the data of Descartes Datamyne

# International research activities

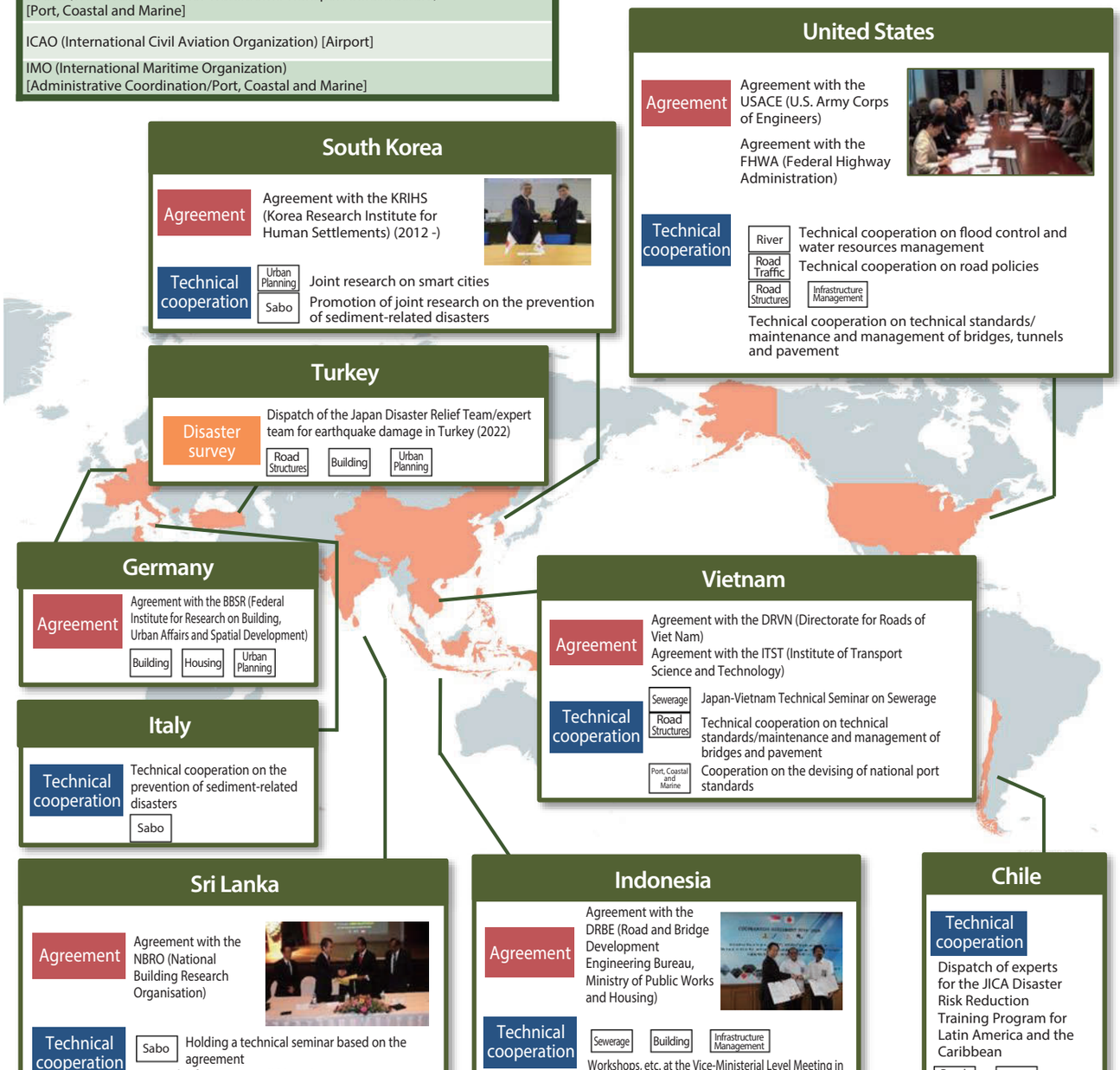
NILIM is promoting international research activities based on the perspectives of its technical contribution to domestic policy, technical cooperation with developing countries, and overseas deployment of infrastructure systems.

## Major multinational cooperation [relevant departments and centers]

- ISO (International Organization for Standardization) [Water Quality Control/Road Traffic/Building/Housing/Infrastructure Management]
- ICOLD (International Commission on Large Dams) [River]
- WMO/UNESCAP [Sabo] (World Meteorological Organization/United Nations Economic and Social Commission for Asia and the Pacific)
- Japan, United States and Europe Trilateral ITS Conference [Road Traffic]
- PIARC (World Road Association) [Road Traffic/Road Structures]
- RILEM (International Union of Laboratories and Experts in Construction Materials, Systems and Structures) [Building]
- PIANC (World Association for Waterborne Transport Infrastructure) [Port, Coastal and Marine]
- ICAO (International Civil Aviation Organization) [Airport]
- IMO (International Maritime Organization) [Administrative Coordination/Port, Coastal and Marine]

## Legend

- Agreement: Research agreement with overseas research institutions
- Disaster survey: Example of expert dispatch for disaster survey
- Technical cooperation: Technical cooperation, workshop, etc. such as support for devising technical standards
- Countries where any of the above activities was carried out from FY 2018 to FY 2024



## United States

**Agreement**
- Agreement with the USACE (U.S. Army Corps of Engineers)
- Agreement with the FHWA (Federal Highway Administration)



**Technical cooperation**
- River: Technical cooperation on flood control and water resources management
- Road Traffic: Technical cooperation on road policies
- Road Structures, Infrastructure Management: Technical cooperation on technical standards/ maintenance and management of bridges, tunnels and pavement

## South Korea

**Agreement**
- Agreement with the KRIHS (Korea Research Institute for Human Settlements) (2012 -)



**Technical cooperation**
- Urban Planning: Joint research on smart cities
- Sabo: Promotion of joint research on the prevention of sediment-related disasters

## Turkey

**Disaster survey**
- Dispatch of the Japan Disaster Relief Team/expert team for earthquake damage in Turkey (2022)
- Road Structures, Building, Urban Planning

## Germany

**Agreement**
- Agreement with the BBSR (Federal Institute for Research on Building, Urban Affairs and Spatial Development)
- Building, Housing, Urban Planning

## Italy

**Technical cooperation**
- Technical cooperation on the prevention of sediment-related disasters
- Sabo

## Vietnam

**Agreement**
- Agreement with the DRVN (Directorate for Roads of Viet Nam)
- Agreement with the ITST (Institute of Transport Science and Technology)

**Technical cooperation**
- Sewerage: Japan-Vietnam Technical Seminar on Sewerage
- Road Structures: Technical cooperation on technical standards/maintenance and management of bridges and pavement
- Port, Coastal and Marine: Cooperation on the devising of national port standards

## Sri Lanka

**Agreement**
- Agreement with the NBRO (National Building Research Organisation)



**Technical cooperation**
- Sabo: Holding a technical seminar based on the agreement
- Dispatch of experts to a JICA project

**Disaster survey**
- Sabo: On-site survey of a sediment-related disaster (2018)

## Indonesia

**Agreement**
- Agreement with the DRBE (Road and Bridge Development Engineering Bureau, Ministry of Public Works and Housing)



**Technical cooperation**
- Sewerage, Building, Infrastructure Management: Workshops, etc. at the Vice-Ministerial Level Meeting in the Construction Sector between Indonesia and Japan

**Disaster survey**
- Housing: Investigation on the Sulawesi earthquake (2018)

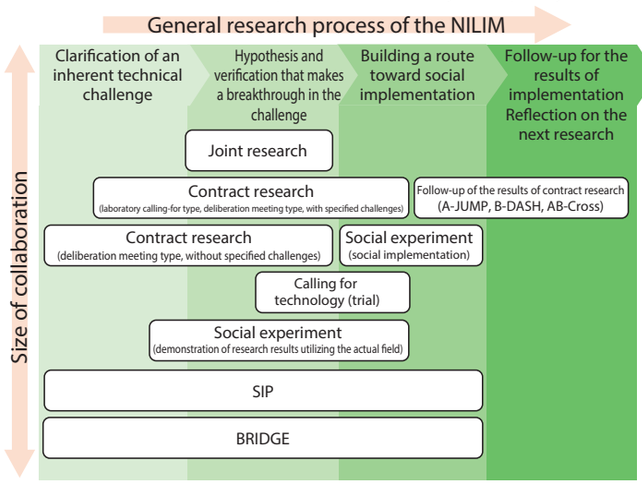
## Chile

**Technical cooperation**
- Dispatch of experts for the JICA Disaster Risk Reduction Training Program for Latin America and the Caribbean
- Road Structures, Building

# Management initiatives supporting high-quality research

## Cooperation with external organizations

By implementing joint research, contract research, calls for technologies, and social experiments and by concluding agreements and leveraging technologies provided by industry and academia, as well as knowledge of different fields such as social science and the humanities, NILIM strives to improve the efficiency and quality of its research.




■ Domestic cooperation

The aim is to develop education and research on the university side and to contribute to the activities of NILIM through coordination and cooperation between universities and NILIM.

University of Tsukuba, Kansai University, Tokyo University of Science, etc.

■ International cooperation

The aim is to improve the quality of research results of NILIM and to give technical support to other countries (international contribution) through joint research, as well as regular information exchange between overseas research institutes and NILIM.

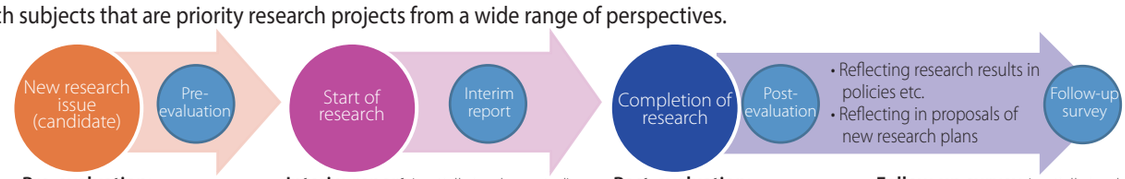
Road and Bridge Development Engineering Bureau of the Ministry of Public Works and Housing of Indonesia, Directorate for Roads of Viet Nam of the Ministry of Transport of Vietnam, Korea Research Institute for Human Settlements of South Korea, National Building Research Organization of the Ministry of Disaster Management of Sri Lanka, Federal Institute for Research on Building, Urban Affairs and Spatial Development of Germany, etc.

## Research evaluation

Internal evaluations and external evaluations of individual research subjects, achievements, and the operation of institutions are performed on the basis of the General Guidelines on the Evaluation of National R&D to build an independent and individual management cycle, promote, and improve the quality of research activities.

### ● External evaluation of individual research subjects

NILIM strives to improve the quality of research results by introducing systems allowing external experts to evaluate individual research subjects that are priority research projects from a wide range of perspectives.




**Pre-evaluation:**
Evaluate necessity and validity when starting new R&D

**Interim report** (partially implemented):
Receive opinions on ongoing research and take the necessary action such as reviewing plans

**Post-evaluation:**
Evaluate R&D results and reflect these in future improvement and dissemination of R&D results

**Follow-up survey** (partially implemented):
Evaluate reflection of results in policies and secondary effects, and reflect these in the examination of future R&D issues and other activities

### ● External evaluation of R&D organization

Outside experts evaluate research activities as a whole at NILIM, as well as environment improvement initiatives that support the research activities, and NILIM strives to improve its operation based on these results.

National Institute for Land and Infrastructure Management Report of the "Evaluation of the Research and Development Institutes" (FY 2018 - FY 2022)

## Internal training

The research and administrative divisions work together to effectively combine off-JT and OJT to systematically develop young personnel. In-house research presentation sessions are held for young researchers who have little experience in presenting their research. Study groups led by young researchers are also held to strengthen their development through mutual learning.

Experience and Know-how Transmission Lectures are held in order to make use of the accumulation of research, experience, and know-how of predecessors for improving the skills of each staff member.


Internal presentation meeting for young researchers

## Compliance

We conduct compliance activities according to the promotion plan for the current fiscal year while giving due consideration to the monitoring results and advisory opinions of the Compliance Advisory Committee (External Expert Committee).

## Response to misconduct in research

In addition to establishing NILIM Guidelines for Responding to Misconduct in Research, NILIM makes efforts to improve awareness of research ethics to prevent misconduct (fabrication, falsification, and plagiarizing).

# To promote a deeper understanding of NILIM

## Website

NILIM actively provides information, including an outline of NILIM, direction of research activities, research subjects, results, and event information.

Visit this site to view information about lecture meetings, open houses, open experiments, and other PR information.


(URL: https://www.nilim.go.jp/)


VR NILIM

(URL: https://www.nilim.go.jp/lab/bbg/vrkokusouken/index.html)

## NILIM Report

This annual publication introduces and explains research trends and examples of how they are reflected in policies and compiles recommendations for technological policy issues. (The full report is published on NILIM website.)


## SNS (X and Facebook)

Using the official SNS (X and Facebook) of NILIM, we are distributing various information such as press releases, website update information, research outcomes, including publication information, and events and lectures.

List of NILIM social media


Official X of NILIM

## NILIM Reference

A Comprehensive Research Report of NILIM is a report of the research results that have academic value, contribute to the planning and enactment of policy, or present the results of surveys, testing, observations, etc. that are deemed valuable enough to be released to the public

(The full report is published on NILIM website.)

## NILIM YouTube channel

Videos of experiments and lectures in the field of housing and social capital of NILIM are available on YouTube with easy-to-understand explanations.

## Presenting papers

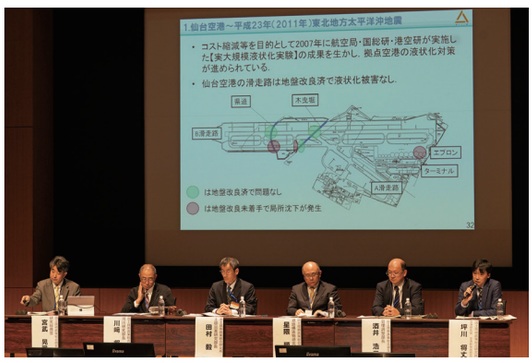
The NILIM is publishing approximately 500 papers per year and receiving awards for papers in many fields, both from inside and outside of Japan.

- 7th Japan Open Innovation Prize (Minister for Internal Affairs and Communications Prize) (February 2025)

## Lectures

NILIM Lectures

NILIM Lectures are held annually to introduce the activities of NILIM such as presenting its research outcomes and making recommendations to solve technology-related policy challenges.




←Scene of a coffee break exchange meeting
↓Scene of a poster exhibition

NILIM Lectures (December 2024)

The lecture meetings are held in hybrid form consisting of participation at an assembly hall and a live distribution. In the NILIM lecture meetings, hours of CPD programs approved by the Japan Society of Civil Engineers can be obtained. (FY 2024: Assembly hall 6.0 hours, Distribution 5.2 hours)

The NILIM also holds specialized lecture meetings and symposiums in various fields whenever necessary.

## Lectures on demand

Lectures on demand are held with the aim of having NILIM researchers go directly to schools etc. to explain research contents and answer questions while holding open communications with people.

(Lectures on demand　Results in FY 2024: 42 cases)　* Online lectures are also available.


## Open house

Open houses are held to introduce NILIM facilities and research projects to visitors.

Please visit our website for more information.

FY 2025

Open house schedule

- Tsukuba Little Scientists: August 1 (Fri.)
- Civil Engineering Day: November 15 (Sat.)
  (Science & Technology Week: April)

Open house (a scene of the Civil Engineering Day 2024)

## Recruiting activities

The NILIM is recruiting people who work with us to make a national land and society that are safe, reliable, vibrant, and attractive.

Individual explanatory meetings are held whenever necessary. Please feel free to participate in the meetings.

In addition, the operations of the NILIM are presented in the Joint Explanatory Meetings of Ministries and Agencies to be held by the National Personnel Authority as well.

Furthermore, we also accept trainees who can know about and experience the operations at the NILIM. Refer to our website for the latest information.

# Introduction to facilities

## Asahi Office　Tachihara Office

Asahi Office and Tachihara Office are in Tsukuba City, and numerous experimental facilities are deployed in the enormous compounds.

### 1 Tachihara Office

### 2 Asahi Office




* Buildings and lots other than those indicated above are those of the Public Works Research Institute, Building Research Institute, and the Port and Airport Research Institute.

### 3 Test course

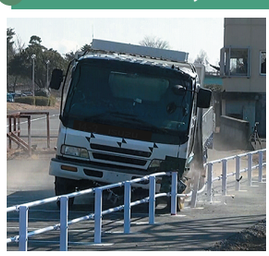
Test course with the length of 6,152 meters. Tests are carried out on road drivability, safety, vehicle-to-infrastructure technology, etc. Findings are reflected in road-related technical standards such as the Road Structure Ordinance.

Specifications

- ☐ Total length: Approx. 6.2 km
- ☐ Number of lanes: 3
- ☐ Curve section

North loop design speed: 100 km/h
South loop design speed: 120 km/h

### 4 Collision test facility



In this experimental facility, vehicles are crashed into traffic safety facilities such as guard fences (guardrail, etc.), to develop, improve, and examine the functions of such traffic safety facilities. Vehicles are moved using the power of winches so that it can accelerate unmanned.

The facility is used for the experiments necessary for the revision of technical standards such as setting the strength performance of guard fences and examining their structure and specifications.
It is also used for experiments by the private sector for the development and improvement of new types of guard fences.

### 5 Full-scale tunnel experiment facility

Various experiments are conducted using a tunnel experiment facility with a total length of 700 m and a cross-sectional area of 45.5 m$^2$, which is unparalleled in the world. The findings of the experiments are used for reflection on road tunnel related technical standards and verification of new technologies. In 2023 the lights were replaced with LED lights, and their brightness has been enabled to be adjusted in 3 steps.


LED lightings adjustable in 3 steps

Videos of various experiments conducted at the NILIM and information videos are available on the NILIM YouTube channel.

## Rental of research facilities at the Asahi Office

Research facilities of NILIM can be rented for a fee by outside organizations within a range that does not obstruct the operations of NILIM.
Inquiries: Planning and Research Administration Department, Research Facilities Division
Email address: nil-shisetsu-rental@gxb.mlit.go.jp
Reference website: https://www.nilim.go.jp/lab/bbg/rental/rental.html

*

# Yokosuka Office

## 1 Yokosuka Office

The main building was completed in April 2004. It has a light court in an atrium to allow natural ventilation and natural lighting to enter the research laboratories. The building also has solar panels and rooftop greening. These and other features are designed to protect the global environment.

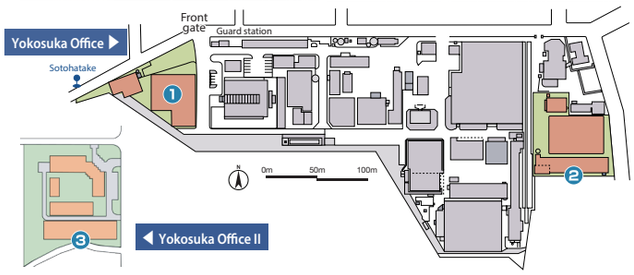
## 2 Typhoon experiment wind wave channel

This is one of the largest wind wave channels in Japan where model tests on storm surges, high waves, strong winds, and tsunamis are conducted. We are conducting research to protect large cities and ports from natural disasters using a wind blower, a wave maker, and a pump to generate typhoon-level winds, waves, and currents.

In recent years, model experiments are implemented to study wind resistance measures and anti-floating measures for containers during a typhoon.

## 3 Airport Pavement Test Field

Test pavements are constructed in an outdoor field to confirm long-term durability, deformation resistance, and other properties of materials used in airport pavement.




## 6 Sewers experimental facility

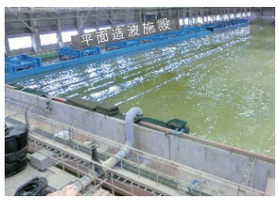
This full-scale experimental facility can artificially reproduce various defects such as joint misalignment and cross-sectional cracks, which occur in sewers. Under uniform conditions, the performance of inspection equipment can be examined and comparatively evaluated more safely and efficiently than conducting experiments with sewers in use.

## 7 River model experiment facility

This is a sprawling 15-hectare facility located outdoors. Up to 15 river models can be set up on the site.
For example, the hydraulic model of Arakawa No. 2 and No. 3 Regulating Ponds is a large-scale model that is 180-meter long and 40-meter wide. Using the 1/50 scale reproduction of river topography such as the Iruma River confluence and levee shapes, researchers are checking how river water flows into a regulating pond and how the water spreads after entering the regulating pond by conducting experiments.

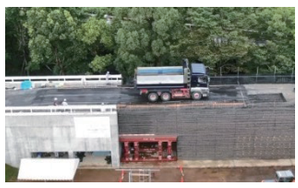
## 8 Oceanic and coastal experiment facility

This facility is used for hydraulic model experiments concerning coastal protection in order to protect the lives of people from the danger of storm surges, high waves, tsunamis, and coastal erosion.




## 9 Road foundation structure experiment facility

This facility reproduces damage to roads (such as the generation of road surface bumps) and uneven subsidence during earthquakes to verify road technology that is resistant to ground deformation.



## 10 Experimental channel with large-scale embankment model

The experimental channel with a large-scale embankment model uses models close to actual size to study the external forces acting on river structures such as levees and their failure mechanisms and to study rational design methods for river structures.
In recent years, researchers are conducting overflow experiments by creating a levee model with the height of 4 meters to study the structure of persistent river levees that are resistant to collapse even when overtopped by water. Based on findings gained at this experimental channel, we created the Technical Reference for Examining the Structure of Persistent River Levee (draft).

## 11 Construction DX experimental field


The construction DX experimental field is a research facility aimed at promoting digital transformation (DX) in the infrastructure sector. This facility consists of full-scale complete-shape models to develop technologies for construction management and inspection of structures using technologies, including 3D measurement technology, and an earthwork field to develop technologies for unmanned construction and automatic/autonomous construction using 5G and other tools.

* Other facilities include a sediment hydraulic test channel, a river hydraulic model test facility, a high velocity test channel, and a full-scale aeration test facility.

# You can visit the NILIM.

## - Invitation to a study tour -

A visit to the facilities (study tour) is available as needed, in which research results, etc. are presented to the visitors while they visit the experimental and research facilities of the NILIM. Explanations will be given to visitors accordingly, such as those for the general public including citizens and students as well as those for experts including civil engineers and people related to local governments. Refer to our website for details.

[Voices of visitors]
I was astonished by the large size of the experimental facility.
I realized that safety is ensured through various experiments.
I was able to learn based on what kinds of experiments and research the standards of infrastructure facilities are created.

Website for the general public

Website for people related to local governments, etc.

**Ministry of Land, Infrastructure, Transport and Tourism**

**National Institute for Land and Infrastructure Management**

NILIM

NILIM is the acronym for the National Institute for Land and Infrastructure Management.
The triangle indicates three fields covered by the former organization: the field related to rivers and roads, the field related to the city and housing, and the field related to ports and airports. The logo represents our commitment to be in charge of housing and social infrastructure development through the cooperation of these three fields.
The orange color represents our expectations that the National Institute for Land and Infrastructure Management will make many contributions to national land policy and create a bright Japan in preparation for the coming age of the 21st century.

**List of NILIM social media**

**Access**

NILIM

Created in April 2025