

Technical Area of innovative construction and infrastructure maintenance/innovative disaster prevention and disaster mitigation

To realize "improvement of productivity in the construction field", "speedup of diagnosis and measures", and "proactive disaster prevention"

Many infrastructure (bridges, tunnels, etc.) built during the rapid economic growth period have deteriorated after 50 years, and the need for measures is increasing. In addition, in recent years, there have been many large-scale disasters. On the other hand, due to a serious shortage of labor caused by the declining birthrate and aging population, and investment constraints caused by declining tax revenues, some infrastructure are in a critical condition where they may not be able to fulfill their functions and may cause serious accidents affecting human lives. To get out of this crisis as quickly as possible, we will "improve productivity in the construction field," "speed up infrastructure diagnosis and measures," and "proactive disaster prevention" by digitally transforming the construction field with new technologies such as AI, robots, etc., so that we can establish an "infrastructure PDCA cycle that aims for durability of more than 100 years" and achieve "Society 5.0 in the construction field".



Director of the technical area of innovative construction and infrastructure maintenance/innovative disaster prevention and disaster mitigation

TASHIRO Tamiharu

Advisor of Kajima Corporation

Profile

1948: Born in Fukuoka Prefecture
1971: Graduated from the Department of Civil Engineering, Faculty of Engineering, The University of Tokyo
1971: Joined Kajima Corporation
Involved in construction of Kawaji Dam, Sekigi Dam, Miyagase Dam (Director), Nukui Dam (Construction Manager), etc.
2000: General Manager of the Tokyo Civil Engineering Branch
2005: Executive Officer of the Tokyo Civil Engineering Branch
2007: Managing Executive Officer, General Manager of Civil Engineering Management Division
2010: Representative Director, Vice President and Executive Officer
2019: Corporate Advisor
Current position since 2021
Chairman of the Board of Chemical Grouting Co., Ltd. since 2016
2016: Ph.D. (Engineering) from the University of Tokyo
The 104th Chairman of Japan Society of Civil Engineers, the 24th Chairman of Japan Society of Dam Engineers

Area Overview

Improvement of productivity in the construction field

The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) promotes i-Construction which aims to digitize construction works and introduce IT to them through ICT and utilization of 3D data in the entire construction process for the purpose of work practice reformation and drastic productivity improvement.

In this area, we focus on a large PDCA cycle in the construction field to seamlessly link construction data that tends to be divided in each phase of design (Plan), construction (Do), inspection (Check), and renewal (Act). Thus, we implement model operations such as 3D/4D design and planning, automation and prefabrication of construction, and digitalization of inspection and management aiming at acceleration of social implementation including revision of standards and manuals. In addition, we will support building of an "MLIT database and platform" in which not only infrastructure basis data including inspection data obtained by the i-Construction initiative but also topographical and geological data, etc., become digitally available on the map for search and download. These measures are expected to contribute significantly to MLIT's goal of "increasing construction site productivity by 20% by FY2025".

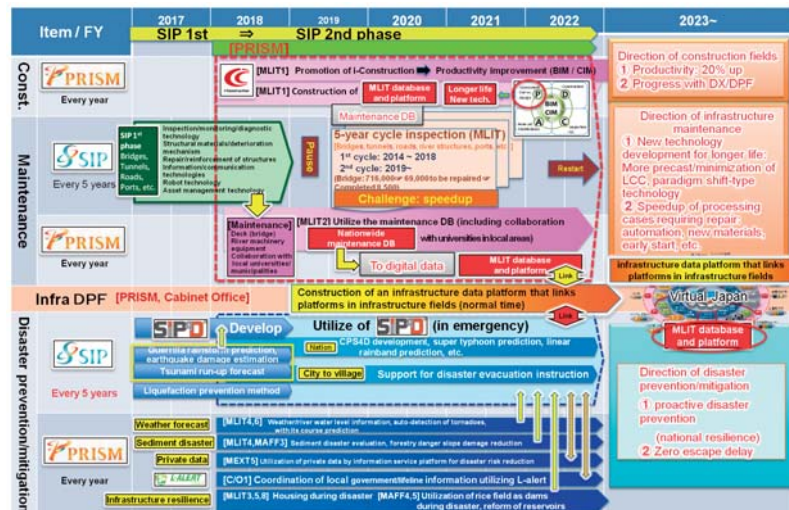
Speedup of diagnosis and measures

Following the Sasago Tunnel ceiling collapse accident in 2012, inspections of infrastructure (bridges, tunnels, embankments, etc.) have become mandatory every five years, and data has been accumulated. In this area, the results of these inspections and diagnoses are compiled into a database and linked to the "MLIT database and platform" to speed up and optimize repair and renewal measures (e.g., prioritization and selection of methods), extend the service life after repairs or renewals, and mitigate infrastructure aging. In addition, to realize preventive maintenance, we will develop technologies to detect invisible minor damage to bridges (steel decks and RC decks) and develop paradigm shifting technologies for early abnormality prediction, detection, and measures for pump facilities to protect human lives and properties from flooding.

Proactive disaster prevention

To expand utilization of the basic disaster prevention information distribution network (SIP4D*) developed under the SIP, we have been developing a water-level prediction system in small and medium-sized rivers, developing special weather forecasting technology for tornadoes and others, utilizing private sector data through the information service platform for disaster risk reduction, and strengthening our response capability (resilience) through coordination of local government/lifeline utilizing L-Alert. In addition to the above, we will also focus on proactive disaster prevention and prevention of local devastation by strengthening rice fields and reservoirs and utilizing them for disaster mitigation.

*1 SIP4D (Shared Information Platform for Disaster Management) : A basic network system for mutual distribution of disaster prevention information across organizations, with the function to collect information required for disaster response from various sources, convert it into an easy-to-use format, and distribute it quickly.



Infrastructure data platform that links platforms in infrastructure fields

In this area, we will utilize technology for cross-sectional data federation (connector)*2 and API under development by SIP for national resilience and other added value creation. Thus, we will develop an "infrastructure data platform that links platforms in infrastructure fields" that includes other ministries and agencies, local governments, and private companies in the fields of roads, railroads, gas, electricity, etc., with the "MLIT database and platform" at its core to promote data linkage within the infrastructure fields. Moreover, we will implement cross-sectional data federation among sectors such as disaster prevention, logistics, food, and biotechnology, and urban areas to contribute to "realization of Society 5.0 in the construction sector".

*2 Technology for cross-sectional data federation (connector) : This is a decentralized basic technology for mutually exchanging data catalogs and data sets. Data catalog cross-search function, contract function, data transfer function, etc., are realized by open-source software.

Introduction of the steering committee members

TASHIRO Tamiharu Area Director/Chair
IKEDA Kentaro Representative Director, Senior Managing Executive Officer, Shimizu Corporation, General Manager of Civil Engineering Division (Chairperson of Infrastructure Revitalization Committee, Japan Federation of Construction Contractors)
OZAWA Kazumasa Specially Appointed Professor, Graduate School of Engineering, The University of Tokyo
KINOSHITA Seiya Professor, Faculty of Risk Management, Nihon University

NAKASHIMA Masayoshi President, Kobori Research Complex Inc.
FUJITA Masahiro Senior Advisor, Mitsubishi Electric Corporation
MIKI Chitoshi President of Tokyo City University
YABUKI Nobuyoshi Professor, Graduate School of Engineering, Osaka University

Interview with the Area Director

Protecting Japan's safety and security through three major combined policies: infrastructure construction, maintenance, and disaster prevention and mitigation



Q1 Could you tell us about the significance of working on construction, infrastructure maintenance, and disaster prevention and mitigation through PRISM?

We tend to take it for granted that the infrastructure that supports our daily lives will always be there, but if we neglect to maintain and renew it, our safety and security will be impaired, and the social infrastructure that supports the foundation of our economy will be at risk.

When we go abroad, we may experience power outages in hotels or be told not to drink tap water, but this is not the case in Japan. This is the result of the efforts involved in maintaining the infrastructure, but it is not well recognized how hard they are.

Especially in the construction field, many infrastructure, including those built at the time of the 1964 Tokyo Olympics, have deteriorated, and maintenance and renewal are required. It is also essential to respond to disasters, such as earthquakes and torrential rain, which have been increasing in severity in recent years.

It is necessary to abandon the assumption that "infrastructure is always there" and start paying attention to the fact that "there are people who are protecting it" even during normal times.

Unfortunately, the negative effects of a lack of interest are also seen in the shortage of workers in the construction field. With aging of workers and lack of digitalization and automation in every phase of the construction field, productivity is low, and innovation is urgently required now.

The Cabinet Office started working on infrastructure maintenance and disaster prevention and mitigation in the first period of SIP (2014-2018) and continues to work on disaster prevention and mitigation in the second period of SIP (2018-). We believe that it is very significant to work as the three major combined policies "infrastructure maintenance" and "disaster prevention and mitigation" in SIP plus "innovative construction" in PRISM. Thus, we will develop construction technologies that optimize the entire PDCA cycle which consists of "assessment, survey, and design (Plan)", "construction (Do)" and "inspection and quality control (Check)", and "renewal and maintenance (Action)". In addition, we will continue our efforts to strengthen our infrastructure, not only in responses to disasters after they occur, but also in proactive measures before they occur. Moreover, we will move forward the PDCA cycle to the next level to contribute to reducing the lifecycle cost of new infrastructure and save on manpower in maintenance by using new materials and construction methods to extend infrastructure service life and by making the infrastructure maintenance-free.

Q2 What is the initiative under the theme construction site innovation through promotion of "i-Construction"?

A special point of the construction field is that the organizations or people responsible for each of the above PDCA processes are separate. For example, in the case of automobiles and home appliances, it is common for one manufacturer to manage all processes, but in the construction field, a design consultant deals with design, a general contractor takes care of construction, renewal and repair, and a contractee (government agency) is in charge of inspection and management. As the roles have been conventionally divided like this, for example, when renewal work is carried out, only analog information such as old drawings drawn on paper often remains in which the information is easily disconnected. Even in new construction projects, it often happens that a 3D model created with 3D CAD is purposely converted to a 2D drawing and output into paper for business use.

"i-Construction" is an initiative promoted by the MLIT to improve productivity and make construction sites more attractive through full utilization of ICT*1. PRISM focuses on the "linkage" between organizations, where information has been disconnected, and is working to improve it by digitizing data and creating 3D images. In the model operations, we are trying to promote use of new technologies such as inspection of the workmanship and quality of reinforcing steel and concrete using digital images, telepresence using wearable cameras, etc., (e.g., on-site inspection by the contractee is conducted in a virtual space), as well as revision of inspection standards and manuals. Furthermore, introduction of the ECI*2, a contract in which the contractor is involved from the design stage, and the DBO, a method in which the public sector finances while the private sector carries out design, construction, and

operation of the facility in an integrated manner, are also effective to prevent information disconnection on "the connecting part". This way, PRISM is specifically supporting "i-Construction", which aims to increase productivity at construction sites by 20%.

Q3 Could you tell us about the theme <Data linkage and utilization beyond normal times/disasters by building a cooperative data platform for the entire infrastructure sector>?

I think that the world of construction and civil engineering has some difficulties because it deals with nature. No matter how meticulously assessments and calculations are conducted, there are many times when things do not go according to the original plan in a natural environment. Therefore, we have to take into account a wide range of information (data) in our work.

PRISM is accelerating its efforts by adding a budget to "the MLIT database and platform" by MLIT, as a data platform for normal times where the data is linked to the map. Also, it is not only MLIT that manages infrastructure, but electric power companies and gas companies manage their own infrastructures.

There are various railroad companies that operate trains, and there are also prefectural roads, city roads, and even agricultural roads under the jurisdiction of the Ministry of Agriculture, Forestry and Fisheries. At present, for example, the month after a road has been dug up for burying electricity cables, the same road may be dug up again for gas pipes. If the data is connected, the work can be done efficiently without having to dig up the same road two or three times. Hence, we will build "MLIT database and platform" as the backbone, and then take in the data from infrastructure fields other than MLIT to provide basic information on infrastructure. Moreover, to ensure soundness of the national land and further improve convenience by linking with other areas including disaster prevention and transportation and logistics, we established a data linkage study group in this area in FY2019, and the Cabinet Office started building its own "an infrastructure data platform that links platforms in infrastructure fields".

Q4 Could you tell us about your expectations for the construction and civil engineering area in the future, and the prospect for PRISM?

As the infrastructure built in the past is aging and natural disasters continue to rage, there is a growing interest in sound social infrastructure development and public investment, and I hope that our nation's infrastructure will always be able to maintain a certain level of safety and security. To this end, we would be happy if we could promote DX in the construction field and show everyone accurate images and maps based on data, so that everyone will understand the importance of infrastructure.

In addition, you tend to think that disaster prevention and mitigation are only for emergencies, but unless you maintain the infrastructure properly in normal times, you cannot protect your safety in an emergency. With PRISM, we hope to strongly promote not only maintenance during normal times, but also strengthen and extend the service life of infrastructure.

Finally, the topic of infrastructure often tends to be city-centered, but it is necessary to take a comprehensive view of Japan as a whole, including rural areas for guaranteeing safety and security. While the Cabinet Office is working to break down the vertical division of administration and to promote further public-private cooperation, we would like to play a role in PRISM in thinking about infrastructure from the perspective of Japan as a whole.

*1 ICT: Abbreviation for "Information and Communication Technology", which means communication using technologies.

*2 Abbreviation for "Early Contractor Involvement", which is one of the ordering methods for construction and design work. It is aimed at "cost reduction" and "shortening of construction lead time" by reflecting technical capabilities of the builder (construction company) in the design from the design stage of the project.

*3 DBO method: Abbreviation for "Design Build Operate" method, which is similar to PFI (Private Finance Initiative), one of the business methods related to maintenance and operation of facilities. The public company/organization constructs and owns the facility while an SPC (Special Purpose Company) established by a private business operator with know-how is in charge of operation during the operation period.