# Activities of Research Center for Infrastructure Management and Future Perspective for DX

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## 1. Introduction

Researches in Research Center for Infrastructure Management (the "Center") cover a wide range of fields, including estimation, public bidding / contracting methods, project evaluation, analysis of economic effect, construction work using ICT, utilization of three-dimensional data, urban greening, landscape / historical community development, and support of recovery from the Kumamoto Earthquake disaster. The following describes main activities of the Center, which has entered the fifth year from the establishment, and the future direction of approach to DX.

## 2. Efforts for productivity improvement

For productivity improvement in construction sites, the Ministry of Land, Infrastructure, Transport and Tourism ("MLIT") is working for "i-Construction" as one of the important measures, which utilizes three-dimensional data, ICT, etc. in each stage of construction process, including research, design based on research, construction, inspection, maintenance, and renewal.

### (1) Works using ICT

Technologies to obtain position data using satellite positioning and three-dimensional data using laser scanner, etc. are progressing, and works using ICT that utilizes such technologies to conduct engineering survey, automatic control of construction machines, as-built management, etc. have been implemented in earthworks and pavement works. The Center has been studying formulation of standards for promoting the introduction of the above-mentioned devices into construction sites. In FY2020, based on the research results, ICT ground improvement works, ICT slope works, and ICT pavement works (repair works) were newly developed. We continue to study on the expansion of types of works and utilization of new technologies.

### (2) Introduction / dissemination of CIM

The MLIT has been using CIM models since FY2012 as one of the activities for utilization of three-dimensional data. CIM (Construction Information Modeling/Management) aims to facilitate information sharing among the persons concerned with the project and thereby achieve efficiency improvement / upgrading of the construction production system by introducing 3D models, ranging from the stages of planning, research, and design to the stages of construction and maintenance.

The Center is also studying procedures and standards for the introduction and dissemination of CIM. The Center will continue to study methods of creating simple 3D models for existing structures, etc. in order to further utilize CIM models.

The Center is also studying on the use of DX Data Center to store and share information on 3D data and point group data obtained from construction works and operation.

Moreover, research will be conducted on the introduction of CIM and the use of 3D data in machinery and equipment.

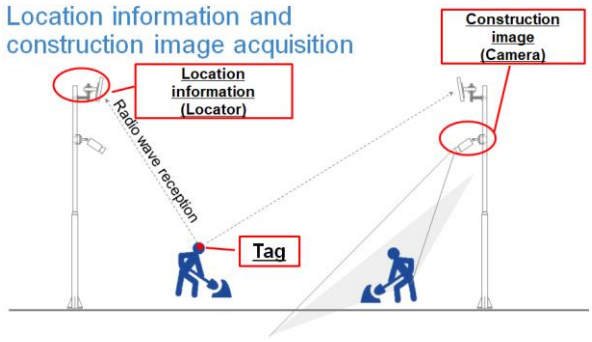
### (3) Infrastructure data platform

The MLIT has been constructing "Infrastructure data platform," which will reproduce the information about national land, such as data on structures and ground data, in the cyberspace. This infrastructure data platform aims to improve operational efficiency and upgrade measures by collecting data on structures etc. obtained in the construction production process ranging from survey, research, design, construction, and maintenance and linking the collected data with the data on economic activities such as movement of people and goods and natural phenomena. The Center has been studying on the linkage, etc. between the infrastructure data platform and various databases, and will continue the research to enable linkage with more data in the future.

### (4) Acquisition and analysis of the data in a construction site

In order to analyze the actual conditions of construction sites and to promote the use of new technologies, it is necessary to grasp and analyze the actual conditions of construction sites using digital data.

To this end, research on data items to be acquired, data acquisition methods, analysis methods, etc., is being conducted at actual construction sites with the cooperation of the people concerned, as shown in **Figure**.




[Acquired data item]
Location information (worker and crane hooker)
Construction image of the site

**Fig. An example of data acquisition**

### 3. Improvement of public bidding / contracting methods

Public bidding / contracting methods have been continuously improved according to the demand of the times and changes in social situations. As a result of the 2014 revision of the Act on Promoting Quality Assurance in Public Works ("Quality Assurance Act"), quality assurance for the present and future public works and development / securing of human resources responsible for quality assurance on a mid- and long-term basis were added to the purpose of the Act, and introduction / utilization of various public bidding / contracting systems were included. Such systems include the technical proposal / negotiation method, which requires the builder's technical cooperation from the design stage, and is also consistent with the concept of front-loading / concurrent engineering (parallel / joint work), which aims at total optimization of the construction production process.
Since the technical proposal / negotiation method mentioned above is applied to construction works in which the owner cannot determine optimal specifications or conditions requisite for specifications are difficult in determination, we intend to continue the research to facilitate the progress of such works.

### 4. Research on high-quality public design

Since the enactment of the Landscape Act in 2005, landscape administration has spread across the country, and the issues of consideration for landscape in public projects and qualitative improvement of designs have been arising.
Under these circumstances, local governments have begun to implement a variety of design administrative frameworks to improve the quality of design, and public design initiatives to effectively link public projects to regional revitalization through total project design.
Therefore, based on these examples, the Center is studying with the aim to propose the construction of design administration frameworks according to the scale of local governments and the landscape characteristics of regions, and measures for total design that will enhance the quality of public projects. We would like to continue to study for the development of unique and good communities.

### 5. Support of restoration from the Kumamoto Earthquake disaster

In the works for restoration from the Kumamoto Earthquake disaster, which occurred in April 2016, advanced technical knowledge about bridges etc. has been required and a laboratory was built on the site in April 2017 to station research personnel on the site in order to accelerate the project. This laboratory is providing prompt and elaborate technical support on the site and contributing to early restoration for projects led by Regional Development Bureaus and local governments.
As the Aso Ohashi Bridge Route on National Route 325 was opened to traffic in March 2021, the restoration has been steadily progressing. While continuing to provide technical support for recovery, we would like to study on reflection of the knowledge obtained in technical standards, quake-resistant structure enabling easy functional recovery, etc.

### 6. Initiatives related to DX in the infrastructure field

As the term "Digital Transformation" (DX) has become widely used, the MLIT has established the DX Promotion Division, and NILIM has installed an Infrastructure DX Research Promotion Division in March 2021.
In the construction process, the progress of digitization is not uniform, and there are many areas where digitization is not yet advanced. Therefore, it would be important to set immediate and future goals, and promote research and on-site implementation, according to the progress of digitization, such as those that are being digitized first, and those that are already digitized and can transform the method of operation.
We would like to study on social capital management that improves productivity and meets on-site needs by using the latest technology and the data obtained.