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# Activities of Research Center for Infrastructure Management and Future Perspective

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*key words: productivity improvement, public bidding / contracting methods, historic scenery, Kumamoto Earthquake*

## 1. Introduction

Research at the Research Center for Infrastructure Management (the "Center") covers a wide range of fields, including estimation, public bidding and contracting methods, project evaluation, analysis of economic effect, construction work using ICT, utilization of three-dimensional data from research for maintenance, urban greening, ecosystem conservation, and landscape / historical community development, and support for recovery from the Kumamoto Earthquake. This paper introduces the main activities and future plans of the Center, which is now in its fourth year since establishment.

## 2. Efforts for productivity improvement

To improve productivity at construction sites, Ministry of Land, Infrastructure, Transport and Tourism (MLIT) is working on "i-Construction" as one of the important measures, which utilizes three-dimensional data, ICT and other tools in the various stages of the construction process from research, design and construction to inspection, maintenance, and renovation.

i-Construction has also been promoted since last fiscal year under the Public/Private R&D Investment Strategic Expansion Program (PRISM), through which the Center is also conducting research.

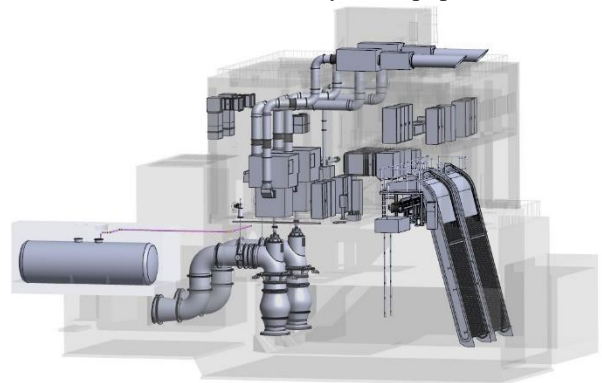
### (1) Works using ICT

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, work progress control, etc. have been implemented in earthworks, pavement works, and dredging works. The Center has been studying ways to prepare and organize standards that would promote the introduction of the aforementioned technologies into construction sites. In fiscal 2018, the types of works were expanded to soil improvement works, slope works and ancillary structure installation works. We continue to study their expansion to other types of works and the utilization of new technologies.

### (2) Introduction / Dissemination of CIM

MLIT has been using CIM models since fiscal 2012 as one of the activities for utilizing three-dimensional data. CIM (Construction Information

Modeling/Management) aims to facilitate information-sharing among the persons concerned with a given project and, thereby, improve efficiency of the construction production system by introducing 3D models 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 for creating simple 3D models of existing structures as yet another application of CIM. The Center also intends to study CIM introduction for machinery and equipment.



**Fig. Example of CIM for machinery / equipment**

### (3) Infrastructure data platform

We are conducting a study into an "infrastructure data platform" for reproducing information on national land assets, such as structure data and ground data, in cyberspace. This infrastructure data platform aims to improve operational efficiency and upgrade policies and measures by collecting data obtained across the construction process from surveying and research to design, construction, and maintenance, and linking the collected data to data on economic activities such as the movement of people and goods, and natural phenomena. The Center is exploring possible links with various databases, etc.

In addition to the infrastructure data platform, the Center intends to search for ways to use data obtained from construction sites, etc.

## 3. Improvement in public bidding / contracting methods

Public bidding / contracting methods have been continuously improved according to the demand of the times and changes in social situations. For example,

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amendments to the Act on Promoting Quality Assurance in Public Works ("Quality Assurance Act") in 2014 added quality assurance for ongoing and future public-works and development / securing of human resources on a mid- to long-term basis to the purpose of the Act, and provided a framework for introducing / utilizing various approaches to bidding / contracting. That included the technical proposal / negotiation approach, 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 process. Guidelines for this technical proposal / negotiation method were issued in 2015, and projects using this method began to appear in 2016. However, there are still few of these projects in the country and we are analyzing the effects of application, issues and potential areas of improvements in relation to the status of implementation in the construction stage. Since the technical proposal / negotiation method is applied to construction works in which the owner cannot set optimal specifications or the conditions requisite for specifications are unlikely, we will continue the study to facilitate progress of such works.

#### **4. Promotion of practice and utilization of resident-participated biological surveys**

MLIT formulated their "Biodiversity Indicators of Cities (draft)" in 2013 and "Biodiversity Indicators in Urban Areas (simple version)" in 2016. Meanwhile, local governments have been faced with the issue of how to more widely monitor the inhabitation / growth of animals and plants. Given the circumstances, biological surveys conducted in cooperation with residents would be relatively easy for local governments to implement, since there are various precedents and this approach is considered a continuous bio-monitoring methods. Therefore, the Center is studying how to effectively implement / utilize methods of resident-participated biological surveys, with the aim of creating a technical guide for local government personnel. We intend to continue research into developing good quality communities with their own identity.

#### **5. Support for restoration from the Kumamoto Earthquake**

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 division was installed in April 2017 by stationing research personnel on the site. This division is providing prompt and detailed technical support at sites and helping to complete projects led by Regional Development Bureaus and local governments.

In August 2019, the replacement work of the Tawarayama Bridge was completed. The division is

also giving advice on future management, in addition to guidance on restoration. While providing technical support for early recovery, we will continue to reflect the knowledge obtained in technical standards and study aseismic structure etc. enabling easy functional recovery based on the same knowledge.



**Photo: Tawarayama Bridge under restoration**

#### **6. Conclusion**

As new technologies like AI and IoT emerge, we intend to use these advanced technologies and the data they obtain to improve productivity and social capital management according to site needs.