Introduction of main measures

Promotion of i-Construction

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Original measure: i-Construction (MLIT)

Issues and Goal

Improving productivity at construction sites

The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has set a goal of increasing productivity at construction sites by 20% by FY2025, and is implementing “i-Construction”, with the aim of breaking down the old constitution of the construction industry and reforming working practices. PRISM aims to strengthen this initiative and to digitally transform the construction field by digitizing, 3D, and 4D data to be used for ICT construction and other purposes, thereby turning the PDCA cycle smoothly for the entire construction field. Furthermore, as a culmination of these efforts, we launched “the MLIT database and platform” in April 2020 to create open data for infrastructures and have upgraded it as needed since then.

Overview

i-Construction (original measure)

MLIT is working on this measure to improve productivity in the construction field, and the goal is to improve productivity of construction sites by 20% by 2025.

Turning PDCA for the entire construction field (PRISM)

To achieve the goal of the original measure, PRISM is working on the following three programs to seamlessly link data in the construction field, which tends to be divided into the following phases: design (Plan), construction (Do), inspection (Check), and renewal (Act).

(1) At the assessment (survey)/design stage (P), we will streamline the design and construction work through development of 3D technology for assessing and surveying data and 3D technology for design data that can be utilized in the construction stage.

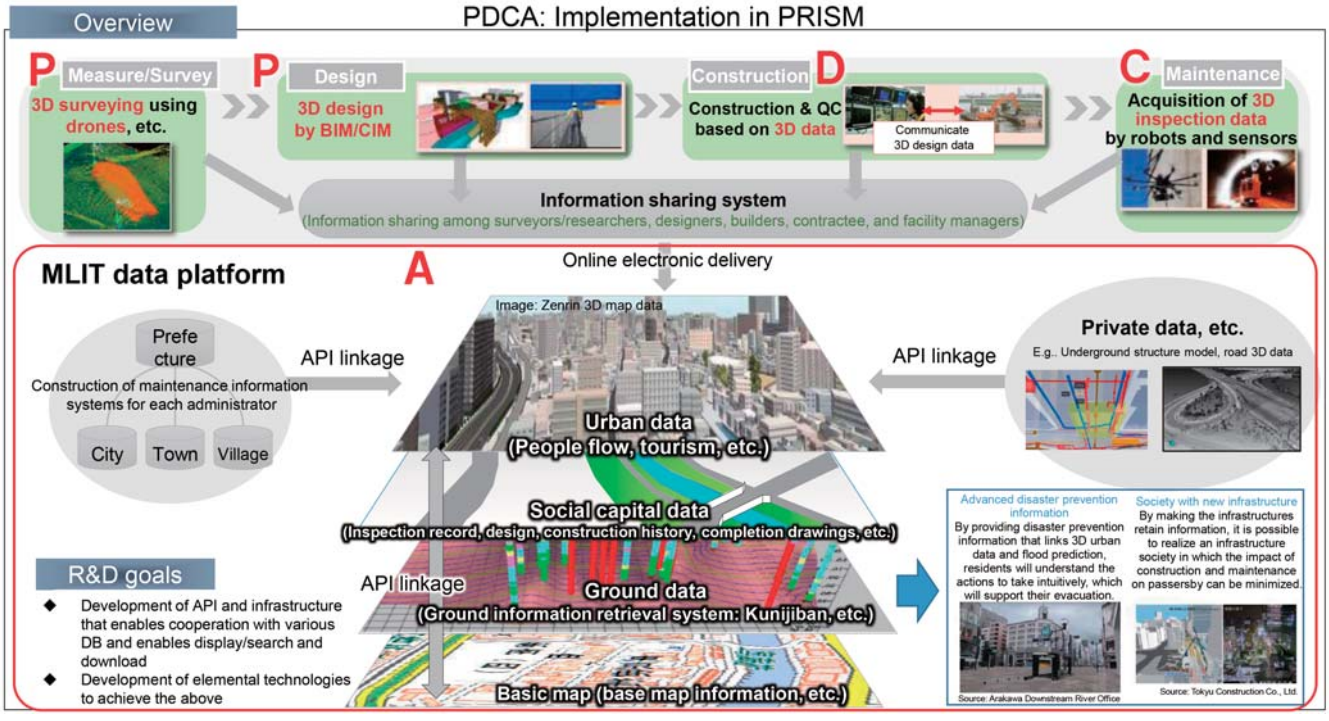
(2) At the construction /measure stage (D), we will save on labor and shorten the construction lead time by developing technologies to streamline and automate the construction process through automatic acquisition of 3D/4D construction data and data analysis.

(3) At the quality control/inspection stage (C), by developing technologies of digitization or 3D conversion of the control and inspection data and all item inspection technologies using images, we will reduce the number of control and inspection documents, reduce the frequency of site visits, and revise the quality and workmanship control manuals and inspection standards accordingly.

With participation of many IT companies and manufacturers outside the construction field, we will develop the above into technologies that can be used in real fields through repeated model operations at real sites, and further reform the regulations by revising the standards and manuals. Moreover, we aim to contribute to revitalization of the entire construction field by involving other fields.

Development of MLIT database and platform (PRISM)

The "MLIT database and platform," a data platform in the infrastructure field linked to map information, has been upgraded as needed even after it was released, and we plan to upgrade it as the core of the data platform in the infrastructure field by the end of 2022. As a culmination of digital transformation in the construction field, PRISM will develop it as a platform that links design, construction, and maintenance data accumulated in the information sharing system, urban data such as human flow and tourism data, geotechnical data, and infrastructure data from local governments and the private sector. Thus, we aim to promote R&D and technological development utilizing data (A), not only to further improve productivity, but also to widely provide infrastructure information to the public.

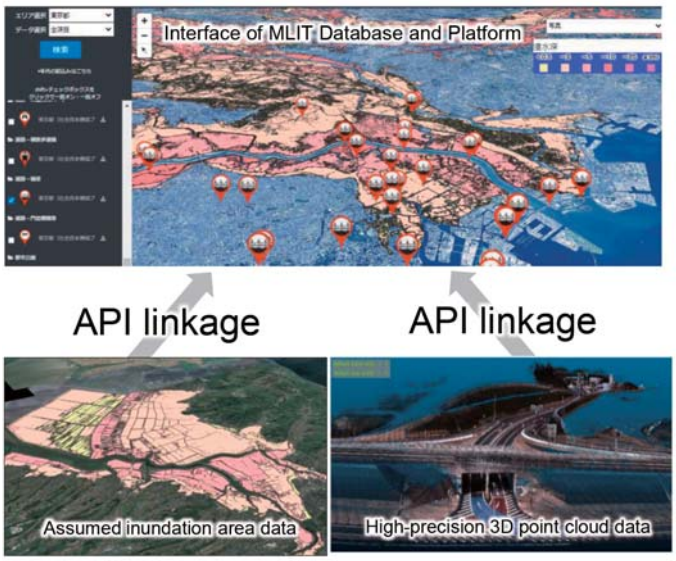


Achievements to date and expected positive ripple effects

Development of MLIT database and platform

We link a total of about 220,000 data items related to the national land, including design and construction data obtained from the information sharing system, data related to the specifications and inspection results of infrastructure obtained from past data, and geotechnical data from boreholes nationwide. Then, we released to the public "MLIT database and platform 1.0," which enables cross-sectional search, display, and download using the same interface. Since then, we have been actively working to expand cooperation data, and in the updated version (MLIT database and platform ver. 2.0) in August 2021, it became possible to display in 3D topographic maps and to be linked with 3D city models (PLATEAU) and other data. We will continue to expand the functions and upgrade the version as the core of DX in the construction field.
In addition, to make more effective use of the data linked to the MLIT database and platform, we are developing and testing a program to create 3D models from 2D drawings as well as a function to extract the data necessary for searching electronic deliverables. We believe that these efforts will not only accelerate productivity improvement in the construction field, but also induce private investment, research investment, and technological development in fields other than construction, such as disaster prevention and logistics.
We will continue to gather a wide range of opinions and requests from experts and users of the MLIT database and platform to expand data linkage, improve the system, and develop new technologies.

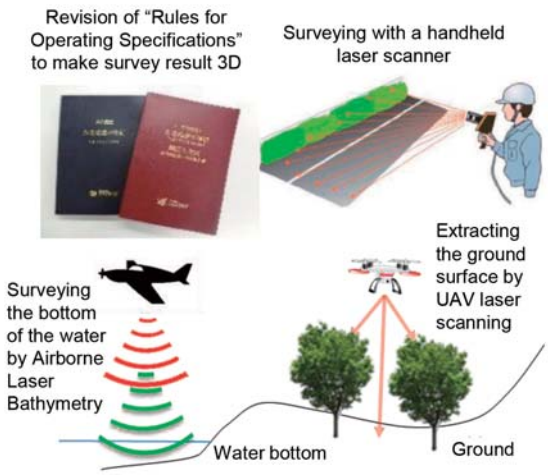
Linking various data on the same map



Laser surveying, 3D design system development

To obtain and utilize efficient and high-quality 3D data using new surveying technologies such as UAVs (drones) and 3D laser scanners, we have been examining standard work methods, verifying accuracy, and preparing various manuals and Rules for Operating Specifications.
In addition, for further utilization of BIM/CIM, we established 10 i-Construction model offices nationwide in March 2019 to examine methods for smooth data transfer from 3D model surveying to construction and efficient project management methods through centralized information management. Also, by using parametric models, which are 3D models whose shapes are specified by parameters such as width, height, and interval, and can be changed as the parameters are changed, we have improved the efficiency of model creation and modification work and promoted use of precast methods. Also, we will induce open innovation by linking data with the MLIT database and platform. In addition to this, we will introduce the ECI contract, in which contractors are involved from the design stage, to further facilitate smooth exchange of data between processes.
Then, in the surveying field, we will continue to verify the effectiveness and accuracy of new technologies and tools, and develop manuals and regulations, while also investigating overseas trends, so that we can utilize rapidly advancing new technologies and tools in public works. This will enable us to acquire and utilize efficient and high-quality 3D data, thereby improving the productivity of public works.
Also, we will investigate system designs, systems, rules, etc., in foreign countries that have introduced BIM/CIM in an advanced manner and adopt the most effective ones into domestic standards while considering differences with our background and systems.

Examples of new technologies related to surveying



Development of technologies for controlling construction equipment, converting execution data to 3D, and advanced inspection to realize unmanned construction sites

In public civil engineering works, by acquiring digital data during construction in real time and using new technologies such as AI and IoT, we are experimenting with new technologies that can save labor and increase sophistication of inspection of assembled reinforcing steel, which until now have been carried out by a large number of people as witnessed in the field. This initiative was launched in 2018 as the "the Project on Introduction and Utilization of Innovative Technologies for Drastic Improvement of Productivity at Construction Sites," and so far about 100 model projects have been carried out through public solicitation of a consortium for private companies and universities. Also, to further utilize and deploy the new technologies, we have published a collection of technologies that summarizes the characteristics and application conditions of the trial technologies, and prepared " Manuals for measuring the completed reinforcing steel utilizing digital data (draft)" and " Manuals for telepresence at construction sites (draft)" for social implementation of the new technologies.
In architectural field, in collaboration with a subcommittee led by private sectors set up at the BIM Promotion Roundtable, the standardization of BIM object libraries and estimation systems and study of codes of practice for building confirmation and inspection by using BIM, and also the technical specifications of the standard for common data environment of the BIM project are carried out in PRISM projects.
In the future, we will focus on streamlining construction including improvement of the efficiency of construction management under non-contact conditions, and promote model projects in the field about supervision and inspection items common to major construction types such as concrete structure work, embankment work, and pavement work. Also by FY2022, we will continue to revise various manuals and procedures to replace the drafts with official ones.

Image analysis and telepresence