Trend of the Times and Reform of Construction Production and Management Systems

YASUHARA Tatsushi, Director, Research Center for Infrastructure Management

(Key words) construction production management/management system, data-driven, green, decarbonization, green infrastructure

1. Introduction

I have had the opportunity to be engaged in management research again after twenty-plus years since the time when I worked for the Research Center for Construction Management Technology, and I feel that now is the critical time for achieving reform of construction production management systems without falling behind the trend of the times. We also face many challenges in order to carry out built-in efforts for green (G) such ad decarbonization, by overcoming the "2025 Digital Cliff" through work style reform by means of DX (D) such as i-Construction. This paper describes efforts toward reform of construction production/management systems.

2. Reform toward data-driven (D)

Regarding the efforts of i-Construction such as BIM/CIM or ICT construction, our Center visited a model office together with Committee Member Ozawa of the BIM/CIM Promotion Committee, and grasped the challenges. The efforts of BIM/CIM in the model office are roughly classified into efforts in which a digital twin called the project management tool is built and information on the project is visualized and shared by being tied to a three-dimensional model, and efforts in which information on structures that form the basis for asset management is built by means of a three-dimensional model. A great challenge at present would be the utilization of the three-dimensional model that is consistent from design through construction to maintenance and management in the latter efforts. Of these, regarding the delivery from design to construction under the condition of separation of design and construction, we consider that it is essential to thoroughly make design with little risks, while sufficiently examining the method of construction through investigation and consultation or by obtaining technical proposals by the ECI method at the design stage. After that, in the current situation, transmission of information such as that between the order receiver and the orderer, etc. concerning design, etc. is performed in two-dimensional forms such as drawings and discussion documents. Therefore, various types of data that are not conveyed by these forms are handled as additional work with the rules for handling the data remaining unclear, which has become the factor that will not lead to effective utilization of data or work improvement. Concerning these, it is necessary to make rules on the data creation, sharing, processing, approval, utilization, renewal, and discarding, and to review the work of both the order receiver and orderer so that the work will be based on data, including the review of document based contracts. In the "Discussion Meeting on How the Construction Production and Management System Ought to Be in Future to Fulfill the Responsibility of an Orderer" in December last year, a concept of data management is shown that refers to ISO 19650 concerning information modeling of a construction life cycle. Herein, it is stated to aim at achieving advanced project management by saving labor for data management and data-driven approaches and at speedup of decision making of the order receiver and orderer and relevant parties, by storing and sharing a three-dimensional model and QSCDE information (Quality, Cost, Delivery, Safety, and Environment) by means of a project CDE (Common Data

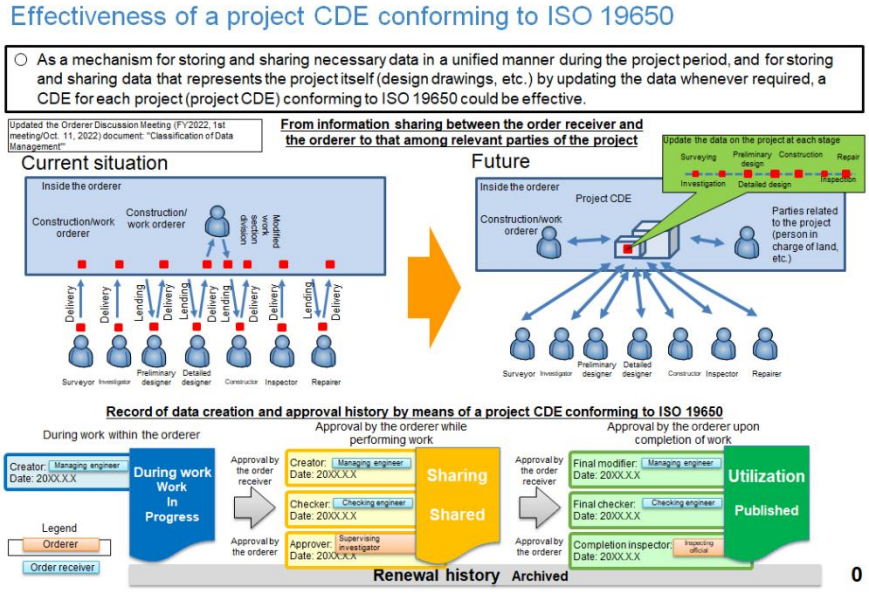

Figure-1 Illustration of data sharing by means of a project CDE

Environment). If this is realized, information on completed construction and its background, etc. that have been accumulated in the project CDE can be transferred to maintenance and management. Furthermore, by utilizing the data accumulated in the project CDE, supervision and inspection, completed construction management, design change and work unit survey, etc. that are performed via forms and human power may also be capable of being rationalized by data analysis.

Our Center plans to make efforts in research and development concerning data and information infrastructures, provision of consultative support for the site, human resource development, and others, toward the reform into the data-driven construction production and management systems such as those described above.

3. Response to green (G)

In COP28, "The Green Public Procurement Statement of Intent" was formulated, and the intention was expressed to require use of life cycle assessment in all the public construction projects. Also, in the international investment markets, GX-related investments are heating up, which realizes both greenhouse gas emissions reduction and economic growth. In realizing Japan's goal of reducing greenhouse gas emissions to zero as a whole by 2050, markets must be vitalized by Japan's GX products and services and they must be utilized appropriately in the construction production and management systems. To do so, an environment is necessary in which the greenhouse gas emissions reduction amounts by the GX products and services can be evaluated appropriately.

Our Center has formulated, as a (draft) manual in FY2023, methods for calculating the greenhouse gas emissions reduction amounts, using the construction cost estimation data for the activity amount of each of the construction supplies, materials and equipment that are required for calculation, and multiplying the data by the emission intensity. (See the featured article.)

Hereafter, in order to manage the calculation of greenhouse gas emissions reduction amounts based on the manual, the following will be necessary, and therefore their study is being conducted. (1) Improvement of the emission intensity of the standard supplies, materials and equipment, (2) Devising the rules to evaluate the emission intensity of GX products and services, (3) Organizing the handling of supplies, materials and equipment for which it is difficult to convert the estimation data to the activity amount, (4) Organizing systems for calculating emissions amounts by linking the estimation data with the activity amount and the emission intensity. In addition to this, in order to adopt GX products and services, evaluation criteria will be required for how to evaluate the greenhouse gas emissions reduction amounts as Value for Money, and so the criteria are also being studied.

As another trend concerning green (G), Nature Positive can be mentioned. The Ministry of Land, Infrastructure, Transport and Tourism has devised the Green Infrastructure Promotion Strategy 2023, stating that a "society living in harmony with nature" will be aimed at. In order to make good use of the effects of disaster preparedness and disaster mitigation as well as well-being, etc. of Green Infrastructure including natural environments, biodiversity, greening, and others, an information infrastructure will be required, in which the statuses of growth of a variety of animals and plants as well as biodiversity can be grasped and their effects can be evaluated.

Our Center would like to proceed with research and development, toward the establishment of biodiversity observation and evaluation techniques in which sensor and digital technologies, etc. that are significantly being advanced will be put into application.

4. Conclusion

In order to secure infrastructure investments in future as well, construction production and management systems must be reformed and maintained, in line with the trend of the times surrounding Japan. We would like to proceed with efforts toward the realization of such reform.

☞For more detailed information, visit:

1) Website of the Discussion Meeting on How the Construction Production and Management System Ought to Be in Future to Fulfill the Responsibility of an Orderer

https://www.nilim.go.jp/lab/peg/13yuusikisya.html

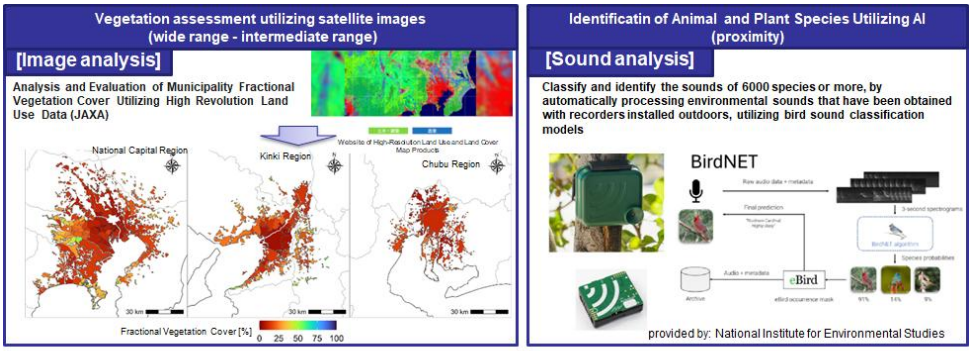

Figure-2 Illustration of the observation and evaluation techniques for biodiversity