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Infrastructure Development Institute—JAPAN

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Road Asset Management Platform Activities

1. Background

Currently, Japan International Cooperation Agency (JICA) is implementing technical cooperation projects to strengthen the maintenance capability of road infrastructure in approximately twenty countries. We are cultivating a wide range of core human resources who will be responsible for road administration in developing countries.

JICA has set out efforts to establish a preventive maintenance-type of maintenance for road infrastructure in developing countries, and to establish an effective and efficient road administration based on road asset management methods.

JICA established Road Asset Management Platform (RAMP) in October 2017 for the following purposes.

- To develop a plan to support road asset management in developing countries where increasing demands for proper infrastructure management are expected.
- To support overseas expansion of Japanese companies with road asset management related technologies.
- To cultivate core human resources who are expected to lead road asset management in developing countries.

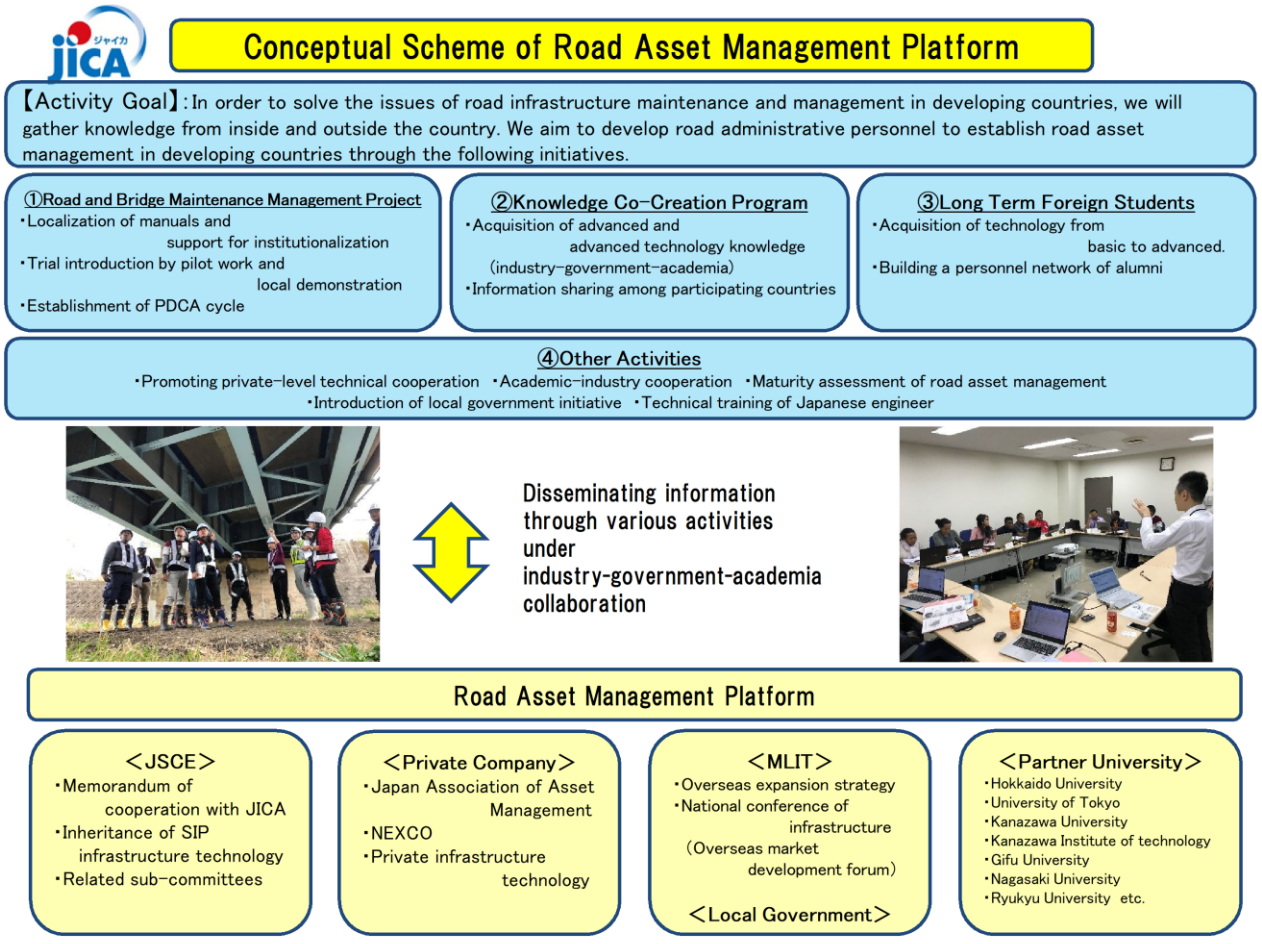

Figure 1: RAMP overview

2. What is Road Asset Management?

Asset management of infrastructure is a concept of systematic and strategic management of public infrastructure, which was originally developed in the United States of America in the 1980's, when the country was facing problems of infrastructure deterioration. Under this concept, infrastructure is regarded as public a asset, and it shall be maintained and improved systematically and strategically.

Road asset management is a type of infrastructure asset management which is applied to road assets, such as roads, bridges, and other road structures. The purpose of the concept is to implement strategic management plan to minimalize life cycle cost of road assets through the following activities; to understand the current state of the structures properly, to estimate the degree of degradation, and to repair or reinforce infrastructure at the best timing.

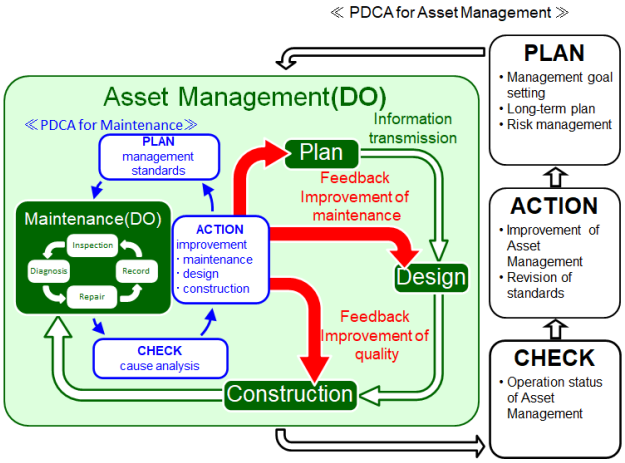

Figure-2 Maintenance PDCA conceptual diagram

3. RAMP Activities

(1) Support Committee

In order to promote RAMP activities, the "Road Asset Management Platform Support Committee" has been established for the purpose of providing professional and technical advice on the implementation contents and its examination.At the 2nd Committee meeting held on November 20, 2020; previous activities, the status of long-term participants, and the implementation status of the Knowledge Co-Creation Program (KCCP) were reported.

(2) Knowledge Co-Creation Program (KCCP)

In order to develop core human resources related to road maintenance technology in developing countries, road administrators or engineers from each country are welcomed and introduced into our organization as short-term participants and long-term participants (master's and doctoral students). The Transportation field Knowledge Co-Creation Program comprises four major categories: administration, construction, maintenance, and traffic safety. Each category consists of nine individual courses, covering everything related to road administration, from planning to maintenance.

Photo-1 KCCP (Lecture)

Photo-2 KCCP (Concrete test)

Photo 3. KCCP (Cultural experience)

Figure-3 Knowledge Co-Creation Program

4. Study abroad system at Japanese universities

The international student system started in 2018, where four students were accepted in 2018, five students in 2019, and fifteen students in 2020.There are nine host universities: University of Tokyo, Hokkaido University, Nagasaki University, Ryukyu University, Kanazawa Institute of Technology, Gifu University, Shibaura Institute of Technology, Osaka University, and Tohoku University.

Photo 4. International student program (Site visit)

5. Technical Cooperation projects

For technical cooperation projects in the field of transportation, Japanese maintenance/renewal/management technologies have been actively applied, cooperatively aiming to establish an efficient and effective maintenance system. Heretofore, implementation of bridge inspections by drones, damage detection by AI, measurement equipment for simple road surface properties measurement equipment, repairment materials, and slope measurement equipment intoduction? have been carried out. Moreover, after the project, private companies have been enforcing activities that have established a support system.

In addition, based on the memorandum of understanding with Japan Society of Civil Engineers (JSCE), cooperation regarding academic research and human resource development have been enhanced through technical cooperation projects.

(1) Case 1: Transfer of bridge inspection technology using VR

In the Republic of Zambia, technology transfer related to bridge maintenance have been carried out, for four years since 2019, aiming to improve bridge maintenance capability in the country. However, due to the Covid-19 pandemic and travel restrictions, carrying out the exercises on-site is currently difficult.

Under these circumstances, the use of virtual reality (VR) technology was considered to be effective for technology transfer in remote areas. Currently, discussions with JICA to introduce this technology into practice are being held; requesting HOME360 Co., Ltd. to produce the teaching material content and conducting remote exercises.

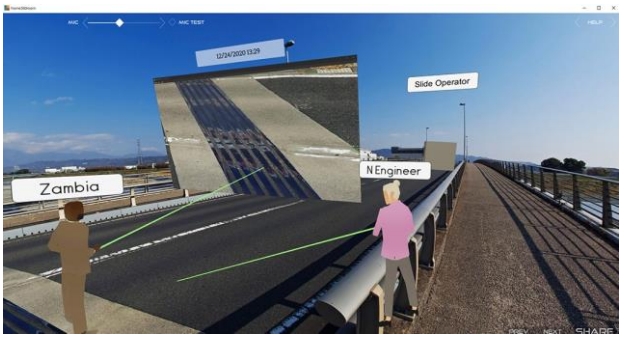

Photo-5 Teaching materials by VR

In the exercise, the Japanese side will explain about the inspection method, damage state, damage causes, etc. using VR, which allows its counterpart to experience it at the same time in the same space, receiving an extremely positive response as a result. The main feature of this system is in the VR space. It is different from other systems in which meetings and lectures can be held in real time on-site (example: bridge surface). If the counterpart has a question, direct advice can be provided at the same time as well.

The amount of data in videos and CG has significantly expanded, resulting in a concern for stable communication depending on the internet environment of the country.

This system requires a pre-shooting of 360-degree images, but the 360-degree images compress high-quality images shot at 14K that maintains 8K resolution, which reduces data traffic to 10MB or less. In addition, a function that can zoom in on 360-degree images has been added. This makes it possible to confirm the main points while being aware of the entire bridge. As a result, it is considered to be effective for establishing a mutual understanding of technology transfer.

In the future, various utilization methods, not only for exercises but also for design and construction, will be considered.

Photo-6 Technical experts to teach (Japanese side)

Photo-7 Engineer receiving guidance (Zambian side)

(2) Case 2: Bridge maintenance using drone technology

In the Philippines, for the "Quality Control Improvement Project for Construction and Maintenance of Road and Bridges", inspection analysis surveys using drones aiming to inspect complex bridges or bridges located in the sea, where access for inspection is complicated, have been carried out.

These images taken by drone during inspections are analyzed in 3D using AI technology, which is used to estimate the damage state.

Currently, this technology is limited to damage such as concrete cracks, cross-section defects, corrosion, and paint peeling. Studies to enable more advanced bridge inspection and diagnosis through accumulation of various damage data, are being enhanced for future prospects.

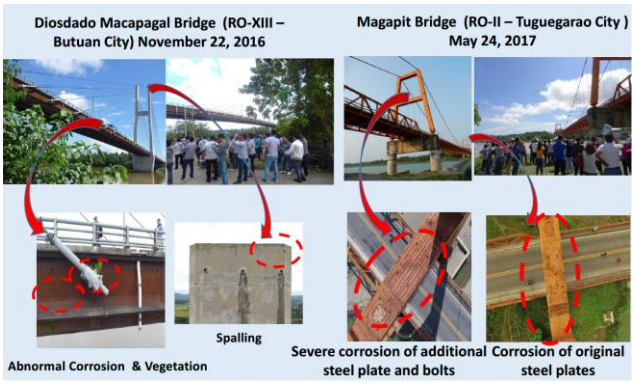

Photo-8 Inspection of the main tower of a suspension bridge using a drone

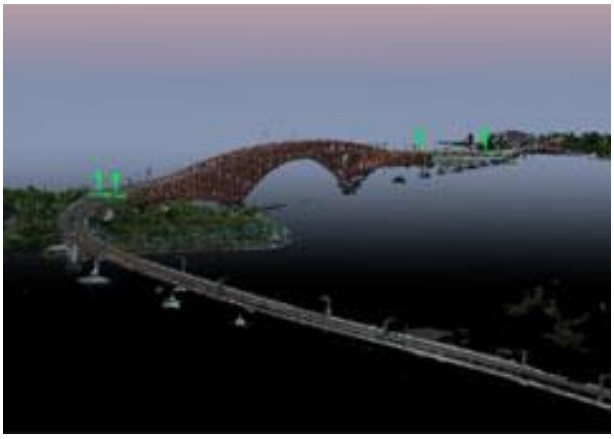

Photo-9 3D model created from photographic data

Photo 10. Analysis result of concrete crack

6. Future outlook

Human resources, materials, and capital shortage issues are presented not only in developing countries but also in local governments in Japan.

Therefore, by deepening and refining Japan's contribution in developing countries through usage of latest technology, we plan to provide further feedback regarding the technology to local governments in Japan.

It is expected for the PDCA cycle of technology to be implemented between Japan and developing countries.

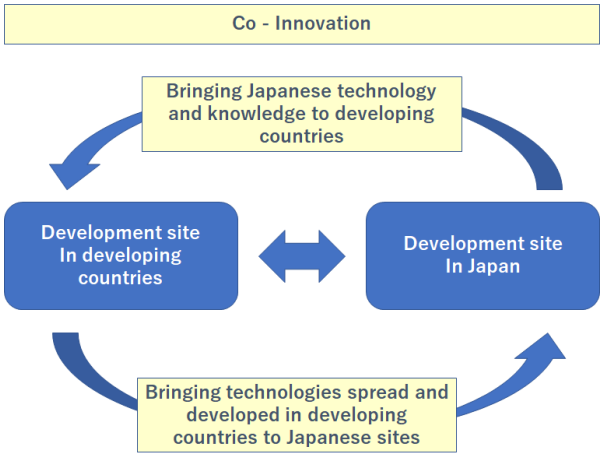

Figure 4. Conceptual diagram of technology utilization cycle

7.Conctact Information

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About IDI and IDI-quarterly

Infrastructure Development Institute-Japan (IDI) is a general incorporated association operating under the guidance of Ministry of Land, Infrastructure, Transport and Tourism of Japanese Government.
IDI provides consulting services to facilitate international assistance to developing countries, to promote international exchange of information and human resources, and to support globalization of project implementation systems targeting both developed and developing countries in the field of infrastructure.

IDI has been publishing a free quarterly journal called “IDI Quarterly” since1996 to introduce information related to public works and construction technologies developed in Japan, to foreign countries. We have distributed the journal to administration officials in more than 90 countries around the world via e-mail.

It will be highly appreciated if you could send us your opinions, impressions, etc. regarding the articles.
We also welcome your specific requests regrading technologies you would like to see on following Quarterly issues.