Socialist Republic of Viet Nam

FY2021 Ex-Post Evaluation Report of Technical Cooperation Project

"The Project for Capacity Enhancement in Road Maintenance/The Project for Capacity Enhancement in Road Maintenance Phase II"

External Evaluator: Keiko Watanabe, Mitsubishi UFJ Research and Consulting Co., Ltd.

0. Summary

The objective of this project[1] was to strengthen the implementation capacity of the implementing agency for road maintenance of the national roads network through two phases of technical cooperation projects. It was envisioned that the objective was achieved by developing a pavement management system (hereinafter referred to as "PMS[2]") specially adapted to Viet Nam's operation method, by improving and applying it, and by supporting the construction of a system for improvement, formulation, and implementation of technical standards and institution. As a result, based on the medium-term maintenance plan, it was expected that appropriate road maintenance would be implemented along with the PDCA cycle management[3]. The objective of the project was consistent with the development policies and needs of the country and the project plan and approach was appropriate. The project was consistent with the development cooperation policy of Japan. It also collaborated with other projects of JICA and with other organizations such as the World Bank (hereinafter referred to as "WB"), and concrete results have been confirmed. Therefore, relevance and coherence are high. Through implementation of the project, improvement of the implementing capacity of the implementing agency for road maintenance, which was set as the project purpose, was achieved. In addition, the project has contributed to the overall goal of maintenance work based on the PDCA cycle to a certain extent. The project results have been largely achieved as planned, therefore, the effectiveness and impacts of the project are high. Efficiency is high as the project cost and period slightly exceeded the plan. Sustainability of the effects of the project is moderately low since there are some minor financial issues and they are not expected to be improved/resolved in the near future.

In light of the above, this project is evaluated to be satisfactory.

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[1] Phase I and Phase II are collectively referred to as "this project."

[2] PMS is one of the tools for accurately grasping and predicting pavement conditions, and accurately judging what kind of management action to implement at what timing within budget constraints for systematic and efficient pavement management. (Japan Road Association website (in Japanese): https://www.road.or.jp/technique/pavement.html)
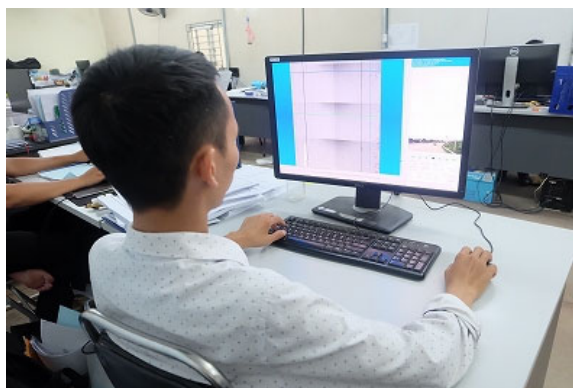
[3] It is a management method to enhance work efficiency by repeating Plan (P), Do (D), Check (C) and Action (A).

1. Project Description
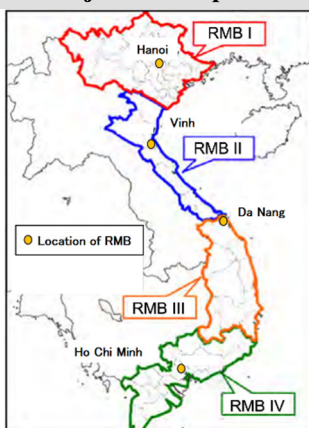
Project Location

Source: Modified from Information provided by JICA

RMB officer analyzing pavement condition data

Source: Taken by local consultant at the time of ex-post evaluation survey

1.1 Background

National road network of Viet Nam has been improved with the support from Japan, WB, the Asian Development Bank (ADB) and others in addition to its own budget, which has contributed to its strong economic development. On the other hand, since the priority was set for the construction and major rehabilitation in road sector, the sufficient budget was not allocated to the road maintenance. Thus, the adequate maintenance was not implemented. In the field of road maintenance, the Directorate for Roads of Viet Nam under the Ministry of Transport (hereinafter referred to as "DRVN"), which is in charge of the maintenance of the national roads, has been provided with PMS and databases as software for formulating medium-term plans for national roads by WB and ADB. However, they were not actually put into operation due to problems such as the low reliability of the original data and the complexity of the data input. Furthermore, the actual road maintenance work was outsourced to the private sector or government joint ventures by the Road Management Bureau (hereinafter referred to as "RMB"[4]) under DRVN and Road Department of the People's Committee, but it was not functioning sufficiently either. This was because problems such as inadequate guidelines for inspection and repair, inconsistency in technical standards, and insufficient technical levels of local engineers had become apparent.

Under these circumstances, the Government of Viet Nam requested to the Government of Japan to improve the capacity to formulate maintenance plans and to strengthen the capacity for routine maintenance.

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[4] The country is divided into four districts and Road Management Bureaus (RMBs) are allocated at each regional base (Hanoi, Vinh, Da Nang and Ho Chi Minh). At the time of Phase I, the same organization was called Regional Road Management Unit (RRMU), but RMB is used in this evaluation report.

1.2 Project Outline

		Phase I	Phase II
Overall Goal		1. Road facilities are properly maintained in the target region. 2. Outputs of the project are disseminated across the country.	Road maintenance is conducted properly based on medium-term plan, following PDCA cycle.
Project Purpose		1. Road maintenance institution in the target region is enhanced. 2. Dissemination system of the output of the project across the country is developed.	Implementation capacity for road maintenance is strengthened in Viet Nam.
Output	Output 1	Enhancement of capacity for road information management	PMS data development technology is improved.
	Output 2	Enhancement of planning capacity for road maintenance	PMS is upgraded and applied to the planning of trial pavement repair works.
	Output 3	Enhancement of road maintenance technologies	Technical specifications for inspecting road facility and selecting repair work are developed.
	Output 4	Reinforcement of DRVN institutional issues on road maintenance management	Responsibility assignment and administration procedure are clarified for road maintenance.
	Output 5	-	Training implementation and public relations are reinforced.
Total Cost (Japanese Side)		465 million yen	605 million yen
Period of Cooperation		July 2011 - April 2014 (Extension period: February 2014 - April 2014)	February 2015 - April 2018 (Extension period: One month in April 2018)
Target Area		Road Management Bureau I (RMB I)	Viet Nam Nationwide
Implementing Agency		Directorate for Roads of Viet Nam, Ministry of Transport (DRVN/MoT)	
Other Relevant Agencies /Organization		None	
Consultant/ Organization in Japan		None	
Related Projects		<Technical Cooperation> ・ The Comprehensive Study on the Sustainable Development of Transport System in Vietnam (2007-2013) ・ The Project for Strengthening Operation and Maintenance System for Expressway in Vietnam (2012-2013) 【International Organization】 ・ World Bank, "Vietnam Road Asset Management Project (VRAMP)" (2015-2022)	

Below is a conceptual diagram showing the relationship between Phase I and Phase II. In Phase I, a new database system and PMS were developed and applied to the RMB I jurisdiction area as a pilot area to strengthen the implementation system. In Phase II, the results of Phase I were utilized and improved and were rolled out nationwide. Therefore, the direction of the two projects to be evaluated is common, and the two projects were evaluated as one project in the ex-post evaluation.
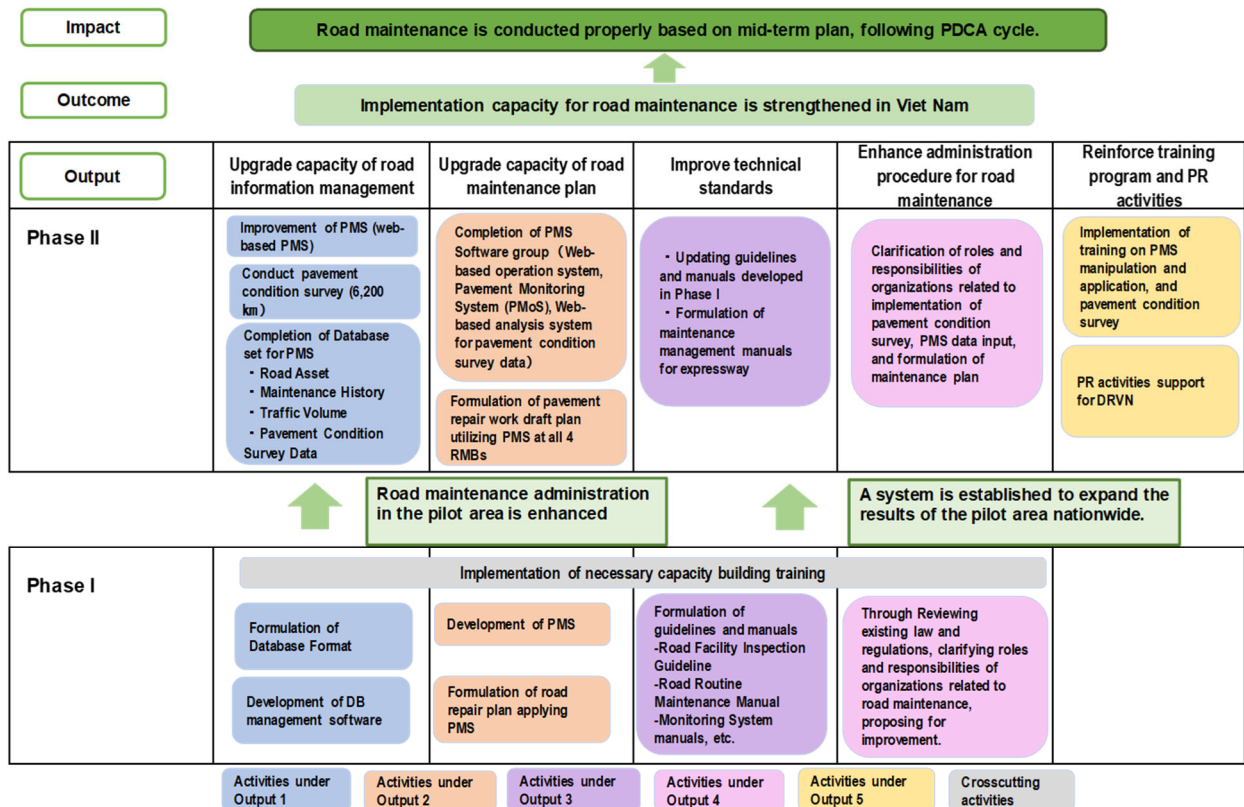
Source: Formulated by the external evaluator

Figure 1: Relations between Phase I and Phase II

1.3 Outline of the Terminal Evaluation

Although the terminal evaluation was not implemented in Phase II, the relevant parts from the completion report are quoted as below.

1.3.1 Achievement Status of Project Purpose at the Terminal Evaluation

At the time of terminal evaluation of Phase I, although an initial base of the new road database and new PMS, and the manual for routine maintenance were developed, the OJT period leading up to actual operation could not be secured sufficiently. Furthermore, the procured new pavement condition survey vehicle was expected to arrive in the original project completion month. It was necessary to have an opportunity to implement OJT for on-site data collection by

this vehicle, analysis, PMS operation, and medium-term plan formulation. Therefore, the project purpose was likely to be achieved if the OJT period was secured, and an extension of the practical training period was proposed in the terminal evaluation.

At the time of completion of Phase II, all expected outputs were achieved and it was judged that the project purpose was achieved through effective technical transfer by training session, OJT, and involvement in the project for the officers of implementing agency and related local agencies.

1.3.2 Achievement Status of Overall Goal at the Terminal Evaluation (Including Other impacts)

The prospect to achieve overall goal could not be judged since the project purpose had not been achieved at the time of terminal evaluation of Phase I. On the other hand, the existing laws and regulations reviewed in Output 4 served as an important input, and institutional impacts were seen, such as the formulation of decree to clarify regulations on road maintenance[5].

At the time of completion of Phase II, the implementing agency had started preparing an action plan to achieve the overall goal. In the action plan, it was planned that pavement condition surveys would be regular surveys, and that the annual and medium-term plans formulated using PMS would be the official plans for DRVN in consultation with the Ministry of Transport. In addition, based on the results of this project, DRVN developed a road maintenance manual by themselves adding the contract procedure information. The manual has become a regular manual of DRVN after the legal procedure. Therefore, the overall goal was considered highly likely to be achieved.

1.3.3 Recommendations from the Terminal Evaluation

(1) A few months' extension of the project period was required for operation training of a new PMS and for conducting OJT on a series of tasks from data collection, analysis, PMS operation and medium-term plan formulation. The data would be collected using pavement condition survey vehicle that was delayed in procurement.

(2) Recommendation during the project period: ①Completion of input of necessary data in the database with strong support from DRVN, ②Completion of PMS development by adding improvements based on operations, and ③Conducting training on formulation of medium-term plans

(3) Recommendation after the project completion: ① Dissemination of project outputs nationwide, ②Completion of the national road database, ③Improvement and update of road database, PMS and pavement monitoring System (PMoS), and ④ Utilization of routine maintenance manual

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[5] In No.538/QD-BGTVT "Comprehensive innovation for management and maintenance of national highway network" issued as a Decision in March 2013, a decree was proposed to clarify the regulations on road maintenance.

(4) Implementation of further coordination with related organizations led by the Project Management Unit until project completion

2. Outline of the Evaluation Study

2.1 External Evaluator

Keiko Watanabe, Mitsubishi UFJ Research and Consulting Co., Ltd.

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: November 2021 - February 2023

Duration of the Field Study: May 23, 2022 - June 3, 2022, October 28, 2022 - November 25, 2022 (By local consultant)

2.3 Constraints during the Evaluation Study

Due to global spread of the coronavirus infection (COVID-19) pandemic, the external evaluator was unable to travel to Viet Nam and instead, conducted the field survey remotely using a local consultant. Since the external evaluator was not able to directly collect responses to the questionnaires, interview the stakeholders and beneficiaries, and conduct field surveys of the project sites, there were restrictions on the information and data necessary for evaluation analysis. For this reason, the external evaluator conducted evaluation analysis and judgment through careful examination of the information and data obtained from the remote and desktop surveys.

3. Results of the Evaluation (Overall Rating: B[6])

3.1 Relevance/Coherence (Rating: ③[7])

3.1.1 Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of Viet Nam

In the Five-Year development plans that were valid at the time of planning of Phase I and Phase II, respectively (*8th Social and Economic Development Plan (SEDP)* (2006-2010) for Phase I and *9th SEDP* (2011-2015) for Phase II), transportation infrastructure development is the most important issue for promoting industrialization and economic growth. The road maintenance is important factor that is indispensable for the development of transportation infrastructure system.

The policy at the time of completion of Phase I is the same as at the time of planning of Phase II above (2014). *The 10th SEDP* (2016-2020), which is effective at the time of completion of Phase II, lists infrastructure construction as one of the three breakthroughs for

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[6] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[7] ④: Very High、③: High, ②: Moderately Low, ①: Low

economic and social development, and emphasizes the importance of transportation infrastructure development in particular.

Therefore, the objectives of both phases are consistent with Viet Nam's development policy at the time of planning and completion.

3.1.1.2 Consistency with the Development Needs of Viet Nam

At the time of planning for Phase I, it was stipulated that the implementing agency would utilize the database (RosyBASE) introduced for formulation of medium-term maintenance plans with assistance from ADB, and formulate a nationwide maintenance plan through the PMS (HDM-4) introduced by WB. However, due to the inadequacies in the creation of datasets, the necessity of the large number of input data for using PMS, and the complexity of the software themselves for both RosyBASE and HDM-4, the implementing agency was unable to operate them. Therefore, there was an urgent need to improve the road database and PMS to be simpler and easier to maintain. In Phase I, the format of the road database and PMS adapted to the operation method in Viet Nam were developed, and the road maintenance manual and other documents were created. Phase I was targeted at the pilot area in northern Viet Nam (RMB I jurisdiction area) and it was necessary to expand this outcome nationwide and ensure its establishment.

At the time of completion for Phase II, the importance of infrastructure development was high for the national goal of becoming an industrialized country by 2020, and the need for efficient road maintenance was high.

From the above, it was confirmed that the development needs from the time of project planning to the time of completion are consistent with this project, which aims to improve road maintenance capabilities.

3.1.1.3 Appropriateness of the Project Plan and Approach

In Phase I, utilizing the lessons pointed out in the ex-ante evaluation paper, "Apply simpler technology for the introduction of the planning system and the operation of the database, build a post-project management system, and ensure technology transfer," Simple and easy-to-maintain software tailored to the operational situation of Vietnamese side was developed for the new PMS[8]. In Phase II, based on the lessons learned from Phase I that "the implementing agency should sustain project activities and outcomes with ownership," working

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[8] For example, while the PMS dataset requires a minimum of 159 data entries in WB's HDM-4, the data required for new PMS dataset has become simplified to 61 items mainly from four types of data: 1) road inventory data, 2) pavement condition data, 3) traffic volume data, and 4) road maintenance history data. It reduced the burden on road administrators. In addition, Kono (2012) pointed out that the new PMS has been customized to enable budget plans, annual repair plans, deterioration predictions, and ex-post evaluations of repairs as outputs. (Kono Hirotaka, "De fact standardization strategy for social capital asset management for Asian countries" (Asiashokoku wo taisho toshita shakai shihon asset management no de-facto hyojunka senryaku), paper presented in Japanese at the 2012 National Land Technology Study Group.

groups were established for each output, and Japanese experts and Vietnamese counterparts co-worked closely. It fostered ownership and led to the establishment of outcomes.

On the other hand, the setting of indicators was not appropriate, such as setting indicators for the project purpose that would produce effects after the project completion[9], or proceeding the project without setting target value for overall goal. However, it cannot be said that there was a serious problem.

Therefore, it can be said that the project plan and approach were appropriate.

3.1.2 Coherence (Rating: ③)

3.1.2.1 Consistency with Japan's ODA Policy

The Country Assistance Program (2009) at the time of planning of Phase I listed promotion of economic growth and enhancement of international competitiveness as one of priority issues. In order to deal with this issue, it was stated that assistance would be provided for the development of transportation infrastructure and strengthening capacity of operation and maintenance. In the Country Assistance Policy (December 2012) at the time of planning of Phase II, "human resource development and quality assurance related to the operation and maintenance of increasing transportation infrastructure assets" was listed as one of the issues to be addressed to the priority area of "growth and strengthening competitiveness." JICA Country Analytical Paper for Viet Nam (March 2014) stipulates that the basic policy of the "main transport infrastructure development" program is to integrally implement operation and maintenance and soft aspects of cooperation such as institutional development.

Therefore, the project was consistent with Japan's development cooperation policy at the time of planning.

3.1.2.2 Internal Coherence

There was a collaboration with the "Project for Strengthening Operation and Maintenance System for Expressway in Vietnam" (2012-2013). In response to a request from the implementing agency during Phase II, the manual formulated by that project was modified into a PMS-compatible manual. As a result, a concrete collaborative effect was confirmed, in which maintenance plans can be formulated using PMS not only for national roads but also for expressways.

3.1.2.3 External Coherence

The PMS developed in the project is based on the pavement deterioration prediction model developed by Kyoto University (hereinafter referrer do as "Kyoto Model"), and was developed in collaboration with Kyoto University, University of Transport and

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[9] For details, refer to "3.2.1.2 Achievement of Project Purpose."

Communications (UTC) in Viet Nam and this project. Kyoto University has been cooperating with UTC to conduct educational and research activities related to road asset management since before the planning of Phase I. The Kyoto Model was introduced to the implementing agency, Viet Nam's Ministry of Transport, engineers of private companies, etc. through such as summer schools and seminars. In collaboration with the JICA Viet Nam Office, Kyoto University conducted a trial operation of the Kyoto Model using 2007 road data. After that, repeated technical discussions with JICA led to the development of a Vietnamese version of the PMS using the Kyoto Model in this project, confirming the concrete effects of collaboration.

In addition, prior to the commencement of Phase II, the efforts were made to coordinate with the WB supported VRAMP [10], which aims to build a comprehensive road asset management system[11], so that there would be no overlap in the contents of the two projects. During the project period, close cooperation and coordination were carried out such as by setting up a working group and sharing information. Support for road maintenance and management was implemented in a mutually complementary manner and concrete collaborative effects were confirmed. Thus, external coherence was recognized. (see "3.2.2.2 Other Positive and Negative Impacts").

The implementation of this project is consistent with Viet Nam's development policy and development needs, and the project plan and approach were appropriate. It is also consistent with Japan's development cooperation policy, confirming internal and external coherence. Therefore, its relevance and coherence are high.

3.2 Effectiveness and Impacts[12] (Rating: ③)

3.2.1 Effectiveness

3.2.1.1 Project Output

(1) Phase I

Table 1 shows the achievement of outputs at the time of completion of Phase I. Among four outputs, Output 1 was mostly achieved but other outputs were achieved. Regarding Output 1, after developing the new database system, existing data was supposed to be utilized. However, there was a lot of missing or inconsistent data and the project had to re-acquire new data. It was not possible to sufficiently acquire technical skills related to operation using actual data.

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[10] VRAMP consists of four components (A: Road Asset Management, B: Road Network Maintenance, C: Road Asset Improvement, D: Institutional Strengthening). Especially for Component A "Road Asset Management," the road database developed in Phase I of this project was utilized to collect and input road data.

[11] To achieve the maintenance plan for the purpose of extending the life of assets and minimizing life cycle costs by properly grasping the current status of road assets, predicting asset deterioration and damage, and carrying out repairs and reinforcements at the appropriate time. (https://www.jica.go.jp/activities/issues/transport/ramp/index.html)

[12] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

Table 1: Achievement of Project Outputs (Phase I)

Output	Actual
Output 1: Enhancement of capacity for road information management	**Mostly Achieved** 1) A new database system was developed and started operation. 2) Although the skills were acquired on how to input the data and manipulation of database, due to the problem of data inadequacy, the database had not yet been used for routine maintenance. 3) Relevant guidelines were formulated and the trainings were carried out as planned. 4) At least one employee who can be a training instructor was developed.
Output 2: Enhancement of planning capacity for road maintenance	**Achieved** 1) A new PMS was developed. Annual and Medium-term maintenance plans utilizing PMS were developed in the pilot area. 2) Seven training courses were conducted on pavement condition survey, PMS data, and road maintenance plan. A total of 117 people attended the courses.
Output 3: Enhancement of road maintenance technologies	**Achieved** 1) OJT was conducted using the developed Road Facility Inspection Guideline and Road Routine Maintenance Manual. They were used for daily activities. 2) Pavement Monitoring System (PMoS) was developed and its operation method was learned through training. 3) Relevant training courses were conducted for a total of 222 people. 4) At least one employee who can be a training instructor was developed.
Output 4: Reinforcement of DRVN institutional issues on road maintenance management	**Achieved** 1) Roles of relevant departments of DRVN HQs and RMB were clarified. 2) Recommendations were made to strengthen the maintenance system based on review of existing relevant laws and regulations.

Source: Information provided by JICA, Questionnaire results from the implementing agency and implementing consultant

(2) Phase II

Table 2 shows the achievement of outputs at the completion time of Phase II. All five outputs were achieved.

Table 2: Achievement of Project Outputs (Phase II)

Output	Actual
Output 1: PMS data development technology is improved.	**Achieved** 1) Road database set required for PMS[13] was completed and became available for utilization for officers at the regional level.
Output 2: PMS is upgraded and applied to the planning of trial pavement repair works.	**Achieved** 1) PMS developed in Phase I was improved by being online. 2) Annual and Medium-term plans were developed in all four RMBs.
Output 3: Technical specifications for inspecting road facility and selecting repair work are developed.	**Achieved** 1) A guideline and manuals[14] were prepared to provide local engineers with basic techniques for road maintenance.

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[13] Road inventory database, Maintenance history database, Traffic volume database and Road administration database

[14] Road Facility Inspection Guideline, Road Routine maintenance Manual and Expressway Maintenance Manual

Output 4: Responsibility assignment and administration procedure are clarified for road maintenance.	**Achieved** 1) Recommendations were made regarding the methods of implementing, sharing of responsibilities, and the improvement of administrative procedures of Output 1 to 3 of this project. DRVN formulated an action plan based on the recommendations.
Output 5: Training implementation and public relations are reinforced.	**Achieved** 1) PMS training was conducted five times each at the four RMBs. 2) An annual road maintenance plan was prepared. A system was developed for private companies to register their road maintenance technologies on the DRVN web page.

Source: Information provided by JICA, Questionnaire results from the implementing agency and implementing consultant

3.2.1.2 Achievement of Project Purpose

(1) Achievement of Project Purpose of Phase I

The set indicators (1) and (2) were indicators for effects that would emerge after the completion of the project, not indicators for measuring the degree of achievement of the project purpose. Therefore, for indicator (1), whether a new PMS and a new road database have been developed and whether actual data has been input; for indicator (2), whether road maintenance skills had improved through OJT using developed manuals on road maintenance management skills, were confirmed through questionnaires to the implementing agency and interviews with the implementing consultant.

As a result, except indicator (1), other indicators were achieved as shown in Table 3. Thus, it can be judged that the project purpose of Phase I was mostly achieved.

Table 3: Achievement of Project Purpose (Phase I)

Project Purpose	Indicator	Actual
1. Road maintenance institution in the target region is enhanced. 2. Dissemination system of the output of the project across the country is developed.	(1) New PMS and new road database are continuously operated and updated after the project completion. → New PMS and new road database are developed and actual data is entered into them. (Alternative)	**Mostly Achieved** It took longer than expected to enter the data into the database required to operate the new PMS. It was, therefore, not possible to spend enough time on the operation using the actual data. However, the initial base of new road database and the new PMS have been developed. It can be said that certain outcomes have been achieved.
	(2) Standard of road maintenance technology enhanced by OJTs is maintained. → Technical capacity on road maintenance is enhanced through OJTs utilizing developed manuals of road maintenance. (Alternative)	**Achieved** Training and OJT were conducted using the guideline and manuals for road maintenance developed in Output 3, including the PMS user manual. It can be said from the achievement status of Outputs 1 to 3 that road maintenance technology has improved.
	(3) Staff allocation and training program are established for nationwide deployment of project output under the pilot area.	**Achieved** Through this project, staff who can develop training programs and become instructors for nationwide expansion were fostered.

Source: Information provided by JICA, Questionnaire results from the implementing agency and interview results from the implementing consultant

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(2) Achievement of Project Purpose of Phase II

In Phase II, three indicators of project purpose were achieved as shown in Table 4. Five outputs were also achieved. Therefore, it can be said that project purpose of Phase II was achieved.

Table 4: Achievement of Project Purpose (Phase II)

Project Purpose	Indicator	Actual
Implementation capacity for road maintenance is strengthened in Viet Nam	(1) Trial pavement repair work plan using PMS is formulated in RMB I, II, III and IV.	**Achieved** Draft road maintenance plans using PMS were formulated in each RMB during the project period. Through this exercise, it can be thought that RMB engineers understood the formulation method and meaning of the plans.
	(2) Primary rules for road facility inspection, maintenance and repair work are formulated (target facilities, frequency, methods, diagnosis, selection method for repair works, repair wok and construction management).	**Achieved** Based on the developed "Road Facility Inspection Guideline" and "Road Maintenance Manual," DRVN itself clarified the fundamental but important rules and created a new "Procedure Manual of Road Management, Operation and Maintenance." The created manual was officially issued by DRVN Decision in December 2017.
	(3) Implementation structure for road maintenance is established.	**Achieved** Based on the recommendations made in Output 4, DRVN reviewed organizational responsibility sharing and maintenance procedures.

Source: Information provided by JICA, Questionnaire results from the implementing agency and interview results from the implementing consultant

Through Phase I activities, a road database format and input system were constructed (Output 1), and a Vietnamese version of the PMS adapted to the actual situation in Viet Nam was developed (Output 2). In addition, technical standards such as road facility inspection guideline and road routine maintenance manual were prepared (Output 3), and by reviewing existing laws and regulations, roles and responsibilities of maintenance-related organizations were clarified (Output 4). For each output, training was conducted for the staff of the implementing agency to strengthen their capacity. Of the four outputs, Output 1 was mostly achieved and the rest were achieved. The four outputs formed the initial basis for the new road database and new PMS system, improved the road maintenance system in the pilot area, and contributed to the establishment of a system to deploy the results of the pilot area nationwide (Project purpose of Phase I).

In Phase II, through activities to establish the developed PMS nationwide, improvements were made such as making the PMS online so that it can be used by all RMBs (Output 1), the annual and medium-term maintenance plans utilizing PMS were drafted by each RMB (Output 2). In addition, the technical standards formulated in Phase I were improved (Output 3), and the rules and regulations related to the implementation of Outputs 1 to 3 were reviewed and an

improvement plan was proposed (Output 4). Furthermore, training and public relations functions were strengthened (Output 5). As a result, the project contributed to improving the road maintenance capacity of the implementing agency (Project purpose of Phase II).

The project purpose of Phase I was mostly achieved, and that of Phase II was achieved. Therefore, the project purpose was achieved.

3.2.2 Impacts

3.2.2.1 Achievement of Overall Goal

As shown in Figure 1, Phase I is the basis for the achievement of Phase II. Since the direction of the two projects is the same, the overall goal was evaluated using the overall goal of Phase II. However, the target values were not set in the indicator and the implementing agency has not obtained the data for the indicator. Therefore, the situation at the time of the ex-post evaluation was confirmed from the three perspectives in Table 5 as alternative indicators.

Table 5: Achievement of Overall Goal

Overall Goal	Indicator	Actual
Road maintenance is conducted properly based on medium-term plan, following PDCA cycle. Original Indicator: The indicators for pavement damage (IRI, cracks, rutting, etc.) will be improved X%.	(1) Utilization status of PMS and road database, and update status of data (Alternative)	**Mostly Achieved** ・ Some of the data collection and data update required for PMS have been taken over by VRAMP, and the road database has been updated. However, due to the limitation of budget, not all national roads have been covered. However, the collected data has been input into the PMS by each RMB, and been shared between the headquarters and the RMB using the online PMS.
	(2) Implementation status of pavement condition survey (Alternative)	**Mostly Achieved** ・ Pavement condition surveys were conducted on approximately 25,000 km of national roads under the jurisdiction of RMB in four regions and part of expressways. ・ Conducting pavement condition surveys has become an official task of DRVN, but it cannot be done every year due to the enormous cost and time involved in carrying out 25,000 km with two vehicles. It is scheduled to be implemented once every 3 to 5 years. ・ After this project, it was updated once by VRAMP in December 2020.
	(3) Formulation status of annual and medium-term maintenance plans utilizing PMS (Alternative)	**Partially Achieved** ・ The annual maintenance plan has been prepared almost from the expert point of view of engineers. ・ In the medium-term maintenance plan, the PMS data was treated as a reference value, and the final adjustment and formulation were made from the expert point of view of the engineers.

Source: Questionnaire results from the implementing agency and interview results from the implementing consultant

WB supported VRAMP has taken over the results of this project, partially updating the road data, and inputting the data into the PMS developed by this project by each RMB (Indicator (1)). Pavement condition surveys were also conducted by VRAMP recently in December 2020 on approximately 25,000 km of national roads under the jurisdiction of four RMBs and part of expressways. It was confirmed that the online PMS has been used to grasp road conditions and utilized for road maintenance (Indicator (2)). On the other hand, although PMS data was referred to in formulating medium-term maintenance plans, the plans were actually formulated from a technical point of view by engineers. The reason is that due to the limited budget for pavement condition surveys, it is not possible to conduct them frequently, and some of the data in the PMS has not been updated or is incomplete due to missing data. However, the implementing agency pointed out that data inputted into the PMS such as pavement conditions, repair history, traffic volume, etc., were very effective in formulating plans. In addition, they stressed that the accuracy of the medium-term maintenance plan was significantly improved compared to before the project by referring to the data calculated from the PMS, combined with the technical perspective.

Thus, the project has achieved its overall goal only to a certain extent compared to the plan.

3.2.2.2 Other Positive and Negative Impacts
1) Impacts on the Natural Environment

This project was classified as Category C based on the JICA Guidelines for the Confirmation of Environmental and Social Considerations (April 2010) as it was judged to have minimal negative impacts on the environment. No negative impacts were confirmed by the implementing agency and implementing consultant.

2) Resettlement and Land Acquisition

There was no resettlement or land acquisition for this project.

3) Gender Equality, Marginalized People, Social Systems and Norms, Human Well-being and Human Rights, and Unintended Positive/Negative Impacts

<Coordination Effects with VRAMP>

As described in "3.1.2.3 External Coherence," the project has been collaborating with VRAMP since the planning of Phase II and clarified the division of roles for each other. During the project implementation, a coordination committee and working groups were established for each related field to share information. Through such collaboration, for example, one pavement condition survey vehicle was purchased with the VRAMP budget after the

completion of Phase II, contributing to the efficient implementation of pavement condition surveys. In order to update the PMS data set, VRAMP has collected road information, input data as well as conducted training on road maintenance including PMS. In the training, training materials were prepared based on the manuals on road maintenance developed by this project. Therefore, synergistic effects were confirmed, such as the effect of this project being passed on to VRAMP, and the increasing opportunities to implement the effect of this project, which has become established in the implementing agency.

<Establishment of human network with Kyoto University and UTC>

The cooperative relationship with Kyoto University and UTC, which collaborated in PMS development, was maintained even at the time of the ex-post evaluation. A system was established to receive support in case of technical problems or consultations. It can be said that this project established a strong human network to ensure the sustainability of PMS.

<Institutional Impacts>

According to the questionnaire results of the implementing agency, it was confirmed that the results of the review in this project (Output 4 of Phase I and Phase II) became important inputs and references when formulating and revising important laws and regulations related to road maintenance. For example, the results of review were utilized when formulating a decision on Comprehensive innovation for management and maintenance of national highway network to clarify the rules on road maintenance (Decision No.538/QD-BGTVT (2013)), and when revising Quality control and maintenance of construction works (Decree No.46/2015/ND-CP (2015)), Regulations on the management, use and exploitation of road traffic infrastructure assets (Decree No.33/2019/ND -CP (2019)) and others.

Through the implementation of this project, the implementation capacity of the implementing agency for road maintenance has been improved, which was set as the project purpose. Although it has not reached the stage of formulating a medium-term plan that fully utilizes the PMS, road information collection and inputting them into the PMS have been carried out in order to utilize the PMS to a certain extent. It was confirmed that the project contributed to the maintenance work based on the PDCA cycle, which is the overall goal, to a certain extent, and the effects were largely realized as planned. In addition, the collaboration effects with VRAMP, Kyoto University, and UTC and the institutional impacts were also observed. No negative impacts were observed. In light of the above, the effectiveness and impacts of the project are high.

3.3 Efficiency (Rating: ③)

3.3.1 Inputs

Table 6: Plan and Actual of Inputs

Inputs	Phase I		Phase II	
	Plan	Actual (Completion time)	Plan	Actual (Completion time)
(1) Experts	Long-term: 1 expert (36 MM) Short-Term (110 MM)	Long-term: 1 expert (36 MM) Short-Term: 13 experts (100 MM)	Long-term: 1 expert (36 MM) Short-Term: 13 experts (138 MM)	Long-term: 1 expert (36 MM) Short-Term: 14 experts (138 MM)
(2) Trainees received	Not mentioned	13 persons (2 times)	3 times	25 persons (3 times)
(3) Equipment	Equipment for pavement condition survey, PC	Pavement condition survey with equipment, PC, Copy machine	Equipment and materials for pavement repair works, PC	Equipment and materials for pavement repair works, PC, Application server, Database server, Training equipment
(4) Local Expenses	Not mentioned	12 million yen	Not mentioned	6 million yen
Japanese Side Total Project Cost	415 million yen	465 million yen	470 million yen	605 million yen
Vietnamese Side Total Project Cost	Project operation costs	843 million VND (About 3.6 million yen[15]) Costs for consultant, pilot repair works, and pavement condition survey	Costs for pilot repair works and pavement condition survey	Costs for pilot repair works, pavement condition survey, and training participation

*MM stands for man months
Source: Information provided by JICA

3.3.1.1 Elements of Inputs

Table 6 above shows the inputs of the project. In Phase I, the plan was to provide pavement condition survey equipment, but in actuality it was provided together with the vehicle. In Phase II, based on the lessons learned in Phase I, the implementing agency secured a project office space near the DRVN headquarters, allocated counterpart officers, formed working groups for each outcome, and maintained close communication with Japanese experts. Especially, regarding PMS a system was established to act proactively by allocating staff in charge of PMS system to each RMB, Road Technical Center (RTC), and Sub-Bureau. Efficient input was also made. According to the implementing consultant, prompt arrangements by the implementing agency for importing equipment and machinery for Phase II pilot construction shortened the period by two months, contributing to the smooth implementation of the pilot construction.

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[15] The exchange rate is calculated from the IMF/IFS average from 2012 to 2013 (1 VND = 0.0043 yen).

3.3.1.2 Project Costs

In Phase I, the actual project cost was 465 million yen compared to the planned cost of 415 million yen, slightly exceeding the plan (112% of the plan.) The increase in the amount was due to the increase in expenses for OJT and long-term expert because of the extension of the period, and the addition of a training in Japan. To the planned value for Phase I, the following costs were added before the comparison: the cost of the pavement condition vehicle with necessary equipment, which was re-estimated during the project period after the specifications were finalized in consideration of the road conditions in Viet Nam; and the country specific training costs, which could not be estimated due to lack of data at the planning. In Phase II, the actual cost was 605 million yen compared to the planned cost of 470 million yen, exceeding the plan (128% of the plan).

The total project cost for both phases was 121% of the plan, slightly exceeding the plan.

3.3.1.3 Project Period

The project period of Phase I was 34 months compared to the planned period of 31 months, slightly exceeding the plan (109% of the plan). Due to the inadequacy of existing data, the development of database and PMS was delayed and the OJT period could not be secured sufficiently. The project responded by implementing a three-month extension. The project period of Phase II was 39 months compared to the planned period of 38 months, slightly exceeding the plan (102% of the plan).

Combining the two phases, the project period was 73 months compared to the planed period of 69 months, slightly exceeding the plan (106% of the plan).

Therefore, although both the project cost and project period slightly exceeded the plan, efficiency of the project is high.

3.4 Sustainability (Rating: ②)

3.4.1 Policy and System

In the *Socio-Economic Development Strategy* (2021-2030) that was effective at the time of the ex-post evaluation, comprehensive infrastructure development is positioned as one of the three strategic breakthroughs for economic development. It also emphasizes the importance of infrastructure development as the most effective means of stimulating post-pandemic economic recovery and economic growth[16], and among other things, advocates the promotion of transport infrastructure construction[17]. The master plan on the road network

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[16] Strategic breakthroughs indicate the three directions of "socialist-oriented market economy," "development of human capital," and "infrastructure construction," which will be emphasized in order to innovate the growth model. (IDE-JETRO Web page (in Japanese): https://www.ide.go.jp/Japanese/IDEsquare/Eyes/2021/ISQ202120_019.html)

[17] VIETO JO Web page: https://www.viet-jo.com/news/economy/210723081844.html

(2021-2030) places emphasis on improving road database and upgrading and using software to help formulate road maintenance plans. In regard to the pavement condition survey, it is positioned as an official task of DRVN. Based on the above, no major problems were found in the policy and systems related to this project.

3.4.2 Institutional/Organizational Aspect

There have been no major changes in the roles of road maintenance from the time of planning. The Planning and Investment Department of DRVN is in charge of general management of PMS, formulation of annual and medium-term maintenance plans, and support for formulation of plans by RMB. The Maintenance Department is in charge of collecting and updating road data. The Science, Technology, Environment and International Cooperation Department is in charge of managing PMS software development through outsourcing. The implementation of the pavement condition survey and the management of the pavement condition survey vehicle are carried out by the RTC and supervised by the responsible RMB. RMB formulates annual and medium-term maintenance plans for the areas under its jurisdiction and reports them to the Planning and Investment Department.

According to the questionnaire responses from the implementing agency, there were 22 engineers in charge of maintenance at the DRVN headquarters, and about 100 of the 120-130 staff at each RMB are engineers. The required number of staff was generally filled, and there have been no problems related to operation and maintenance due to staff shortages.

In light of the above, no major problems were found in terms of the institutional/organizational aspect.

3.4.3 Technical Aspect

It was confirmed that the technical outputs of this project, such as collection of road data related to maintenance, input to the database, operation of PMS, and implementation of inspections and repairs using guidelines and manuals on road maintenance, were maintained. It was also confirmed that each RMB was conducting maintenance in accordance with the guidelines and manuals formulated in this project. In addition, as mentioned above, the training materials of the VRAMP's training were developed based on the manuals of this project, which ensures the sustainability of the technology of this project. Furthermore, if a problem arises, technical advice can be obtained from the human network built by this project with Kyoto University, UTC, and the implementing consultant. The pavement condition survey was conducted using the vehicle procured under this project, and it was confirmed that there were no technical problems with the survey.

In light of the above, no major problems were found in the technical aspects of maintenance.

3.4.4 Financial Aspect

In order to implement the PDCA cycle of maintenance and ensure the sustainability of the project, mainly 1) expenses for collecting and updating road information including implementation of pavement condition surveys, 2) maintenance costs for PMS system and pavement condition survey vehicles, 3) road repair and maintenance costs, and 4) training costs are required.

1) Expenses for collecting and updating road information

It is planned to conduct pavement condition survey by every 3 to 5 years because it requires a large amount of money. In fact, according to the implementing agency, it was confirmed that a certain amount of budget has been secured since they are planning to conduct the survey with existing two vehicles in FY2003 after the implementation by VRAMP in FY2020. However, according to the results of questionnaires and interviews with the implementing agency, in order to maximize the operation of PMS and formulate annual and medium-term plans, it is necessary to collect the latest data including new routes by conducting a pavement condition survey once a year, screen and input data. In addition to the collection of road data through such periodic pavement condition surveys, there remains the issue of survey costs for collecting repair history and traffic volume data.

2) Maintenance costs for PMS system and pavement condition survey vehicle

The operating and maintenance costs for the PMS and pavement condition survey vehicle were secured by the implementing agency. There were no problems due to insufficient funds.

3) Road repair and maintenance costs

Overall, the budget for the repairs and maintenance carried out by the RMB was not sufficiently secured. According to the implementing agency, maintenance costs to the RMB are distributed according to the distance of the roads under their jurisdiction[18]. Each RMB places priority on ensuring safety and smooth pavement, and carries out maintenance work within a limited budget. As shown in Table 7, the budget remains at 40% to 60% of the requested amount, except for RMB I. Insufficient budget for repair and maintenance costs leads to the inability to ensure the effectiveness of the plan using PMS, which did not lead to effective utilization of PMS.

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[18] According to the implementing agency, the average repair costs are 230-250 million VND (approximately 1.36 - 1.46 million yen, 1 VND=0.006 yen) per kilometer. The maintenance costs are determined by the specification unit price of each route.

Table 7: Road Maintenance Budget for each RMB (2019 – 2021)

(Unit: billion VND)

RMB I	2019	2020	2021
Budget Request	855	735	607
Allocation	670 (78%)	711 (96%)	607 (100%)
Expenditure	670	711	607

RMB II	2019	2020	2021
Budget Request	2018	2160	2163
Allocation	961 (45%)	700 (32%)	935 (43%)
Expenditure	961	700	607

RMB III	2019	2020	2021
Budget Request	1080	1087	1111
Allocation	660 (61%)	553 (51%)	747 (67%)
Expenditure	660	553	747

RMB IV	2019	2020	2021
Budget Request	1610	1045	1294
Allocation	973 (60%)	611 (58%)	792 (61%)
Expenditure	973	611	792

Source: Questionnaire results from the implementing agency

4) Training costs

Although the training necessary for road maintenance is mainly done by OJT, it was confirmed that a certain amount of training costs was secured.

In light of the above, some issues have been observed in terms of financial aspect.

3.4.5 Environmental and Social Aspect

As a result of confirming with the implementing agency, there were no unforeseen issues related to environmental and social consideration.

3.4.6 Preventative Measures to Risks

Due to the influence of the coronavirus, measures were taken to minimize the impacts, such as conducting some training online and adjusting the timing of the pavement condition survey.

3.4.7 Status of Operation and Maintenance

The PMS system was properly maintained and operated without any problems at the time of the ex-post evaluation. There were no major problems with maintenance for the pavement condition survey vehicle.

In light of the above, some minor issues have been observed in terms of the financial aspects in order to sustain the effects of this project. They are not expected to be improved/resolved in the near future. Therefore, sustainability of the project effects is moderately low.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of this project was to strengthen the implementation capacity of the implementing agency for road maintenance of the national roads network through two phases of technical cooperation projects. It was envisioned that the objective was achieved by developing a PMS specially adapted to Viet Nam's operation method, by improving and applying it, and by supporting the construction of a system for improvement, formulation, and implementation of technical standards and institution. As a result, based on the medium-term maintenance plan, it was expected that appropriate road maintenance would be implemented along with the PDCA cycle management. The objective of the project was consistent with the development policies and needs of the country and the project plan and approach was appropriate. The project was consistent with the development cooperation policy of Japan. It also collaborated with other projects of JICA and with other organizations such as WB, and concrete results have been confirmed. Therefore, relevance and coherence are high. Through implementation of the project, improvement of the implementing capacity of the implementing agency for road maintenance, which was set as the project purpose, was achieved. In addition, the project has contributed to the overall goal of maintenance work based on the PDCA cycle to a certain extent. The project results have been largely achieved as planned, therefore, the effectiveness and impacts of the project are high. Efficiency is high as the project cost and period slightly exceeded the plan. Sustainability of the effects of the project is moderately low since there are some minor financial issues and they are not expected to be improved/resolved in the near future.

In light of the above, this project is evaluated to be satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

The main reason why PMS was not fully utilized when formulating annual and medium-term maintenance plans was that the budget for collecting data to be input into PMS was not sufficiently allocated. To make PMS a more effective tool for planning, it is recommended to devote resources to survey.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

In order to realize appropriate road maintenance, it is essential to cooperate with other related donors and to continuously encourage the implementing agency and relevant ministries even after the project is completed.

The project dealt with the development of PMS, a system necessary for formulating plans for efficient and effective road maintenance, and provision of technical assistance to utilize it, as well as institutional building. A certain level of effect was confirmed through this project, such as the accuracy of the maintenance plans being improved compared to before the project. This is partly due to the fact that strategic cooperation with VRAMP has increased opportunities to put the results of this project into practice even after the project, and the effects of the project have been established to a certain extent. However, due to the lack of frequent data collection and updates because of limited finances, it is not possible to formulate a plan that makes the most use of PMS. Therefore, the ultimate goal of proper maintenance work has not been achieved. Appropriate implementation of the PDCA cycle for road maintenance cannot be accomplished solely through the implementation of this project, which mainly supported the development of systems such as PMS. Based on a comprehensive strategy for implementing appropriate road maintenance, it is important to clarify the roles of individual projects, cooperate with other related donors and to continuously encourage the implementing agency and related ministries to consider the need for securing finance and merits of using the system (implementation of maintenance based on a highly accurate plan is economical as a result) not only during the project period but also after the project. In cases where the implementing agency has formulated the action plans after the completion of the project, as in this project, follow-up by the JICA office with the implementing agency will serve as a tool for such encouragement.

5. Non-Score Criteria

5.1 Performance

5.1.1 Objective Perspective

None.

5.2 Additionality

As additionality of this project, it can be raised that improvement of human resources, equipment, technology, and capacity was promoted through industry-government-academia collaboration, including related projects and exchanges between universities.

As for PMS, HDM-4 and RosyBASE have been established as international standard systems. According to Han et al. (2009) [19], many developing countries have introduced HDM-4 as a condition for receiving infrastructure loans from WB. In fact, various versions have been used in more than 100 countries and regions[20]. However, there have been few reports of successful

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[19] HAN, Daeseok, Kiyoshi Kobayshi, and Myungsik Do. "Improved Calibration for HDM-4 Implementation: A Lesson from Korean Experience," Journal of JSCE, Vol 4, 2009
（http://library.jsce.or.jp/jsce/open/00039/200911_no40/pdf/84.pdf）
[20] Fujiwara Eigo, et al. "Issues of Pavement Management System and Measures to Improve Practicality" (Hoso

operation[21]. According to THAO et al. (2015) [22], since HDM-4 was first introduced as a PMS in Viet Nam in 1988, by 2006, six trials were conducted by WB and ADB. However, due to the large amount of data required (for example, 159 data items for one road section must be manually entered into the dataset) and the high skills required to use the software, it was not possible for DRVN staff to manipulate them themselves. Under such circumstances, DRVN requested JICA to develop PMS software that can be used relatively easily by their staff. Then, this project was realized.

On the other hand, the international standard system was a "black box" (the internal structure is unknown and cannot be improved), and the inability to adjust according to the circumstances of each country has been viewed as a problem [23]. At the international seminar on the implementation of road asset management in Asia held in Malaysia in 2009, it was emphasized that the standard system could not respond to the circumstances of each country because the method of asset management is completely different depending on the situation of each country[24]. Many participating countries agreed that future road asset management systems should be developed to be user-friendly, practical and effective. Against this background, in Japan, Kyoto University has conducted research on new PMS, and the "Kyoto Model" has been developed. The reason why this project has successfully developed the PMS customized for Viet Nam based on the "Kyoto Model" was because there were voluntary efforts of Japanese researchers to develop human resources on the Vietnamese side as an added value. Kyoto University and UTC had an agreement even before Phase I of this project was planned, and Kyoto University has been conducting annual training on road maintenance and asset management for UTC staff and students. Among participants, there were DRVN staff as well in the training. In addition, during the project period, Japanese researchers participated in the project's training as instructors, and continued to develop human resources for roads in Viet Nam. Such industry-government-academia collaboration between Japanese researchers, JICA, and the implementing consultant contributed to the smooth implementation of this project. As mentioned above, the relationship with these research institutes and the implementing consultant has continued even at the time of the ex-post evaluation. The introduction of locally customized PMS in Viet Nam has become a pioneering example for the introduction of PMS in other developing countries in the future.

END

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[21] THAO, Nguyen Dinh, Kazuya AOKI, Tsuneo KATO, To Nam TOAN, Kiyoshi KOBAYASHI, Kiyoyuki KAITO "A Practical Process to Introduce a Customized Pavement Management System in Vietnam," Journal of JSCE, Vol.3, 246-258, 2015 (https://www.jstage.jst.go.jp/article/journalofjsce/3/1/3_246/_pdf)

[22] THAO et al. (2015), op. cit.

[23] For example, pointed out in Han et al. (2009), op. cit. and THAO et al. (2015), op. cit.

[24] THAO et al. (2015), op. cit.