Democratic Socialist Republic of Sri Lanka
Road Development Authority

Democratic Socialist Republic of Sri Lanka

Consulting Service for Training in Japan on Capacity Development on Bridge Management

Training Completion Report

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Japan International Cooperation Agency

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Democratic Socialist Republic of Sri Lanka

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Table of Abbreviations

Abbreviation	Official Name
AI	Artificial Intelligence
BM&AU	Bridge Management & Assessment Unit
BMS	Bridge Management System
BRMS	Bridge Repair and Maintenance System
BoQ	Bill of Quantity
CE	Chief Engineer
EE	Executive Engineer
ERD	Department of External Resources
FY	Fiscal Year
HI	Health Index
JICA	Japan International Cooperation Agency
MoF	Ministry of Finance, Sri Lanka
MoTH	Ministry of Transport and Highways
NEXCO	Nippon Expressway Company Limited
RDA	Road Development Authority, Sri Lanka
RTRI	Railway Technical Research Institute, Japan
ToR	Terms of Reference

CHAPTER 1. Description of Consulting Service

1-1 Background of the Consulting Service

There are approximately 4,300 bridges on national roads in Sri Lanka, and the Maintenance, Management & Construction Division (MM&C) of Road Development Authority (RDA) has been carrying out certain bridge maintenance and management works, including inspection, cleaning, and repair works. However, according to the RDA, the bridges on national roads aged 50 years or over accounted for 42% in 2010 and 60% in 2020 of the total and have been deteriorating with time.

Therefore, the Japan International Cooperation Agency (JICA) implemented the Project for Capacity Development on Bridge Management (hereinafter referred to as "the Project") for about 3 years from February 2015 to February 2018 for Sri Lanka, to study and implement effective bridge maintenance and management methods for Sri Lanka, to improve institutional framework and budget allocation planning, and to enhance technical knowledge and skills in bridge maintenance and management. The Project has completed the transfer of basic technical knowledge and skills, including (i) bridge maintenance and management plan development, (ii) bridge management guidelines development, (iii) preparation of bridge inventory manual, inspection manual, bridge diagnosis manual, and bridge repair manual, (iv) Bridge Management System (BMS) development with its user's manuals, and (v) suggestion of organizational structure to support the appropriate bridge management.

However, since the bridge inspection and repair methods that are advanced and complex were out of scope of the Project, some bridges managed by RDA have not been adequately inspected on abutments and piers below the water level. In addition, although bridge repair manual was prepared in the Project, RDA could not implement repairs on bridge piers and abutments, girders and beams, bridge expansion joints, and other bridge components adequately, as the on-the-job training on repair works other than re-painting of steel girders and structural concrete restoration has not been conducted. Thus, there is a need for RDA staff to acquire advanced bridge inspection and repair methods.

Furthermore, in 2021, the "New Bridge Construction Project over the Kelani River" was completed and since then the Golden Gate Kalyani Bridge (New Kelani Bridge) has been in service. This is the first extradosed bridge, steel box girders, and steel piers in Sri Lanka. Therefore, it is necessary for RDA staff to acquire knowledge and skills in inspection, diagnosis, and repair methods for these bridge components to ensure proper bridge maintenance and management.

1-2 Purposes of the Consulting Service

The training goal, objectives, and outputs of this consulting service are described below.

- Training Goal

  To improve and strengthen the capacity on bridge management of Road Development Authority (RDA) and other related authorities.

- Objectives of Consulting Service

  To realize the expected outputs below and achieve the training goal by implementing the scope of this consulting service.

■ Outputs

Output-1: The training participants can explain the concept of bridge management (concept of road asset management).

Output-2: The training participants can explain bridge inspection methods other than visual inspection.

Output-3: The training participants can explain the repair methods for bridge components, including abutments and piers, girders and beams, and bridge expansion joints.

Output-4: The training participants can explain bridge inspection and repair methods for extradosed bridges and steel box girder bridges.

Output-5: The training participants will develop an action plan to improve the bridge maintenance and management situation as well as the training program for bridge engineers involved in bridge management in Sri Lanka and can explain and share the future challenges and plans to be addressed to their organizations.

1-3 Period of the Consulting Service

Approximately 20 months from April 2023 to November 2024

1-4 Scope of the Consulting Service

The consulting service will be to conduct the training in Japan once and organize the online seminar on bridge management in the Fiscal Year 2023 (FY2023) and conduct the training in Japan once on bridge management in the Fiscal Year 2024 (FY2024).

(1) Training in Japan and online seminar on bridge management

(i) Preliminary activities

The training participants will prepare a country report regarding the current situation and future challenges on bridge management in Sri Lanka, including the organizational structure, budget preparation and allocation.

(ii) Training in Japan

Lectures, practices, study tours to bridge sites and relevant facilities, preparation of action plans, discussions, and evaluations related to bridge management will be conducted in Japan. At present, the training in Japan is planned once in each fiscal year for the training participants listed in "(2) Eligible training participants" below. However, the number of trainings in Japan, the number of training participants, and the contents of the training program may be subject to change through consultation between JICA and the Consultant, based on the requests of the Government of Sri Lanka and the situations in Japan and Sri Lanka. The training program will be tailored to local conditions, considering the extradosed bridge and steel box girder bridges of the Golden Gate Kalyani Bridge (New Kelani Bridge) opened to traffic in November 2021.

(iii) Post activities

The training participants will re-examine the effectiveness of the action plan after they return

to Sri Lanka and implement initiatives to improve the bridge management in their organizations. It is expected that such initiatives be conducted by the training participants themselves in their organizations. The Consultant will provide advice and information appropriately if requested by the training participants.

(iv) Online monitoring and seminar

After the training in Japan and review of the action plans implementation in FY2023, the online monitoring and seminar as to the training in Japan in FY2023 will be organized for the training participants listed in "2. Eligible training participants" below.

The online monitoring is to monitor the progress of initiatives of the action plan prepared by each training participant at the end of the training in Japan in FY2023.

The online seminar is to supplement the training program provided in the training in Japan in FY2023. The theme of the seminar will be determined based on the feedback from the questionnaire surveys for the training in Japan and the review of the action plans implementation in FY2023 .

However, based on the requests of the Government of Sri Lanka and the situations in Japan and Sri Lanka, there may be subject to changes in the number of trainings in Japan, number of training participants, and curriculum of the training program through discussions between JICA and the Consultant.

(2) Eligible training participants

Approximately ten (10) administrative officers and engineers from the Bridge Management and Assessment Unit (BM&AU) of Road Development Authority (RDA) under the Ministry of Transport and Highways (MoTH) in Sri Lanka and its regional offices and related authorities will participate in each of the two trainings in Japan.

For the first training in Japan in FY2023, the subject training participants will be mid-level staff members and senior executives who play a central role of bridge inspection and repair works at sites, officials in charge of design and operation of institutional framework for training of bridge engineers, and teachers/ instructors acting as lecturers. As to the second training in Japan in FY2024, the subject training participants will be working-level administrative officers and engineers.

(3) Period of training in Japan

In this consulting service, one training in Japan will be conducted for about two weeks in FY2023 and FY2024 respectively. The training in Japan is scheduled to take place from late August 2023 to early September 2023 in FY2023, and from late May 2024 to early June 2024 in FY2024. However, considering the travel restrictions and limitations of activities caused by the COVID-19 pandemic, as well as the capacity of host institutions in Japan, the timing and period of the training in Japan will be reviewed and determined flexibly.

CHAPTER 2. Approaches for Consulting Service

2-1 Understanding of Present Bridge Management in Sri Lanka

The Consultant understands the present situation of bridge management in Sri Lanka through the experiences of implementation of the Project for Capacity Development on Bridge Management as follows:

(1) Current bridge conditions

From the records of inventory surveys and inspections of 1,392 bridges in three (3) sample provinces of the Western (general area), Central (mountainous area), and Southern (coastal area) Provinces, it was observed that the bridge superstructure types are composed of prestressed concrete girders and beams (PSC), reinforced concrete slabs (RCS), steel girders (Steel), box culverts (Box), arch bridges (Arch), and others, as given in Figure 2-1.

Since the environmental conditions, except in coastal areas, are not particularly severe in Sri Lanka, the major deterioration on bridges observed in Sri Lanka, aside from construction defects, are scouring, surface coating deterioration and corrosion of steel girders, and salt damage in coastal areas, as given in Figure 2-2.

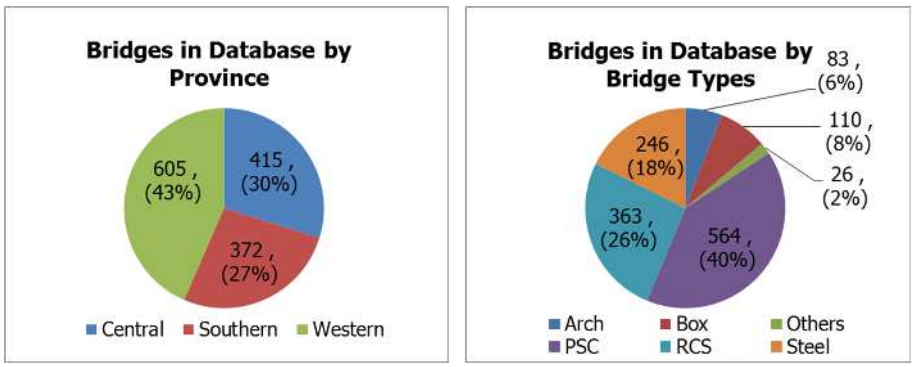


Figure 2-1 Bridge Types in Sri Lanka

Figure 2-2 Major Deterioration of Bridges

The major causes of such deterioration were attributed to sand and mineral mining in upstream reach of the rivers for scouring, inadequate design considerations for corrosion of steel girders and salt damage, and lack of maintenance.

(2) Institutional arrangements on bridge management

The Government of Sri Lanka has pursued a development-oriented policy to promote economic

growth, resulting in the bridge maintenance left behind. As evidence, the bridge maintenance budget allocated by the central government in the past seemed to be insufficient for the actual maintenance needs, partly because the budget was not prepared based on reliable data. In addition, the staff at the RDA Head Office and regional offices lacked technical knowledge and skills on bridge maintenance and did not have the equipment and resources necessary for bridge maintenance.

Furthermore, there were challenges related to the management of bridges. The database needed for management were paper-based and had low reliability in detail written therein. The necessary manuals and standards were also not established adequately as the available bridge maintenance manuals have insufficiency and deficiencies in descriptions.

(3) Activities performed in the Project for Capacity Development on Bridge Management

The Consultant carried out the activities given in Table 2-1 in the Project for Capacity Development on Bridge Management for the period of about 3 years from February 2015 to February 2018.

Table 2-1 Description of Activities in the Project

Activities	Description
Bridge management strategy / plan are prepared.	• Suggestion of bridge management policy and strategy. • Preparation of bridge maintenance and management plan using the developed BMS.
Institutional framework of RDA Head Office and regional offices (PD, CE, EE) on bridge management is re-established.	• Suggestion of organizational structure for bridge management, including allocation of necessary staff in each organization. • Definition and documentation of roles and responsibilities of each organization involved in bridge management. • Documentation of bridge management procedures. • Preparation of reliable bridge management budget for budget request.
Bridge inventory, inspection and diagnosis manuals are revised and developed. Bridge repair manual and bridge management guidelines are developed.	• Preparation of bridge management guidelines. • Preparation of bridge inventory & inspection manual. • Preparation of bridge diagnosis manual. • Preparation of bridge repair manual.
Bridge Management System (BMS) is developed.	• Development of BMS. • OJT related to the operation of BMS.
Basic engineering knowledge of the staff of RDA Head Office and regional offices in sample provinces is enhanced through seminars and OJTs.	• Conduct seminars and workshops related to bridge inspection, diagnosis, and repair. • OJT of bridge inspection (provision of bridge inspection vehicle and pole camera). • OJT of bridge diagnosis. • OJT of repair works **(re-painting of steel girder, structural concrete restoration).** • Training in Japan. • Suggestion of a system for human resource development.

The Consultant provided the following recommendations on bridge management policy and strategy, which were approved by the RDA.

- ❑ Recognize the importance of bridge maintenance and management and continuously implement the bridge management cycle.
- ❑ Work with river administrators to monitor sand and mineral mining in the upstream reach of the rivers to prevent scouring.
- ❑ Provide access to the underneath the bridge to facilitate inspection.

- ❑ Disclose the information on bridge management to seek understanding of bridge management from the public.
- ❑ Develop and implement a human resource development plan to secure human resources engaged in bridge management.
- ❑ Maintain and enhance the motivation of RDA staff engaged in bridge management.
- ❑ Improve the bridge planning and design that should be considered for ease of bridge maintenance as well as construction quality.

2-2 Issues related to Bridge Management

The Consultant recognizes the following issues related to bridge management, based on the (i) background, purpose and objectives of this consulting service as mentioned above, (ii) current situation of bridge management in Sri Lanka, and (iii) activities and outcomes of the Project for Capacity Development on Bridge Management.

Issue-1: Enhance the knowledge and skills on inspection (other than visual inspection), diagnosis, and repair works for bridge components in the water.

Issue-2: Enhance the knowledge and skills of repair methods other than re-painting of steel girders and structural concrete restoration.

Issue-3: Enhance the knowledge and skills on inspection, diagnosis, and repair works for newly completed extradosed and steel box girder bridges in Sri Lanka.

Issue-4: Enhance the knowledge on effective human resource development through industry-government-academia collaboration.

2-3 Approaches for the Consulting Service

The Consultant has developed the basic approaches for the consulting service based on the background, purpose and objectives of the training in Japan, current situation and issues on bridge management in Sri Lanka as follows:

Approach-1 Collaboration with Osaka University

JICA has concluded an agreement with Osaka University specifying the necessary matters for international cooperation to developing countries in collaboration with Osaka University with the aim of contributing to the improvement of quality of international cooperation projects in developing countries and international contribution, as well as to the development of academic research and education. This consulting service is **to support the activities based on the Memorandum of Understanding (MoU) concluded between JICA and Osaka University.**

Therefore, the Consultant will closely coordinate not only with JICA but also with [redacted] at the Department of Civil Engineering, Graduate School of Engineering, Osaka University, on matters relating to the arrangement of lecturers and destinations of study tours, checking the contents of material for lectures, etc.

Approach-2 Close coordination with JICA and training coordinator

The Consultant will refer to the "Guideline for Implementation of Training and Invitation Programs in Japan under Consultant Agreement (April 2022)" and carry out the training in Japan. According to this guideline, the works for training in Japan consist of three types: "prior arrangement work", "supervision work", and "implementation work", and the JICA and the Consultant shall share these works.

The Consultant understands the work share given in Table 2-2 and will implement these works while communicating, coordinating, and consulting with JICA as appropriate to smoothly carry out the training and invitation programs in Japan.

Table 2-2 Work Share of Training Program between JICA and the Consultant

Type of Work	In charge	Descriptions
Prior Arrangement Work	JICA	• Confirmation of Exchange of Notes (E/N) and receipt of application forms. • Arrangement of international air tickets. • Arrangement of visas. • Airport pickup and drop-off on arrival in and departure from Japan. • Arrangement of accommodation in Japan. • Taking out overseas travel insurances. • Arrangement of transportation in Japan. • Provision of various allowances for the training participants.
Supervision Work	JICA	• Leading the training participants. • Brief interpretation for training participants during the training in Japan. • Communication, reporting, and coordination with the training participants and related parties. • Handling of payment of various allowances to the training participants. • Initial response to illness, injury, and other situations of the training participants.
Implementation Work	Consultant	• Selection of training participants for the training in Japan. • Preparation of itinerary and curriculum for training in Japan. • Arrangement of lecturers and interviewees, destinations of study tour and practice, etc. • Preparation of documents (lecture material, reference material) related to the curriculum. • Briefing the training participants before coming to Japan (itinerary, curriculum, accommodation, meal arrangements, etc.). • Arrangement of interpreters (if required). • Arrangement of alternative conference rooms and accommodation when the JICA's training center facilities and accommodation are not available. • Implementation of curriculums (lectures, practices, study tours to the sites and facilities, interviews, etc.). • Preparation of various reports.

The Consultant will communicate and coordinate with the related JICA domestic department and training institution for the development and implementation of the training program and will also provide progress reports. For decisions regarding changes or undecided matters, the Consultant will have consultation with the said department and institution in advance.

The training coordinator assigned by JICA will lead the training participants, provide interpretation, and perform other support tasks during the training in Japan. The Consultant will closely coordinate and confirm all necessary arrangements with the training coordinator as to matters such as the places of destination and meeting time for training curriculums, and other tasks required during lectures and practices. If the training coordinator performs interpretation, the Consultant will provide the training

materials sufficiently in advance to ensure accurate interpretation.

Approach-3 Fostering the training participants' initiatives

The training in Japan aims to enhance the training participants' problem-solving abilities.

However, improving problem-solving abilities cannot be achieved through the training program in Japan alone. To continue implementing the PDCA cycle for solving issues related to bridge management in Sri Lanka after the training in Japan, it is essential for the training participants themselves to take **the initiative** to utilize and practice the outputs of the training in Japan.

To draw out the training participants' initiative, it is believed that "intrinsic motivation" is necessary. The Consultant considers "competence," "autonomy," and "relatedness" as factors that can bring out intrinsic motivation.

The Consultant will foster the training participants' initiative by incorporating the contents given in Table 2-3 into the methodologies.

Table 2-3 What to Do to Foster Training Participants' Initiative

Factor	Outline	What to Do
Competence	To have a self-perception of "I can do it". Success experiences, approval from others, and a feeling of growth are vital factors.	• The group of training participants to be accepted from Sri Lanka should be **balanced with administrative officers, senior staff members, mid-level staff members, and field engineers.** To implement the action plan after returning to Sri Lanka, it is important to establish a relationship where administrative officers assist senior staff members and senior staff members assist mid-level staff members and field engineers, with mutual understanding and approval. • For the training participants to have success experiences, it is important that the results of action plan implementation are reflected in the field, and that the **administrative officers are requested to work to have them reflected in policies/ strategies and institutional framework.** • The Consultant will contribute to the success of the action plan **by conducting monitoring and providing advice and information on the implementation of the action plan**.
Autonomy	To choose freely according to one's own will. It is important to increase opportunities for individuals to think and choose by themselves.	• **The training participants will be asked to organize the issues** they think regarding the present bridge management in Sri Lanka while preparing the country report. • The Consultant will develop the training program to address the issues that the training participants consider.
Relatedness	To have a deep mutual understanding and active communication among related people, as well as a shared recognition of the goal and objectives.	• Before coming to Japan, online explanatory meeting is conducted for **preparation of the country report** to promote active communication and mutual understanding among the training participants and to foster a **mutual understanding of the issues related to bridge management** in Sri Lanka. • It is necessary for the training participants to have an understanding from the organizations they belong to implement the action plan after they return to Sri Lanka. **The administrative officers and senior staff members who participate in the training are asked to reach out to such organizations so that the training participants can implement the action plan with ease.**

Approach-4 Continuous training quality improvement through PDCA cycle implementation

The training in Japan will be conducted once every year for about 2 years in Japan. Through the continuous implementation of the training, lessons learned will be gathered by questionnaire surveys to the training participants as well as evaluation and feedback meetings and utilized the same in the following years to improve the quality of the training.

Approach-5 Utilization of Japan's knowledge on bridge management

The Consultant will identify the technical skills and techniques available in Japan to effectively address the above-mentioned issues in Sri Lanka and select the ones that can be utilized in Sri Lanka and prepare the curriculums for the training in Japan, including the introduction of such advanced skills and techniques that can be utilized in all areas of bridge management in Sri Lanka.

Approach-6 Flexible responses to various constraints

The Consultant will suggest **adjusting the training period or conducting remote training** if it becomes difficult to implement the training in Japan as planned due to travel restrictions between the two countries and limitations of activities in each country caused by COVID-19 pandemics or other factors.

In remote training, **moving images/ videos** will be prepared in advance and used instead of study tours and practices in Japan. In the case of screen sharing of training material and moving images/ videos with the training participants in Sri Lanka during remote training, this constitutes "public transmission" under the copyright law. The Consultant will therefore refer to the "Guideline for Consultant Agreement for Remote Training (March 2022)" and take the following measures.

- If the material created by lecturers are used as training material and translation, adaptation, or video editing of the same are performed, the Consultant will obtain written consent as to the permission to use for such original material, translation, adaptation, or video editing from the original copyright holders.
- If "lecture moving images/ videos" are used instead of training material, the Consultant will confirm the **portrait rights**.
- If a third party creates "derivative works" such as translated texts or moving images/ videos based on the copyrighted material created by lecturers, the copyright of those derivative works belongs to the creators of those derivative works. In this case, the Consultant will request the creators of those derivative works to transfer the copyright of those derivative works to JICA.

Approach-7 Safety measures

The Consultant establishes the following principles for safety during the training in Japan, including travel in Japan, practices at bridge sites, study tours to the sites and related facilities.

- The time schedule will be set with ample time to ensure safety when traveling by train or bus.
- During practices at bridge sites, study tours to sites and related facilities, the training participants are required to wear Personal Protective Equipment (PPE) as needed. PPE includes work clothes, helmets, safety belts, safety vests, and other necessary items.

Furthermore, as a preparation against COVID-19 pandemic, the Consultant will implement necessary precautions such as confirming the vaccination status of the training participants before coming to Japan, daily body temperature checks, encouraging gargling and hand washing, checking their physical condition regularly, and allowing them to take a break if they feel unwell.

Approach-8 Implementation of measures for information security

The Consultant will comply with the JICA's Regulations for Cyber Security Measures (April 2017) and JICA's Implementation Rules for Cyber Security Measures (April 2017) and take appropriate measures to address the matters stipulated therein.

Approach-9 Protection of personal information

The Consultant will appoint an **"administrator for retained personal information"** when handling personal information retained by JICA and shall comply with Article 26 of the Contract Agreement between JICA and the Consultant (hereinafter referred to as "Prime Contract"). After the completion of this consulting service, the Consultant will promptly cease the use of personal information retained, and return to JICA any documents, drawings, photographs, or other media containing personal information retained, or erase the personal information in the media, destroy and dispose of the media in a manner that cannot be restored, and submit a written report (**Information Destruction Report**) to JICA stating that it has been disposed.

Approach-10 Copyright processing

The Consultant shall, in accordance with JICA's "Copyright Guideline for Training and Invitation Programs (2nd edition) (March 2019)", properly and efficiently carry out the (i) confirmation of all necessary tasks for copyright processing at each stage of contract execution for the consulting service for the training in Japan, implementation of the training, and organization of all the copyrights related to the training, and (ii) procedures for obtaining permission for use of material. Additionally, the Consultant shall take necessary measures to prevent troubles with copyrights.

The Consultant understands that all the necessary tasks for copyright processing at each stage of contract execution for the consulting service for the training in Japan, implementation of the training, and organization of all the copyrights related to the training are as indicated in Table 2-4.

Table 2-4 Necessary Tasks for Copyright Processing

Stage	Description of Tasks
Contract Execution	• The Consultant will confirm with JICA the specific workflow of all the necessary tasks for copyright processing during contract execution.
Implementation	• When requesting lectures to lecturers/ lecturer's affiliated institutions, the Consultant will explain the precautions for creating the lecture material and confirm the scope of the permission for use of copyrighted material. • The lecturer is required to obtain permission for use of the third-party's copyrighted material if he/she uses the same to create lecture material and to submit a consent agreement obtained from the said third party. • The copyright of the translation of lecture material prepared at JICA's expense (derivative works) including those commissioned to a translation company or translated by the Consultant himself shall be transferred to JICA upon completion of the translation. When commissioning to a translation company, this shall be included in the contract between the Consultant and the translation company. • The Consultant will check the name of each lecture material, name of the lecturer, and scope of permission for use for each lecture material (copyrighted work). The Consultant shall compile them in a prescribed form and submit the same to JICA prior to the evaluation meeting.

Stage	Description of Tasks
Organization of Copyrighted Material	• The Consultant will confirm the status of the copyright processing (scope of permission for use) of each lecture material (copyrighted work), summarize the same in the list, attach the same to the training completion report, and then submit it to JICA.

2-4 Methodologies for the Consulting Service

The consulting service is scheduled to be carried out for approximately 20 months from April 2023 to November 2024. The methodologies of the consulting service to be provided by the Consultant are described as follows:

[Task-1] Preparation of inception report

The Consultant will prepare and submit the inception report to JICA within 10 working days from the date of the contract execution, in accordance with Article 2 of the Prime Contract.

The inception report is the fundamental document for contract management, outlining the description and methodologies of the agreed-upon tasks between JICA and the Consultant. If there are any changes in the significant matters, the Consultant shall promptly modify the inception report and submit it to JICA for approval.

[Task-2] Study of qualifications for eligible training participants

Task 2-1 Study of qualifications for eligible training participants

The objective of this training in Japan is “to enhance/ strengthen the capacity on bridge management in RDA and related authorities”. Therefore, as stated in Approach-3, the Consultant will suggest selecting a balance of administrative officers, senior executives, mid-level staff members, and field engineers for both the trainings in Japan in FY2023 and FY2024. For the qualification of eligible training participants, the Consultant will suggest the health status, COVID-19 vaccination status, and agreement to comply with "Rules for Preparation of Manuscript (Copyright, etc.)", and those listed in Table 2-5. In addition, the Consultant will suggest including an agreement “to work for RDA and related authorities for at least XX years after the training” as one of the qualifications to ensure the continuous development of institutional capacity of RDA and related authorities.

Table 2-5 Proposed Qualification for Eligible Training Participants

Participants	Proposed Qualification
Administrative Officers	• Individuals who hold positions of responsibility in decision-making and design of institutional framework related to bridge management.
Senior Executives	• Individuals who are the person in charge within organizations related to bridge planning, design, construction supervision, and bridge management.
Mid-level Staff Members & Field Engineers	• Individuals with approximately 10 years of experience in bridge planning, design, construction supervision, and bridge management.
Human Resource Development	• Individuals who are responsible for the design of the institutional framework for human resource development and operation of the same. • Individuals who are capable of being a teacher/ instructor in bridge management.

The Consultant will examine the eligibility of training participants approximately three (3) months before the start of the training and share the results with the in-charge department and domestic training institution.

Task 2-2 Advice on determining the training participants for the training in Japan

JICA's training institution will review the application documents submitted to JICA Sri Lanka Office two (2) months before the start of the training, examine the acceptance or rejection of candidates for the training, and determine the training participants.

The Consultant will provide advice to JICA domestic training institution on determination of acceptance or rejection of training participant candidates.

[Task-3] Study and preparation of detailed training program

Task 3-1 Preparation of detailed training program (draft)

The Consultant will examine the training goal and objectives, required training curriculums, methodologies, lecturers, and time schedules for the training program, and compile the same in Form-1 given in the "Guideline for Implementation of Training and Invitation Programs in Japan under Consultant Agreement (April 2022)" by three (3) months prior to the start of the training in Japan.

Since the situations in Japan and developing countries are significantly different in general, it is essential to convey the experiences of Japan to stimulate the training participants' awareness and encourage the application of such experiences in Sri Lanka. As JICA has accumulated know-how on such effective training, the Consultant will work closely with JICA to develop a training program.

The Consultant will ensure smooth and efficient travel without any unnecessary delays in movement in preparing the detailed training program (draft).

Task 3-2 Consultation with JICA

The Consultant will hold consultation meetings with the in-charge department and domestic training institutions within JICA based on the detailed training program (draft). Because there are certain organizations (especially the government related authorities) that require prior requests through JICA for lectures, study tours to the sites and related facilities, and other training activities as well as having designated departments for accepting training requests, the Consultant will confirm with JICA the organizations necessary for such arrangements during consultation meetings and adjust the time schedule accordingly.

Task 3-3 Finalization of detailed training program

The Consultant will finalize the detailed training program by one (1) month prior to the start of the training in Japan after receiving the results of the above Task 3-2 and below Task 4-1.

[Task-4] Preparation of implementation of training in Japan

Task 4-1 Selection of lecturers and arrangement of sites and facilities for study tour

The Consultant will select and secure lecturers and arrange the sites and related facilities for study tours based on the detailed training program (draft).

The Consultant will make appointments and other arrangements for requests to external organizations.

Task 4-2 Assistance in establishing a system for prior arrangements

The host organizations for the training program proposed by the Consultant may include road/ expressway companies that require a request letter to be sent to the Ministry of Land, Infrastructure, Transport and Tourism (MILT). In this case, it is necessary for JICA to send the MLIT fundamental information regarding the training programs at least 2 months before the start of the training in Japan.

The Consultant will inform JICA of the background, purpose and objectives of the training in Japan, the background and purpose of the requests to the organizations relevant to MLIT for receiving the training participants, overall training schedule (draft), nationality and number of training participants, organizations where the participants belong, and participation of administrative officers.

After receiving a notification from MLIT as to the contact persons and details of the organizations that receive the training participants for lecturers and study tours to sites and facilities, the Consultant will commence coordinating with these organizations.

Task 4-3 Assistance in preparing country report

The Consultant will make use of his experience on the Project for Capacity Development on Bridge Management to assist the training participants to correctly understand the **current situation and issues of the bridge management in Sri Lanka** and prepare the country report, including the changes in bridge management after the said Project.

Each training participant will prepare his/her country report regarding the current issues and challenges in his/her organization. The content of the country report is expected to cover topics such as bridge planning and design in consideration of ease of maintenance, construction quality control to prevent deterioration caused by construction defects, development of bridge maintenance and management plan, implementation status of bridge inspection, diagnosis, and repairs based on bridge maintenance and management plan, budget allocation, institutional framework, and human resource development.

The Consultant will organize an online meeting to provide **guidance** before preparing the country report and will **review the same** for finalization.

[Task-5] Implementation of training in Japan

The Consultant will conduct the training based on the finalized detailed training program, covering the following curriculums. The training will be conducted in English or Japanese through English interpretation.

Task 5-1 Presentation of country report

The Consultant will organize the opportunity for the training participants to present their country reports, which will help the Consultant to understand the current issues and future challenges on bride management in Sri Lanka and enhance the mutual understanding and sharing of the same among the training participants from the different organizations in Sri Lanka.

Task 5-2 Lecture

The Consultant will implement the lectures given in the detailed training program.

The Consultant will use the seminar rooms within JICA's domestic training institution and/or lecture rooms at Osaka University as the training venue by prior consultation.

In preparation of training material, the Consultant will carefully select/ review the material to determine its relevance and narrow down the contents to minimum amount necessary for the lecture. The Consultant will request the preparation of lecture material in Japanese sufficiently in advance to secure ample time for the English translation so that the Consultant can translate into English by himself or commissioning to a translation company.

The lectures will be conducted using audiovisual equipment as necessary to enhance the training participants' understanding.

Task 5-3 Practice

The Consultant will conduct practical trainings as given in the detailed training program for the purpose of providing opportunities for the training participants to implement their knowledge and skills learned from the training and develop practical skills that they can apply in Sri Lanka.

Furthermore, the Consultant will implement the safety measures stated in Approach-7 when conducting practical training.

Task 5-4 Study tour to sites and facilities related to bridge management

The Consultant will arrange to visit the bridges on the road/ expressway in service and related facilities on bridge management, and institutions for training of bridge engineers engaged in bridge management so that the training participants can acquire practical knowledge and skills.

In addition, the Consultant will implement safety measures stated in Approach-7 during the study tours.

Task 5-5 Preparation and presentation of action plans

The action plan outlines the initiatives that should be implemented by each training participant and as an organization, and in a short-term and a mid-to-long term, including the sharing and expansion of knowledge and experiences gained through the training in Japan within their organizations to strengthen the capacity on bridge management in Sri Lanka.

These initiatives are to be at an achievable level, considering prerequisites such as the understanding and support of superiors, budgetary constraints, and other necessary conditions.

The Consultant will provide guidance in preparing the action plans.

After the guidance, the Consultant will support the training participants in preparing and presenting their action plans. The presentation of action plans will be to share the post-training activities of the training participants from each organization, deepen mutual understanding, and conduct discussion and evaluation. This is also expected to contribute to "fostering the training participants' initiatives" as described in Approach-3.

Task 5-6 Feedback meeting

The Consultant will attend the feedback meeting held by JICA after the training in Japan to summarize the training and discuss the improvement plans for subsequent trainings in terms of curriculum, modality of operation of the training, etc.

[Task-6] Schedule adjustment for training supplementary programs

The Consultant will adjust the training program schedule for the training supplementary programs listed in Table 2-6 to be conducted by JICA.

Table 2-6 Training Supplementary Programs

No.	Supplementary Program	Timing	Description
1	Briefing	At the start of the training in Japan	• Briefing on the status of each training participant, how to use cash card and medical card, transportation in Japan, etc., and verification of passport and visa expiration.
2	Program Orientation	At the start of the training in Japan	• Explanation about the training program schedule, goal and objectives, outlines, and precautions.
3	Evaluation Meeting	Before departure	• Hear from the training participants about their views as to the details of the training program and curriculum, etc. to see the effectiveness of the training provided and refer the same as a reference for future trainings. The training participants will be asked to fill out the prescribed questionnaire in advance.
4	Closing Ceremony	Before departure	• JICA will award a "Certificate of Completion" to training participants who have successfully completed the training and have met JICA's criteria for issuance.

[Task-7] Review activity

The Consultant will conduct a review (3) three months after the training participants return to Sri Lanka to confirm the implementation status of the action plans and the horizontal expansion of the training contents in their organizations.

The Consultant believes it is important to participate in the country report and action plan presentations so the issues identified by the training participants can be understood in advance and appropriate reviews can be conducted.

The review will be conducted by distributing a pre-prepared review form (Review Questionnaire Form) to the training participants for their responses, and the Consultant will review the written forms submitted by the training participants and organize the review results.

Task 7-1 Development of review plan

The Consultant will prepare the review plan including the purpose of the review, timing of review implementation, method of review, contents and submission timing of the review results report, Review Questionnaire Form, and submit the same to JICA by two (2) months prior to the review implementation (one (1) month after the training in Japan).

Task 7-2 Implementation of reviews

The Consultant will confirm the following based on the Review Questionnaire Forms submitted by the training participants.

- Activities that have already been completed and the timing of implementation thereof, details of cooperation from the organization, and the effectiveness/ impact of the said activities planned in the action plan.
- Activities that were planned in the action plan but have not been completed yet, constraints thereof, possibility of improvements of the said constraints, and prospects for future activities.
- The status of the horizontal expansion of the knowledge and experience gained from the training in Japan within the organization.
- Activities other than those in the action plan.
- Requests for additional advice and assistance as well as issues raised from the training participants.

In addition, if it is considered desirable to adjust the training contents from the review results, the Consultant will confirm the same including the reasons thereof.

Task 7-3 Preparation and submission of review related reports

The Consultant will compile the results of the reviews into "Review Results Report" and submit it to JICA one (1) month after the review is conducted. Lessons learned from the review will be described as key points of attention on developing the training program in the "Training Progress/ Completion Report" so that such lessons learned can be used in other JICA projects.

The review results will be shared with all training participants via email or teleconference, aiming to provide them with an objective understanding of their individual action plan implementation progress and facilitate the utilization of the results for future initiatives.

[Task-8] Online monitoring and seminar

Task 8-1 Detailed online monitoring and seminar implementation plan

The Consultant will share the review results with training participants and confirm the same online one (1) month after the review activities (called "**Online Monitoring**").

In addition, the Consultant will examine the online seminar curriculum to be conducted one (1) month after the review activities based on the questionnaire survey results and review results.

The detailed online monitoring and seminar implementation plan will be prepared and submitted one (1) month before its implementation, summarizing the implementation details and methodologies of online monitoring as well as the schedule and curriculum of an online seminar.

Task 8-2 Online monitoring

The Consultant will conduct the online monitoring in accordance with the detailed online monitoring and seminar implementation plan prepared in Task 8-1.

Task 8-3 Online seminar

The Consultant will conduct the online seminar in accordance with the detailed online monitoring and seminar implementation plan prepared in Task 8-1.

[Task-9] Public relations activity

For the planning of public relations activity, the Consultant will categorize the target audiences and examine appropriate means of public relations applicable to each target audience based on their respective objectives.

In Sri Lanka, it is expected for the general public to raise awareness for the importance of bridges on roads that contribute to socio-economic development as well as the significance of bridge management, and to know Japan's technical capabilities and technical assistance to Sri Lanka. Additionally, it is expected to draw the interest of the engineers in RDA and other related authorities on bridge management and encourage their participation in bridge management.

The Consultant will suggest the public relations activities given in Table 2-7.

Table 2-7 Public Relations Activities (Proposal)

Target Country	Target Audience	Purpose	Means for Public Relations
Sri Lanka	• Ministry of Transport and Highways (MoTH) • Road Development Authority (RDA) • Bridge Management & Assessment Unit (BM&AU) • Relevant Authorities	• To raise awareness for the importance of bridges on roads that contribute to socio-economic development, to emphasize the significance of bridge management. • To introduce Japan's Bridge Management Technology. • To draw the interest of the engineers/ staff on bridge management and encourage them to participate in bridge management.	• RDA Website • Organizing debriefing session by the training participants in the target organizations
	• General Public	• To raise awareness for the importance of bridges on roads that contribute to socio-economic development, to emphasize the significance of bridge management, to showcase Japan's technical capabilities, and to promote understanding of Japan's technical assistance.	• JICA Sri Lanka Facebook • JICA Sri Lanka Twitter

[Task-10] Reports and deliverables

The Consultant will submit the reports and deliverables listed in Table 2-8 at every stage of the consulting service.

The Training Completion Report to be prepared after the training in Japan in FY2024 will serve as the final deliverable.

Table 2-8 List of Reports and Deliverables

Task	Reports/ Deliverables	Due Date	Description
10-1	Inception Report	Within two (2) weeks after commencement of the service	• Approach & methodology, work plan, etc. for the training program implementation.
10-2	Detailed Training Program (Draft)	At least three (3) months before the training in Japan	• Outline training curriculum and schedule (training goal and objectives, contents, methodologies, lecturers, time, etc.).
10-3	Detailed Training Program	At least one (1) month before the training in Japan	• Final training curriculum and schedule (training goal and objectives, contents, methodologies, lecturers, time, etc.)
10-4	Training Progress/ Completion Report	Within one (1) month after all the services are complete in each fiscal year	• Approaches and methodologies performed for the training. • Progress of activities for the subject fiscal year and entire activities, future activities, and schedule. • Workflow and work schedule. • Lessons learned from the training. • Review plan • Verification of effectiveness of training program. • Lessons learned to be incorporated in the subsequent trainings.
10-5	Review Plan	At least two (2) months before the review (one (1) month after the training in Japan)	• Plan to check the status of action plan implementation. • Plan to check the status of horizontal expansion of knowledge, skills, and experiences gained in the organizations.
10-6	Review Results Report	Within one (1) month after the review	• Review results, lessons learned, verification of effectiveness of training program. • Approaches for incorporation of lessons learned in the subsequent trainings.
10-7	Detailed Online Monitoring and Seminar Implementation Plan	At least one (1) month before the online monitoring and seminar	• Details of activities and time schedule to confirm the review results online (monitoring the action plan implementation online). • Selection of online seminar curriculum and schedule based on questionnaire survey results and review results.
10-8	Monthly Progress Report	Within one (1) week after the end of each month	• Tasks performed for the month and plan for the next month. • Work progress, actual time-input of experts. • Online monitoring and seminar results. • Public relations activity. • Pictures of activities.
10-9	Expense Settlement Report	Within one (1) month after the submission of training progress & completion report	• Remuneration, direct expenses, indirect expenses, etc.

2-5 Work Schedule

The Consultant will develop a work schedule to ensure the smooth implementation of all the tasks described in the methodologies without delay. The work schedule (draft) is given in Figure 2-3.

Tasks		Input (in Person-Day) / Position: Total	Team Leader / Training Program Preparation and Implementation		Review Planning and Implementation		Project Coordinator / Training Program Preparation & Implementation (Support)	
Task-1	**Preparation of inception report**							
Task-1	Preparation of inception report	4.0	2.0	●	1.0	●	1.0	●
Task-2	**Qualifications for eligible participants**							
Task 2-1	Study of qualifications for eligible participants	4.0	2.0	●	2.0	●	0.0	
Task 2-2	Advice on determining the participants for the training in Japan	2.0	1.0	●	1.0	●	0.0	
Task-3	**Study and preparation of detailed training program**							
Task 3-1	Preparation of detailed training program (draft)	10.0	4.0	●	2.0	●	4.0	●
Task 3-2	Consultation with JICA	4.0	2.0	●	2.0	●	0.0	
Task 3-3	Finalization of detailed training program	1.0	1.0	●	0.0		0.0	
Task-4	**Preparation of implementation of training in Japan**							
Task 4-1	Selection of lecturers and arrangement of sites and facilities for study tour	12.0	4.0	●	2.0	●	6.0	●
Task 4-2	Assistance in establishing a system for prior arrangements	1.0	1.0	●	0.0		0.0	
Task 4-3	Assistance in preparing country report	9.0	3.0	●	3.0	●	3.0	●
Task-5	**Implementation of training in Japan**							
Task 5-1	Presentation of country report	3.0	1.0	●	1.0	●	1.0	●
Task 5-2	Lecture	17.0	8.0	●	1.0	●	8.0	●
Task 5-3	Practice	8.0	4.0	●	0.0		4.0	●
Task 5-4	Study tour to sites and facilities related to bridge management	8.0	4.0	●	0.0		4.0	●
Task 5-5	Preparation and presentation of action plans	3.0	1.0	●	1.0	●	1.0	●
Task 5-6	Feedback meeting	3.0	1.0	●	1.0	●	1.0	●
Task-6	**Schedule adjustment for training supplementary programs**							
Task-6	Schedule adjustment for training supplementary programs	1.0	1.0	●	0.0		0.0	
Task-7	**Review activity**							
Task 7-1	Development of review plan	5.0	1.0	●	4.0	●	0.0	
Task 7-2	Implementation of reviews	4.0	2.0	●	2.0	●	0.0	
Task 7-3	Preparation and submission of review related reports	0.0	As below	●	As below	●	As below	●
Task-8	**Online monitoring and seminar**							
Task 8-1	Detailed online monitoring and seminar implementation plan	3.5	2.0	●	0.5	●	1.0	●
Task 8-2	Online monitoring	6.0	2.0	●	2.0	●	2.0	●
Task 8-3	Online seminar	3.0	1.0	●	1.0	●	1.0	●
Task-9	**Public relations activity**							
Task-9	Public relations activity	5.0	3.0	●	2.0	●	0.0	
Task-10	**Reports and deliverables**							
Task 10-1	Inception Report	0.0	As above	●	As above	●	As above	●
Task 10-2	Detailed Training Program (Draft)	0.0	As above	●	As above	●	As above	●
Task 10-3	Detailed Training Program	0.0	As above	●	As above		As above	
Task 10-4	Training Program Progress & Completion Report	10.0	4.0	●	4.0	●	2.0	●
Task 10-5	Review Plan	0.0	As above	●	As above	●	As above	
Task 10-6	Review Results Report	3.0	1.0	●	2.0	●	0.0	
Task 10-7	Detailed Online Monitoring and Seminar Implementation Plan	0.0	As above	●	As above	●	As above	●
Task 10-8	Monthly Progress Report	32.0	9.5	●	4.5	●	18.0	●
Task 10-9	Expense Settlement Report	14.5	4.5	●	0.0		10.0	●
Total Input (in Person-Day)		176.0	70.0		39.0		67.0	

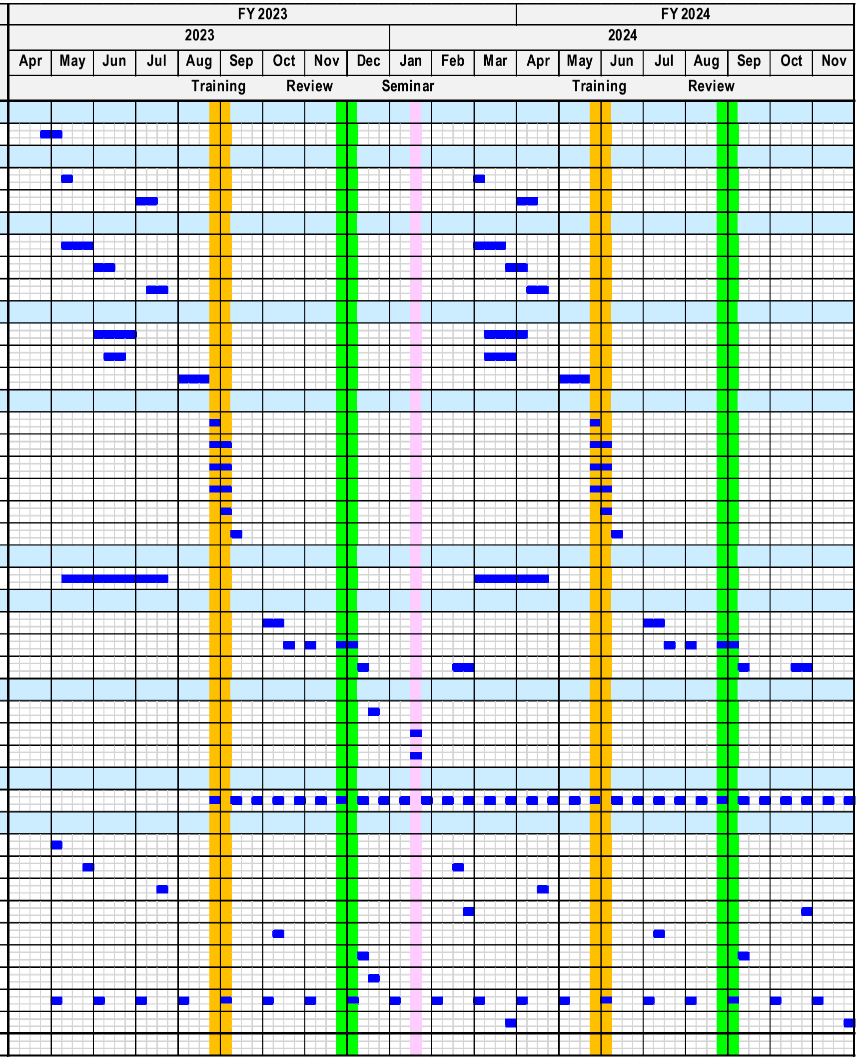


Figure 2-3　　Work Schedule

2-6 Staff Planning

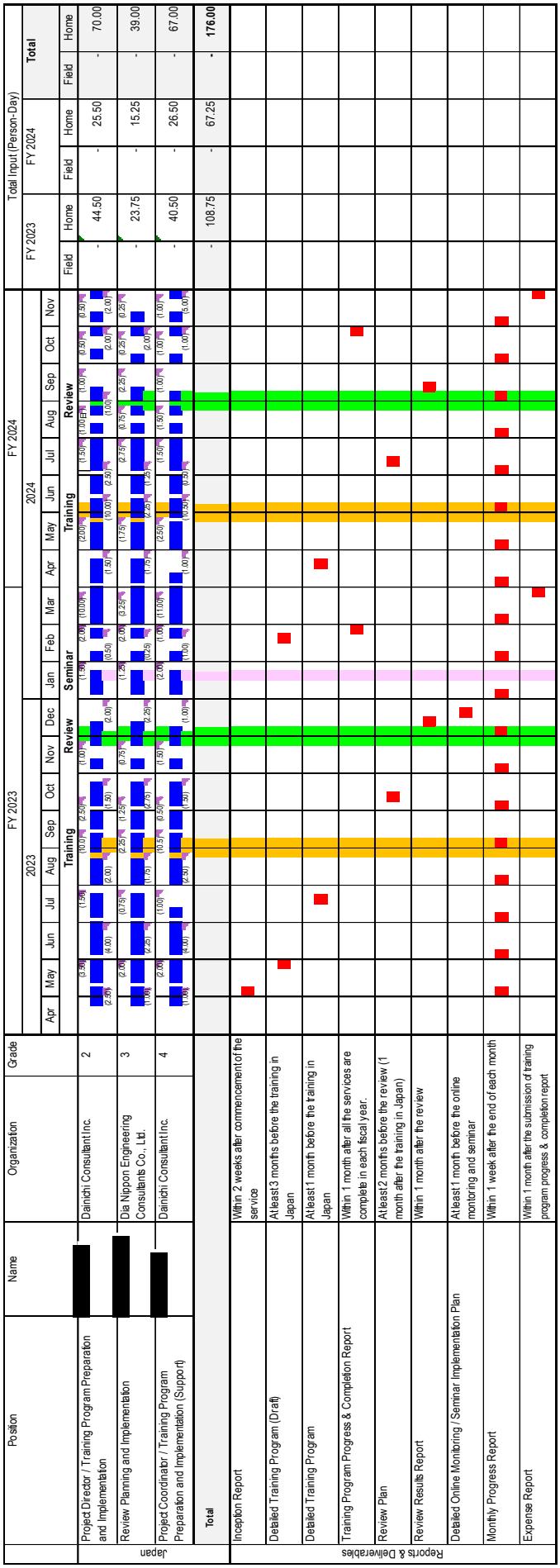
The staffing plan for the consulting service is given in Table 2-9.

Table 2-9 Consultant's Staffing

Position	Name	Experience in Bridge Management	English Language Skill
Team Leader / Training Program Preparation and Implementation	[redacted]	◎	TOEIC 880
Review Planning and Implementation	[redacted]	◎	TOEIC 850
Project Coordinator / Training Program Preparation and Implementation (Support)	[redacted]	◎	-
Language Support (at the expense of the Consultant)	[redacted]	-	TOEIC 945

The assignment schedule for each staff member is given in Table 2-10.

Table 2-10 Assignment Schedule



CHAPTER 3. Report on Training in Japan in Fiscal Year 2023

This chapter summarizes the results of a Country Focus Training for Capacity Development on Bridge Management in Japan held in FY2023.

3-1 Description of the Consulting Service in FY2023

1) Service Name: Consulting Service for Training in Japan on Capacity Development on Bridge Management for Democratic Socialist Republic of Sri Lanka (Country Focus Training)
2) Service Period: April 24, 2023 to February 29, 2024 (1st year)
3) The Client: Japan International Cooperation Agency
4) The Consultant: Dainichi Consultant Inc. in Joint Venture with Dia Nippon Engineering Consultants Co., Ltd.

3-2 Preparation of Inception Report in FY2023

The Consultant, in accordance with Article 2 of the Prime Contract, prepared the inception report and submitted it to JICA on May 8, 2023 within 10 working days from the contract execution date of April 21, 2023.

3-3 Qualifications for Eligible Training Participants in FY2023

The Consultant suggested the qualifications for the training participants in the technical proposal. However, the establishment of communication channel between the Consultant and JICA Sri Lanka Office was delayed. During that time, JICA Sri Lanka Office determined the training participants. As a result, the Consultant could not examine the "qualifications for eligible training participants" and provide "advice on determination of the training participants" in FY2023.

The training participants selected and determined by JICA Sri Lanka Office are given in Table 3-1.

Table 3-1 List of Training Participants in FY2023

No	Participant's Name	Job Title/ Position
1	[redacted]	Additional Director Bridge Management & Assessment Unit (BM&AU), Engineering Services Division, Road Development Authority (RDA)
2	[redacted]	Senior Design Engineer Engineering Services Division, Road Development Authority (RDA)
3	[redacted]	Senior Design Engineer Engineering Services Division, Road Development Authority (RDA)
4	[redacted]	Engineer Bridge Management & Assessment Unit (BM&AU), Road Development Authority (RDA)
5	[redacted]	Engineer Bridge Management & Assessment Unit (BM&AU), Road Development Authority (RDA)

No	Participant's Name	Job Title/ Position
6	[redacted]	Engineer Bridge Management & Assessment Unit (BM&AU), Road Development Authority (RDA)
7	[redacted]	Senior Engineer Bridge Management & Assessment Unit (BM&AU), Road Development Authority (RDA)
8	[redacted]	Senior Design Engineer Engineering Services Division, Road Development Authority (RDA)
9	[redacted]	Design Engineer Bridge Designs Office, Road Development Authority (RDA)
10	[redacted]	Engineer Bridge Management & Assessment Unit (BM&AU), Road Development Authority (RDA)

3-4 Study and Preparation of Detailed Training Program for FY2023

With the experience of "Capacity Development on Bridge Management" in Sri Lanka implemented for the duration from February 2015 to February 2018, the Consultant studied the contents of the lectures, practices, and study tours to related facilities and activities required to address the present issues on bridge management in Sri Lanka and strengthen the capacity of RDA as a road administrator and its related institutions under the guidance of [redacted] at the Department of Civil Engineering, the Graduate School of Engineering, Osaka University. These contents are given in Attachment-1: Training Curriculums for FY2023. In addition, a two-week training program was developed and compiled as given in Attachment-2: Schedule of Training in Japan in FY2023 (Detailed Training Program for FY2023 (Draft)) to implement these training contents.

As some organizations (particularly those related to the Ministries) require the official request through JICA for lectures, practices, and study tours in advance or have a designated point of contact for training requests, the Consultant discussed with JICA, confirmed such organizations, and coordinated the schedule.

The Consultant compiled these results into Attachment-3: Detailed Training Program for FY2023 (Final Version), including the location and address of training venues, travel routes to facilities and sites, mode of transportation, and other costs, and finalized the same approximately two (2) weeks prior to the start of the training in Japan.

3-5 Preparation for Implementation of Training in Japan in FY2023

3-5-1 Selection of Lecturers and Arrangement of Sites and Facilities for Study Tours

Based on the Detailed Training Program for FY2023 (Draft), the Consultant, with the assistance of [redacted], selected and secured lecturers and arranged the site visits as given in Table 3-2. In addition, the Consultant provided the lecturers and related facilities with information on the background and history of the training in Japan, as well as the objectives of the lectures, practical training, and study tours.

Table 3-2 List of Lecturers and Institutions in FY2023

Type of Training	Training Subject/ Theme	Lecturer/ Institution
Lecture	Digital Asset Management: Introduction	Emeritus Professor [redacted] at Kyoto University
Lecture	Current Situation & Issues on Bridge Management in Asian & African Countries	International Students from Osaka University
Lecture	Human Resources Development System for Bridge Engineers (Industry-government-academia collaboration)	Professor [redacted] at Gifu University
Lecture	Bridge Monitoring	Associate Professor [redacted] at Nagasaki University
Study Tour	Damaged Bridge Components, Causes of Deterioration, and Repair Methods at Ibaraki Technical Training Center	NEXCO West
Lecture	Maintenance and Management of Tsukuhara Bridge (Extradosed Bridge)	NEXCO West
Study Tour	Extradosed Bridge Site (Tsukuhara Bridge)	NEXCO West
Lecture	Statistical Deterioration Prediction Model Based on Actual Inspection Data	Professor [redacted] at Osaka University
Lecture	Corrosion in Steel Bridges	Associate Professor [redacted] at Osaka University
Lecture	Fatigue of RC Slab (Non-destructive Test)	Assistant Professor [redacted] at Osaka University
Study Tour	Akashi Kaikyo Bridge	Honshu-Shikoku Bridge Expressway Co., Ltd.
Lecture	Full Scale Drawing (From Drawing to 3D Modelling)	Yokogawa Bridge Osaka Factory
Study Tour	Factory Tour	Yokogawa Bridge Osaka Factory
Lecture	Quality Control for Steel Bridge Fabrication	Yokogawa Bridge Osaka Factory
Lecture	Inspection, Diagnosis and Evaluation of Bridges	Dainichi Consultant Inc.
Lecture	Maintenance and Management of Prestressed Concrete (PC) Slab Bridge	Dainichi Consultant Inc.
Lecture	Bridge Repair Methods & Materials	Dainichi Consultant Inc.
Practice	Practical Training on Investigations Required for Bridge Repair Design	Dainichi Consultant Inc.
Practice	Learn about Bridge Repair Materials	Dainichi Consultant Inc.
Lecture	Inspection of Bridge Structures under Water	Dainichi Consultant Inc.
Lecture	Scour Survey	Dainichi Consultant Inc.
Practice	Practical Training on River Scour Survey	Dainichi Consultant Inc.
Lecture	Introduction of Bridge Maintenance Management System	Dia Nippon Engineering Consultants Co., Ltd.
Practice	Actual Inspection using a tablet	Dia Nippon Engineering Consultants Co., Ltd.
Lecture	Planning and Design of Bridges for Better Maintenance	Dia Nippon Engineering Consultants Co., Ltd.

3-5-2 Assistance in Establishing a System for Prior Arrangements

The Detailed Training Program for FY2023 (Draft) included West Nippon Expressway Company Limited (NEXCO West) and Honshu-Shikoku Bridge Expressway Co., Ltd. as destinations for lectures and study tours. For these two (2) institutions, JICA needed to communicate the basic information to the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) at least two (2) months before the start of the training in Japan for MLIT to examine how to respond to the requested training curriculums.

Therefore, the Consultant provided the required information to JICA Headquarters, such as background and purpose of the overall training, the background and purpose of the request to these two (2) institutions, the overall schedule of the training (draft), the nationality, number, and organization of the

training participants, and whether or not high-ranked administrative officers participate.

3-5-3 Assistance in Preparing Country Report

Due to the delay in determining the training participants, the Consultant received the final list of participants and provided assistance in preparing the country report one (1) week before the start of the training in Japan.

Most of the training participants were from the same organization, with seven (7) from BM&AU of RDA's Engineering Services Division and three (3) from Bridge Designs Office of RDA's Engineering Services Division. When explaining the preparation of the country report, one (1) of the training participants expressed a desire to prepare the country report as a “group” based on the recognition that the participants were from the same organization and shared the same problems and issues in bridge maintenance and management. However, the Consultant had identified a wide range of issues in advance, and as a result of assigning issues to each training participant, it was decided that each of the ten (10) training participants would prepare a country report individually.

Through the preparation of the country report, the training participants were encouraged to share and often discuss issues with each other and to deepen a common understanding of the goal, objectives and outputs of the training.

The country reports were submitted by all the training participants on August 27, 2023 just before leaving Sri Lanka for Japan.

3-6 Implementation of Training in Japan in FY2023

Prior to the implementation of the training in Japan, the Consultant established a Contact Details and Emergency Liaison Mechanism in FY2023.

3-6-1 Presentation of Country Report

The Consultant organized the opportunity for the training participants to present their country reports, which helped the Consultant to understand the current issues and future challenges on bride management in Sri Lanka and enhance the mutual understanding and sharing of the same among the participants.

Since there was no prescribed format prepared in advance, no limit set on the number of sheets to be prepared, and no limit on the presentation time, there were variations in the number of sheets and contents, and the presentation time was not well managed by the Consultant, resulting in slight excess of the scheduled time. In addition, there was not sufficient time for the Consultant to ask questions to the training participants.

3-6-2 Lecture

For the first week of the entire two-week training program in Japan, lectures were given in the lecture room of JICA Kansai by professors, associate professors, and an assistant professor invited from Kyoto University, Gifu University, Nagasaki University and Osaka University. The contents were for establishing a management cycle and elemental techniques on maintenance and management, including Digital Asset Management, Human Resources Development System for Bridge Engineers (industry-government-academia collaboration), Bridge Monitoring, Statistical Deterioration Prediction Model Based on Actual Inspection Data, Corrosion in Steel Bridges, Fatigue of RC Slabs (non-destructive test).

Among these lectures, [redacted] at Gifu University introduced in his lecture the "Training Course of Infrastructure Maintenance Expert (ME)" and "Infrastructure Museum" exhibiting full-scale models of bridges and other structures in Gifu University, and one ongoing project in one of the developing countries in Africa to establish an Infrastructure Museum with the assistance of Japanese ODA. The training participants showed their high interest in Infrastructure Museum. In addition, the lecture about Maintenance and Management of Tsukuhara Bridge (Extradosed Bridge) was provided at Kobe Expressway Office of NEXCO West.

In the first half of the second week, the training participants moved to Gifu Prefecture, where the lectures and practices were given by the Consultant. The contents included Inspection, Diagnosis and Evaluation of bridges, Bridge Repair Methods and Materials, Maintenance and Management of Prestressed Concrete (PC) Slab Bridge that are the main bridge type constructed in Sri Lanka, Inspection of Bridge Structures under Water and Scour Survey that are the current maintenance and management issues in Sri Lanka, and Actual Inspection using a Tablet as an advanced inspection technique.

In the second half of the second week, the training participants returned to JICA Kansai, where the Consultant gave a lecture on Planning and Design of Bridges for Better Maintenance to prevent the occurrence and progression of bridge deterioration and damage as well as Introduction of Bridge Maintenance Management System using a tablet system.

3-6-3 Practice

The practical training was conducted by the Consultant in the first half of the second week at the Uzura Ohashi Bridge over the Sakai River in Gifu City, Gifu Prefecture. The contents included in-depth investigation necessary for bridge repair design (neutralization test, RC radar survey, Schmidt Hammer Test), structural concrete restoration work (polymer cement mortar) and concrete crack injection work (epoxy resin injection material) using models, scour survey with a boat, staff, hand lead line, and Fish Finder, inspection of structures under water using an underwater drone, and inspection using an integrated tablet system.

The in-depth investigations required for bridge repair design were carried out using the actual bridge abutment. In the neutralization test, drilled holes were made to collect the concrete powder at several designated cover depths on a filter paper soaked with phenolphthalein solution, and the neutralization depth was determined from the boundary of cover depth where the said filter paper developed the color and did not develop the color. In the RC radar survey, the probe was run on a concrete surface to identify the position of the steel reinforcements. In the concrete compressive strength test, the compressive strength of the existing bridge abutment concrete was measured using a Schmidt Hammer.

In the practical training of the bridge repair work using a model, structural concrete restoration and crack injection were performed. For the structural concrete restoration work, polymer-modified mortar was troweled with a plastering finish on the plate enclosed on the four sides (considered as a defect). For crack injection, two plastic plates were glued together to consider as a crack, and epoxy resin was injected with an injector, and the training participants observed how the repair material was being filled in the crack.

In the practical training of scour survey, the water depth was measured in the Sakai River, which was less than one (1) meter deep, using a hand lead line, staff, and a Fish Finder. The training participants commented that the two (2) methods, hand lead line and Fish Finder, are effective in Sri Lanka for the screening purpose to prioritize the bridges in need of repairs, strengthening and reconstruction through

bridge inspection. Especially, the Fish Finder was well received for its high degree of use because it can measure up to a maximum depth of about 45 meters.

An underwater drone was utilized to inspect underwater structures in the Sakai River. While operating the underwater drone, the visibility of the riverbed and structures were confirmed on the screen at hand. However, it was discovered that maneuvering the underwater drone became difficult in fast currents, and the structures could not be observed when the water was muddy. On the other hand, the training participants had a high level of interest in the underwater drone.

In the bridge inspection using a tablet system, the training participants took pictures of the damaged parts of the structure with the tablet and experienced that they could check the cause of the damage and bridge diagnosis results by artificial intelligence (AI) on the screen. Additionally, the training participants commented that inspecting with a tablet is effective because entering the inspection results on-site can save time and effort compared to entering the results into the database after they return to the office.

3-6-4 Study Tour to Sites and Facilities Related to Bridge Management

In order to enable the training participants to acquire more practical knowledge and skills, study tours to the following four (4) related facilities were conducted.

- Ibaraki Technical Training Center (I-TR) at NEXCO West.
- Tsukahara Bridge in Kobe City managed by NEXCO West.
- Akashi Kaikyo Bridge managed by Honshu-Shikoku Bridge Expressway Co., Ltd.
- Fabrication of steel girders at Osaka Factory, Yokogawa Bridge.

The visit to the Ibaraki Technical Training Center was mainly to learn the causes of damage and the corresponding repair methods, demonstrated through exhibits featuring cut-outs of damaged bridge components from the sites. The training participants showed interest in the revision of seismic design standards following major earthquakes, leading to a more densely arranged steel reinforcements in pier columns as well as repair methods of reinforced concrete damaged by salt attack, and actively engaged in questions and discussions. Since Sri Lanka, like Japan, is an island country, and the bridges constructed along the coast are subject to salt damage, the training participants questioned how the road administrator determined whether the structures damaged by salt attack are repaired or reconstructed. The lecturer responded that the decision will be made based not only on economic efficiency, but also on a comprehensive assessment of the social and economic impacts during the repair, demolition and reconstruction period.

The training participants visited the Tsukahara Bridge site located on Sanyo Expressway Miki Connecting Road in Kobe City, Hyogo Prefecture, following the lecture on the morning of the same day. Since the bridge is currently in service, the participants could not get off the vehicle on the bridge for safety reasons, instead they observed the bridge from a distance from the bicycle path below the bridge. In Sri Lanka, there is one extradosed bridge (Golden Gate Kalyani Bridge), constructed with the assistance of Japanese ODA and opened to traffic in November 2021 and the maintenance work for the said bridge will start from now on. Therefore, the participants desired to see the actual damper of the extradosed bridge and have the opportunity to ask questions about it at bridge site.

The Akashi Kaikyo Bridge is one of the world's largest suspension bridges, with a total length of 3,911 meters and a center span of 1,991 meters spanning the Akashi Strait between Kobe City and Awaji Island in Hyogo Prefecture. The bridge had been the world's longest suspension bridge since its opening to traffic in April 1998 until the 1915 Çanakkale Bridge in Turkey, which connects Asia with Europe, was constructed and opened to traffic in March 2022. To experience Japan's world-class technology, a tour to the Akashi Kaikyo Bridge was conducted.

At Yokagawa Bridge, a tour to the Osaka Factory was conducted to learn about the fabrication process and quality control of the steel box girders, which have been constructed and in service since November 2021 as the first bridge type in Sri Lanka. At the factory, the training participants had a look at the processes of primer peeling and scribing of the original plate, cutting, hole drilling, panel line, box girder assembly, welding, and temporary assembly of the entire bridge.

3-6-5 Preparation and Presentation of Action Plans

The action plan is to document the activities to be performed after the training in Japan by the training participant individually and as an organization, and in a short-term and a mid-to-long term, including the sharing and expansion of knowledge and experiences gained through the training in Japan within their organizations and the ones to strengthen the capacity of RDA on bridge management.

With the experience of preparing and presenting the country reports, the Consultant assigned the theme to each training participant and guided the participants to prepare the action plan individually, limiting their presentation time to 5 minutes and the Q&A session to 5 minutes. As a result, all participants prepared the presentation material of approximately ten (10) sheets. Despite the five-minute presentation time limit, many participants exceeded the time limit in their presentations.

The outline of the action plans prepared by the training participants is given in Attachment-4: List of Action Plans Prepared by Training Participants in FY2023.

3-6-6 Distribution and Responses of Questionnaires

The Questionnaire form is prepared and distributed to obtain feedback from training participants regarding the contents and schedule of the training in Japan prior to the evaluation meeting to be held at the end of the training period in Japan. However, for the training in Japan in FY2023, the Consultant was unable to adjust the time schedule and it was difficult to hold the evaluation meeting in Japan. Therefore, JICA Kansai shared a link to the Questionnaire form with the training participants before they returned to Sri Lanka and asked them to answer it within three (3) days of their return.

As a result, all the participants submitted their responses two (2) weeks after they returned to Sri Lanka.

The following were learned from the responses to the Questionnaire. Details of the questions and responses from the training participants are given in Attachment-5: Questionnaire and Responses from Training Participants in FY2023 and Attachment-6: Responses from Training Participants on Achievement Level for Each Training Output in FY2023.

(1) Overall training program

All the training participants participated in the training in Japan with a thorough understanding of the goal, objectives and outputs of the training, and responded that they achieved the training

outputs and they will be able to utilize the knowledge and experience gained during the training in Japan in their day-to-day works in Sri Lanka.

However, the achievement levels of Output-3 (bridge repair methods) and Output-4 (inspection and repair methods for extradosed bridge and steel box girder bridge) were lower than those of the other Outputs. This is because the training participants could not receive practical trainings on inspection and repair of the extradosed bridge, and on the repair of other types of bridges.

All the training participants responded that the overall structure of the training program was appropriate.

Regarding the period of the training program, almost all the participants responded that two (2) weeks was appropriate, but some responded that four (4) weeks was the appropriate time period, and that if more time was given in each theme/ curriculum, they would have gained more knowledge in theory and practice.

As to the number of training participants in the training, almost all participants responded that 10 people was appropriate, but some said that more participants should be trained.

(2) Subjects and contents of the curriculums of the training in Japan

Almost all the training participants were satisfied with the subjects and contents of the training curriculum. Among the subjects and contents, the most useful were for inspection of bridge structures under water, statistical deterioration prediction models, bridge inspection using a tablet system, bridge planning and design for better maintenance, bridge inspection, diagnosis, and evaluation, and bridge repair methods and materials.

On the other hand, subjects and contents of the curriculums that were not covered in the training but should have been covered included: (i) on-the-job training on bridge repair design and repair works of a steel bridge, a prestressed concrete bridge, an extradosed bridge, and a steel box girder bridge, (ii) overview of bridge management manuals developed for Japan, (iii) monitoring and maintenance of underground structures (pile foundations, slopes, and ground anchor systems), (iv) preservation and management of historic bridges, (v) reuse of existing bridge components for new bridge construction, and (vi) pedestrian bridges. Among these demands, many training participants demanded “practical training on bridge repair design and bridge repair work”.

For the bridges subject to foundation scour, the training participants demanded the introduction of repair methods of bridges subjected to minor scouring, though the bridges scoured significantly are usually reconstructed. It is necessary for the Consultant to consider whether the repair methods of bridge foundation with minor scouring can be included in the training curriculum.

One (1) of the participants expressed disappointment, stating that there was no on-the-job training for the repair of extradosed bridges. In Sri Lanka, the Golden Gate Kalyani Bridge has been put into service in November 2021 and the maintenance work for the said bridge will start from now on. However, since the existing extradosed bridges in Japan are all in service and there is no major damage thereon with appropriate maintenance work, it could not be included in the training program for FY2023.

Regarding the themes and contents of the training curriculums, some training participants mentioned that the themes and contents provided included those learned in the past training program in Japan. In the future, it is necessary to listen to the participants' requests ahead of time and consider incorporating new themes and contents.

(3) Lecturer's presentation, materials used and training support

For the presentations and explanations given by the lecturers and the presentation materials used, all the training participants responded that they were easy to understand and of high quality. Additionally, they indicated that the lecturers had excellent knowledge of their subjects and contents.

On the other hand, many participants expressed dissatisfactions on the English presentation conducted through an interpreter. Some participants mentioned that, if the interpreter had a high level of expertise, the interpreter would have no problem interpreting the latest highly advanced themes, and the participants could have gained even more. The other respondents suggested that, if the lecturers could communicate in English, the participants would be able to interact more with the lecturers and make better use of the time given.

Almost all the training participants responded that the assistance provided by the training facilitator was “effective” indicating that the participants were very satisfied.

(4) Expectations for future collaboration with JICA

The training participants expressed the following expectations.

- Assistance in improving the existing BMS/ BRMS that were developed with the assistance of JICA through the Project for Capacity Development on Bridge Management from February 2015 to February 2018.
- Assistance with the purchase of new pole cameras and repair of the existing pole cameras (not available in Sri Lanka).
- Technical assistance on bridge repair techniques to extend the service life of bridges.
- Sharing the Japanese standards for bridge design, inspection, and maintenance to review the current practices in Sri Lanka.
- Opportunities to participate in a comprehensive bridge engineering program.
- Assistance in Bridge Inspector Certification Program.
- Continued cooperation in sharing the latest technologies related to bridge management and evaluation through this kind of training program.

3-6-7 Evaluation Meeting

The evaluation meeting was planned and organized to share the responses to the Questionnaire among all the training participants, and for the Consultant to hear a wide range of opinions regarding the training program from the participants.

The evaluation meeting was conducted online on October 10, 2023, approximately one (1) month after the training participants returned to Sri Lanka. It is because the evaluation meeting could not be

conducted in Japan due to the tight schedule of the training in Japan; the responses to the Questionnaire from all the participants were submitted two (2) weeks after their return to Sri Lanka; and it was difficult to coordinate the schedules among participants.

At the evaluation meeting, the Consultant expected frank opinions and comments in addition to the responses to the Questionnaire; however, new opinions and comments could not be obtained.

3-6-8 Feedback Meeting

The feedback meeting was held on October 13, 2023 online with the attendance of JICA Headquarters, JICA Kansai, and the Consultant to discuss the issues to be improved and reflected to the training program for FY2024 based on the responses to the Questionnaire and the results of the evaluation meeting.

In the feedback meeting, the attendees mainly reviewed the following seven (7) topics and organized the issues to be addressed and improvement approaches for the training in Japan in FY2024.

(1) Training program

The training contents and the curriculums were prepared with the assistance of [redacted] at the Department of Civil Engineering, Graduate School of Engineering, Osaka University based on those specified in the Terms of Reference (ToR) and suggested by the Consultant in the technical proposal.

The main topics discussed at the feedback meeting and the improvement approaches for FY2024 were as follows.

1) Understanding the needs of training participants when developing the training program

Some of the training participants commented that they would like new contents to be added to the program because the contents given included what they had already learned in other JICA training programs.

It was discussed in the meeting whether it would be possible to understand the needs of the training participants (although not all needs could be met) by either talking with them online or asking them to answer a questionnaire prepared in advance before the training program is prepared.

According to the Terms of Reference (ToR), the training participants will be nominated by JICA domestic training institution at least two (2) months before the commencement of the training in Japan. However, as is the case with other training programs, training participants are often not decided until just before the start of the training in Japan, making it difficult to provide such an opportunity to understand the needs of the participants in advance. In addition, in order to select and secure the lecturers, facilities and sites for visit and practice, it is necessary to prepare the training program well in advance, which is difficult in terms of timing.

In FY2024, JICA Headquarters and JICA Kansai will work with the JICA Sri Lanka Office to ensure that the training participants are decided at an early stage. Moreover, the training program will be examined based on the feedback obtained from the training participants in FY2023.

2) On-the-job training for inspection and repair of extradosed bridges and steel box girder bridges

In Sri Lanka, it is not possible to secure the site for the on-the-job training for inspection and repair work of an extradosed bridge and a steel box girder bridge, because the said bridges were newly constructed and just opened to traffic in November 2021 and there are no major damage thereon. Therefore, there was a request from the training participants for such on-the-job training.

However, there are safety issues as it is expected to be carried out on roads currently in service, and it is difficult to obtain the approval from road administrators as it requires traffic regulation. It also seems difficult to add it to the training contents in FY2024 because the subject bridges in Japan are relatively sound and show no major damage.

The Consultant will consider the following two (2) options for the training program for FY2024.

- The Odawara Blue Way Bridge constructed and opened to traffic in 1994, the first extradosed bridge constructed in the world and Japan, aged about 30 years. It would be possible to hear from the administrator about the condition of the subject bridge after 30 years and how it has been managed and maintained.
- It is also a good idea to visit extradosed bridges in other developing countries, such as Thailand and Laos.

3) On-the-job training in bridge repair design and bridge repair work of other bridge types

Many training participants expressed a desire for on-the-job training on bridge repair design and bridge repair work for other types of bridges.

The on-the-job training on bridge repair design are to provide training related to judgment of the necessity of repair, selection of repair methods, and calculation of repair quantities based on the inspections and in-depth investigations results. Considering the limited timeframe, it seems possible to do such on-the-job training for only simple repair methods.

In the on-the-job training for bridge repair work, there are still issues such as whether the bridge repair site is in operation at the time of the training and whether the approval can be obtained from the road administrator. The Consultant has carried out many bridge repair projects in Gifu Prefecture, and it is possible to show the photos of the bridges before and after the repair.

The purpose of the training is not to give the training participants the answers, but to give them awareness, and as a result, the training participants take actions on their own initiative. The Consultant will do his best to the extent possible.

4) Curriculum for the repair of bridges that undergone minor scouring

Scouring of the bridge foundation is a serious issue in Sri Lanka. In fact, there have been cases where scouring has tilted bridge piers and abutments, leading to bridge collapses. Many of the training participants requested the introduction of the bridge foundation repair works in response to scouring.

In Gifu Prefecture, there are cases of scouring of bridge foundations. Disclosure of detailed information will depend on whether the approval is given from the road administrator, but it would be possible to introduce examples of the case with photographs. The Consultant will do his best to the extent possible.

5) Bridge inspection using an aerial drone

There are bridge parts and members that cannot be inspected by pole cameras or bridge inspection vehicles, such as a wide bridge and a bridge with small clearance above the water table and under the soffit of a deck/ girder, a steel truss bridge, etc. For this reason, the training participants requested the knowledge sharing and training of bridge inspection using an aerial drone.

In Gifu Prefecture, opportunities to use aerial drones have been increasing as part of the use of new technology. In addition, the Consultant owns aerial drones and can fly them to let the participants know the advantages and disadvantages of using aerial drones. In FY2024, the Consultant will consider the balance of the entire training program within the limited timeframe and do his best to the extent possible.

6) Allowing more time for the training program

The Terms of Reference (ToR) included a wide variety of contents, and the Consultant tried to incorporate them all in the training program. As a result, an overly packed training program was prepared and implemented.

In FY2024, the Consultant will consider the overall balance between the requirements in the Terms of Reference (ToR) and the given timeframe and strive to create a program with plenty of room.

(2) Languages used in lectures

Many of the training participants requested that “the lecturers give lectures in English”.

As a result of the discussion with JICA at the feedback meeting, "Training shall be conducted in Japanese through an English interpreter" in “4-3 Scope of the consulting service” and “(5) Implementation of training in Japan" of the Terms of Reference (ToR) shall be changed to “Training shall be conducted in Japanese or English”. The lecturers will then be given the option to choose Japanese or English for their lectures. If the lecturer gives the lecture in Japanese, the possibility of interpretation by the training coordinator will be checked, and if necessary, the Consultant will arrange an interpreter or the Consultant himself will interpret.

(3) Relationship with Osaka University

The Terms of Reference (ToR) stated that “this project supports activities based on the Memorandum of Understanding (MoU) signed by JICA and Osaka University”.

As a result of the discussion with JICA, it was decided that the Consultant would take the initiative in conducting the training program, and Osaka University would provide the necessary assistance in planning the training program, selecting and securing lecturers, and arranging the sites and facilities for study tours.

One of the curriculums in the training for FY2023 was “Current Situation and Issues on Bridge Management in Asian and African Countries by the international students from Osaka University using the JICA's RAMP scheme, which was considered beneficial and informative. However, since six (6) international students made presentations, the presentations took a lot of time and sufficient time for discussion was not secured. For the training program in FY2024, the number of international students will be reduced.

(4) Country report and action plan

The Consultant did not provide a format to the training participants prior to the preparation of the Country Report and Action Plan. As a result, there were variations in the contents of the descriptions among the participants, and the presentation time was significantly longer than planned. In order to proceed with the training program as scheduled in FY2024, the Consultant will provide the training participants in advance with the contents to be given in Country Report and Action Plan (simple format, limit on the number of sheets) and limit the time for presentation. Since it is a country focus training program, it is not necessary to include the country introduction in the Country Report.

In addition, after the presentation of the Country Report and Action Plan, active questions and discussions among the training participants were expected, but as a result, no active discussions took place. This is presumably because the participants in the training in Japan in FY2023 were selected from the same organization and work together on a regular basis and they have already understood each other's work problems and issues. In selecting the training participants for FY2024, JICA Headquarters and JICA Kansai will work with the JICA Sri Lanka Office to select the training participants from a wide range of organizations.

Furthermore, it was pointed out that a passive attitude was noticeable among the training participants because the Consultant did too much of everything. For the training in Japan in FY2024, in order to bring out the initiative of the participants, the Consultant will figure out a way to encourage the training participants to participate on their own initiative, such as selecting a moderator from the participants to prepare and present the Country Report and Action Plan.

(5) Evaluation meeting

In developing the training program, the Consultant was not able to foresee sufficient time for the preparation and presentation of the Action Plan and the conduct of the evaluation meeting and closing ceremony. As a result, it was not possible to secure time to conduct the evaluation meeting during the training in Japan. Therefore, the evaluation meeting was changed to be held online after the participants returned to Sri Lanka. In addition, the JICA Kansai distributed a Questionnaire form to the training participants at the time of preparing the Action Plan and requested the participants to fill out and submit the complete Questionnaire three (3) days after they return to Sri Lanka.

Afterwards, due to scheduling adjustments between the Sri Lankan and Japanese sides, the evaluation meeting could only be held one (1) month after the participants returned to Sri Lanka.

In FY2024, an evaluation meeting will be held during the training period in Japan. The presentation of the action plan is scheduled on the morning of the final day, with the implementation of supplementary programs (evaluation meeting and closing ceremony) planned on the afternoon of the final day.

(6) Communication with JICA Sri Lanka Office

There was a delay in establishing a communication channel between the Consultant and the JICA Sri Lanka Office. During that time, the JICA Sri Lanka Office selected the training participants. As a result, in FY2023, the Consultant could not examine “the qualifications for training participants” and provide “advice on determining the training participants”.

Through the training in Japan in FY2023, communication channel with the JICA Sri Lanka Office has already been established. In FY2024, the Consultant will maintain close communication with the JICA Sri Lanka Office and actively participate in the process related to the determination of training participants.

(7) Cultural exchange program

The Consultant scheduled a cultural exchange program at the Kiyomizu Temple and the Kinkaku-ji Temple (The Golden Pavilion) in Kyoto over the weekend during the two-week training period in Japan. This time, the Consultant himself planned a tour to Kyoto instead of asking the Rekishi Kaido Promotional Council.

Most of the ten (10) training participants in FY2023 have visited Japan in the past, and three (3) of them have been to Kyoto.

In FY2024, the Consultant will have a chance to ask the training participants about the experience of visiting Japan and the places they have visited in Japan with the help of JICA Sri Lanka Office. Moreover, the Consultant should understand the purpose of a cultural exchange program that allows the training participants to get to know Japan better using government funds and decide whether or not to implement the cultural exchange program.

3-7 Schedule Adjustment for Training Supplementary Programs in FY2023

The Consultant has adjusted the time schedule for the lectures, practices, and study tours to related facilities and activities so that the JICA Kansai could implement the training supplementary programs listed in Table 3-3 without any schedule conflicts.

Table 3-3 Training Supplementary Programs for FY2023

No.	Supplementary Program	Schedule	Description
1	Briefing	At the start of the training in Japan	• Briefing on the status of each training participant, how to use cash card and medical card, transportation in Japan, etc., and verification of passport and visa expiration.
2	Program Orientation	At the start of the training in Japan	• Explanation about the training program schedule, goal, purpose and objectives, outline, and precautions.
3	Evaluation Meeting	Before departure	• Hear from the training participants about their views as to the details of the training program and curriculum, etc. to see the effectiveness of the training provided and refer the same as a reference for future trainings. The training participants will be asked to fill out the prescribed questionnaire in advance.
4	Closing Ceremony	Before departure	• JICA will award a "Certificate of Completion" to training participants who have successfully completed the training and have met JICA's criteria for certificate.

3-8 Review Activity in FY2023

In order to contribute to the development and strengthening of bridge maintenance and management capacity of Road Development Authority (RDA) and their organizations, the training participants compiled the actions to be implemented after they return to Sri Lanka, utilizing the knowledge and experience on bridge inspection, diagnosis, in-depth investigation, and repair as well as an understanding of bridge asset management gained during the training in Japan.

The Consultant conducted a review with the purpose of confirming the status of the horizontal expansion of the said knowledge and experience as well as the implementation status of the action plans.

3-8-1 Development of Review Plan

The Consultant prepared the Review Plan for FY2023 as in Attachment-7 for the review activity scheduled in the middle of December 2023 (three (3) months after the end of training in Japan in FY2023) and submitted it to JICA by the middle of November 2023, one (1) month prior to the implementation of review (two (2) months after the end of the training in Japan in FY2023).

The review plan included (i) the date and time of the review implementation, (ii) the method of the review, (iii) the format for the training participants to report the implementation status of the action plan in Sri Lanka (Review Questionnaire Form), (iv) the deadline for submitting the Review Questionnaire Form. The Review Questionnaire Form involves the activities planned in the action plan, activities already conducted to date, the effects/ influences of the activities to the organization, activities that were planned but could not be implemented and the reasons/ causes thereof, future activity plans, and activities that were not planned in the action plan but conducted, influence of the training in Japan to the participant him/ herself, and other free comments such as the need for support from the Japanese side and suggestions for improvement in the training program for FY2024.

The Consultant sent the training participants the review plan and Review Questionnaire Form on October 19, 2023, and requested that completed written forms must be submitted by December 15, 2023.

3-8-2 Implementation of Reviews

The Consultant conducted a review based on the written Review Questionnaire Form received by December 15, 2023.

(1) Method of review

The Consultant conducted the review in accordance with the following method.

a. The activities described in the Review Questionnaire Form from each training participant were qualitatively evaluated in 4 stages.

b. The implementation status was evaluated based on the planned action plans of each training participant prepared during the training in Japan.

c. Confirmed the activities already completed in the action plan.

d. Confirmed the reasons/ causes for activities that were planned but could not be completed.

e. Confirmed the activities that were not included in the action plan and implemented such as horizontal expansion of knowledge and experiences within the organization.

f. Organized free comments, requests for support, or others from training participants.

(2) Review results

The evaluation results for the activities outlined in the Review Questionnaire Form submitted by the training participants were as given in Table 3-4. The evaluation results are distributed among the top three (3) out of four (4) stages. Training participants who received relatively low evaluation replied that they could not fulfill the planned activities due to poor weather conditions during the rainy season.

In consideration of these circumstances, the Consultant can evaluate that all the training participants earnestly engaged in activities planned in the action plan.

Table 3-4 Evaluation Results in FY2023

Rating	Very Good	Good	Satisfactory	Unsatisfactory
Response	2	5	3	0
(%)	20%	50%	30%	0%

The main achievements recorded in the written Review Questionnaire Form are given below.

- Using the savings from Golden Gate Kalyani Bridge Project, the purchase list of equipment was prepared and submitted to JICA.
- Discussed with Directors (Training, Engineering Services) to conduct a few seminars on concrete technology and repair work.
- Organized a few seminars for interested engineers in RDA Head Office.
- Reviewed literature to find a proper durability standard for bridge design and also reviewed data to find possible causes for cracks occurring on casted concrete segmental box girder.
- Study of shortcomings in current bridge design practices and design detailing is in progress.
- Improved design standards and detailing have been introduced in the upcoming 3 bridge projects.
- Bridge maintenance teams were formed in 3 Executive Engineer's Offices in Eastern Province.
- Manually modified BMS outputs on priority order function.
- Submitted cost for repairing of pole camera and purchasing supporting equipment including one for scour analysis for further discussion with higher management.
- Held meeting/ telephone conversations with Executive Engineers regarding the correction of structure numbering and cleaning of bridge sites for inspection.
- On-site surveys were conducted to enhance practical knowledge in identifying various types of damage in addition to structural diagnosis.

On the other hand, the following factors were cited as constraints on the implementation of the action plans.

- Poor weather conditions (rainy season) for site activities.
- Insufficient budget allocation.
- Unavailability of some internationally accepted codes of design practices to review the existing

bridge design standards in Sri Lanka.

- Busy working situation toward the end of the fiscal year.
- It is difficult to repair damaged pole cameras because it is hard to obtain supplies in Sri Lanka.

Additionally, for other significant feedback from the training participants, the following four (4) comments were received:

- Lectures in the training in Japan should be provided in English directly for more success.
- Request for provision of Japanese Design Specifications for Highway Bridges to improve design standards of Sri Lanka.
- A considerable number of staff members left RDA for better foreign employment opportunities.
- Knowledge transfer of BMS/ BRMS software for future development plan was insufficient. Deficiency may be in software. An improved version of BMS/BRMS is requested.

(3) Suggestions/ encouragements from the Consultant

All the training participants submitted the answers to the Review Questionnaire Form. The Consultant expresses gratitude for their cooperation to the review activity.

Judging from the submitted answers, it was highly evaluated that all the training participants have earnestly conducted activities in line with their action plans in Sri Lanka.

There seemed to be no doubt that the training participants have been applying knowledge and experiences obtained during the training in Japan in their services and disseminating such knowledge to other colleagues who did not participate in the training program.

Some training participants responded that they were unable to carry out their planned activities due to the poor weather conditions and the busy working situation towards the end of the fiscal year. However, it is believed that if they implement activities based on their action plans in the mid to long term, training in Japan can have a high ripple effect on the development and strengthening of capacity on bridge management in Sri Lanka.

One training participant mentioned that he modified BMS function manually. Another training participant mentioned that he has been studying foreign bridge design standards. As many participants seem to have actively engaged in the action plans upon their return, if all the training participants continue the activities based on the action plans, the effect of the training in Japan would contribute to the development and strengthening of capacity of not only training participants but also their organizations.

The Consultant believes that it is necessary to understand the contents mentioned in the answers to the Review Questionnaire Form, including the free comments, and reflect them in the improvement and enhancement of the training program for FY2024.

3-8-3 Preparation and Submission of Review Related Reports

The Consultant submitted Review Results Report for FY2023 as in Attachment-8 to JICA on December 27, 2023.

3-8-4 Sharing Review Results with Training Participants

The Consultant shared the review results mentioned above with the training participants in the Online Monitoring and Seminar held on January 17, 2024.

3-9 Online Monitoring and Seminar in FY2023

The Consultant conducted online monitoring for the purpose of confirming the answers to the Review Questionnaire Form (implementation status of the action plans) submitted by the training participants by December 15, 2023.

Furthermore, with the aim to supplement the training curriculums provided from late August to early September 2023 during the training in Japan, the Consultant selected one theme titled "Diagnosis and Countermeasures (Repair) of Scoured Substructures for Railway Bridges" from among the topics requested by the training participants that allows remote training, and then conducted an online seminar.

3-9-1 Detailed Online Monitoring and Seminar Plan

For the implementation of online monitoring and seminar scheduled in the middle of January 2024, one (1) month after the first review activity in FY 2023, the Consultant prepared and submitted Detailed Online Monitoring and Seminar Plan for FY2023 as in Attachment-9 to JICA by the middle of December 2023 (one (1) month prior to its implementation).

The Detailed Online Monitoring and Seminar Plan includes the purpose, methodologies, time schedule, and agenda for both online monitoring and online seminar.

3-9-2 Implementation of Online Monitoring and Seminar

The Consultant held an online monitoring and seminar on January 17, 2024 from 13:35 to 16:35 Japan Time (10:05 to 13:05 Sri Lanka Time), following the agenda given in Table 3-5.

Table 3-5 Online Monitoring and Seminar Agenda on January 17, 2024

Time: Sri Lanka time (Japan time)	Description	Presenter
10:05-10:10 (13:35-13:40)	Opening address	[redacted]
10:10-10:13 (13:40-13:43)	Address by JICA	JICA [redacted]
10:13-10:16 (13:43-13:46)	Outline of online seminar	[redacted]
10:16-10:51 (13:46-14:21)	Online seminar: Diagnosis and Countermeasure (Repair) of Scoured Substructures for Railway Bridges	Railway Technical Research Institute, Japan
10:51-11:30 (14:21-15:00)	Online seminar: Q&A session	[redacted], [redacted]
11:30-11:40 (15:00-15:10)	Break	–
11:40-12:13 (15:10-15:43)	Online monitoring: Sharing the review results report.	[redacted]
12:13-13:00 (15:43-16:30)	Online monitoring: Discuss how to deal with the difficulties and constraints encountered by the training participants in order to continue implementing the action plans.	Chaired by [redacted]
13:00-13:05 (16:30-16:35)	Closing remarks	[redacted]

(1) Implementation of online seminar

The Consultant invited lecturers from the Railway Technical Research Institute (RTRI), Japan and provided a lecture titled "Diagnosis and Countermeasure (Repair) of Scoured Substructures for Railway Bridges".

One of the training participants introduced the bridge that was damaged due to the flood occurred in early January 2024 in Sri Lanka and raised the inquiry how to deal with the breakage of approach road behind the abutment due to the outflow of backfill soils.

The lecturers from the Railway Technical Research Institute (RTRI) responded that, in Japan, it is common to install steel sheet piles along the river in front of the bridge abutment, and then fill behind the sheet piles with backfill soil. The training participant asked how to drive the steel sheet piles below the bridge deck with small overhead clearance. The lecturer introduced the "Silent Piler" as a specialized equipment used in Japan, and the training participant understood this.

From another training participant, a question was raised about how to determine the riverbed repair area around the bridge pier subjected to local scouring, whether it is determined through hydraulic mathematical analysis.

The lecturers responded that RTRI basically designs the riverbed repair area in accordance with the design standard, specifying the range for riverbed protection from the edge of the structures such as pier wall and pier footing, which were determined from past experiences, not from the analysis.

In this way, the online seminar was successfully concluded with a lively question and answer session after the event related to the seminar theme occurred in Sri Lanka in early January 2024.

(2) Implementation of online monitoring

The Consultant introduced the review results to the training participants. Afterwards, each training participant provided an explanation on the implementation status of his/her action plan and horizontal expansion within his/her organization.

Thereafter, the Consultant shared ideas on how to deal with difficulties/ constraints/ challenges faced by the training participants, including the following:

1) Improvements on BMS/ BRMS

The issues with BMS/ BRMS raised by the training participants are as follows.

- When a bridge having a Health Index (HI) of 0 is reconstructed, if the data for the newly constructed bridge is entered into the system, the previous data will be overwritten (erased, not retained).
- For bridges that are widened with a different type of superstructure/ substructure from the original ones, only one (1) superstructure/ substructure type can be entered in the BMS. (The type of superstructure and substructure of the widened section cannot be entered.)
- The weighing factors in the calculation of the Health Index (HI) needs to be adjusted. In other words, when scouring is observed, regardless of extent and severity of scour, the subject bridge is given HI = 0 and is ranked high on the priority list for reconstruction.

However, some bridges experiencing small extent/ severity of scouring may only require repair or strengthening. There is no need to reconstruct the entire bridge.

- In the Bridge Repair and Maintenance System (BRMS), the priority of bridge repair and reconstruction does not consider the factors such as bridge length and width, water level under the bridge deck (overhead clearance below the bridge deck), and flow discharge.
- It is not possible to add new route names.

Some of the above issues may require a review of the bridge inspection and repair manuals, and the Consultant will report to and consult with JICA for future actions.

2) Provision of Japanese design specifications for highway bridges

The Consultant had the discussion with JICA considering the high demand from training participants and the necessity for implementing the action plan. As a result, it was decided to provide the English version of the Specifications for Highway Bridges (FY2012 edition), which is the latest English version currently available.

When the training participants for the training in Japan in FY2024 visit Japan, they will be handed over in person.

3) Languages used in lectures for the training in Japan

With the strong requests from the training participants, the Consultant asked the university professors to give lectures in English, and they agreed to provide the lectures in English.

For lectures and practices by the Consultant, the Consultant will arrange personnel fluent in English and provide a lecture/ explanation directly in English.

In this way, the Consultant confirmed the implementation status of the action plans and horizontal expansion, identified any difficulties and constraints encountered by the training participants, and then presented the corresponding measures to the training participants.

3-10 Public Relations Activity in FY2023

The Consultant discussed with JICA and decided to post an article about the training in Japan on the Facebook page of the JICA Sri Lanka Office as part of the public relations activities.

The Consultant sent the material through JICA Headquarters on October 19, 2023 and requested the JICA Sri Lanka to post it on Facebook. However, the sad article was not posted before February 2024.

3-11 Verification of Effectiveness of Training in Japan in FY2023

From the responses to the Questionnaire distributed to the training participants prior to the evaluation meeting, and the comments from participants at the evaluation meeting, it can be evaluated that the overall evaluation of the training in Japan in FY2023 by the participants was generally high. Moreover, from the responses to additional questions asked to the participants during the evaluation meeting (Attachment-6: Response from Training Participants on Achievement Level for Each Training Output in FY2023), it can be evaluated that the five outputs of the training in Japan were generally achieved in FY2023.

It is generally difficult to fully achieve the training goal, objectives, and outputs in a two-week training program in Japan. The training program in Japan is intended to give training participants awareness and opportunity to take initiative in developing and strengthening the capacity of their own organizations and themselves on bridge maintenance and management.

As a result of reviewing the implementation status of action plans in the review activity in the middle of December 2023 and interview with training participants in the online monitoring on January 17, 2024, it was confirmed that the training participants have been proactively implementing action plans to strengthen the capacity of RDA on bridge maintenance and management, including discussion with RDA higher management about procuring new equipment, review of existing bridge design standards to improve them, establishing new bridge maintenance teams in their respective provinces, and conducting practical training on bridge inspections and diagnosis at their respective regional offices. Moreover, it was turned out that all the training participants have applied the knowledge and experience gained through the training in Japan to their own day-to-day works in Sri Lanka, and also have carried out activities to convey such knowledge and experience to other staff members in their organizations who had not participated in the training in Japan.

As are given above, the training participants have been working to strengthen the capacity of bridge maintenance and management based on the awareness they gained from the training in Japan. It can be said that the training in Japan has been highly effective.

Even with some constraints such as poor weather conditions and busy working towards the end of the fiscal year, if the training participants continue working on the action plans in the mid to long term, the training in Japan will have a high ripple effect on the development and strengthening of capacity on bridge management in Sri Lanka.

3-12 Lessons Learned from the Training in Japan in FY 2023 and Approaches for Improving the Training in Japan in FY 2024

(1) Training contents

The training themes and contents specified in the Terms of Reference (ToR) were plentiful and extensive for the approximately two-week training period. To understand the training participants' needs and develop a suitable training program, an online interview will need to be conducted after the participants are nominated and determined. The interview should focus on understanding the details of their day-to-day work, issues and challenges, and desired training themes and contents.

According to the ToR, the preparation of a detailed training program (draft) begins three (3) months before the start of the training and is finalized one (1) month prior to the start of the training. This time schedule is considered appropriate as it is necessary to select and secure lecturers, as well as arrange sites and facilities for study tours.

For the new projects in the future, it is necessary that sufficient time be secured to nominate and determine the training participants before start of preparing the detailed training program (draft) and the ToR include a task to confirm “demands of the training participants on the training themes/ contents” through an online interview after the participants are determined.

For the preparation of detailed training program for FY2024, the Consultant will study the requests and demands from the training participants through the training in Japan in FY2023 and include

such requests and demands to the extent possible in consideration of given timeframe.

The approaches for handling each request in FY2024 are as follows.

1) Practical training on inspection and repair of an extradosed bridge

Although this was brought up at the feedback meeting, it would be difficult to conduct the on-the-job training for inspection and repair of an extradosed bridge that is on the road/ expressway in service, due to safety concern and necessity of traffic regulations. The Consultant will check the possibility of having the lecture and site visit on the Odawara Blue Way Bridge, which is the first extradosed bridge built and put into service in the world and Japan, with the administrator to see if there are any past repair records and that knowledge can be shared with the training participants.

2) Practical training on repair of other types of bridges

In the practical training on bridge repairs, there are still issues such as whether the bridge repair sites are in operation at the time of the training in Japan and approval from the road administrator can be obtained. The Consultant has conducted many bridge repair projects in Gifu Prefecture, and it is possible to explain the types of defects, damage and deterioration and details of repair works thereof, and show the bridge photos before and after the repair. The Consultant will study the possibility of arranging the said curriculum within the limited timeframe in coordination with other training curriculums.

3) Practical training on repair design of bridges

The practical training on bridge repair design involves the judgement of necessity of repair based on inspection and in-depth investigation results, selection of repair methods, and calculation of repair quantities. Considering the limited timeframe, it is possible to include the practical training only for simple bridge repair methods. The Consultant will study the possibility of arranging the said curriculum within the limited timeframe in coordination with other training curriculums.

4) Knowledge sharing related to the repair of bridges subjected to minor scouring

In FY2023, the Consultant invited lecturers from the Railway Technical Research Institute (RTRI), Japan to conduct a lecture titled "Diagnosis and Countermeasures (Repair) of Scoured Substructures for Railway Bridges" in the online seminar.

Since the online seminar is not held in FY 2024, the Consultant will study the possibility of arranging the said curriculum during the training period in Japan, in coordination with other training curriculums within the limited timeframe.

5) Aerial drone

In Gifu Prefecture, opportunities to use aerial drones have been increasing as part of the use of advanced technologies. In addition, the Consultant owns aerial drones and can pilot them to let the participants know the advantages and disadvantages of using aerial drones. The Consultant will study the possibility of arranging the said curriculum during the training period in Japan, in coordination with other training curriculums within the limited timeframe.

6) Infrastructure Museum at Gifu University

The Infrastructure Museum of Gifu University consists of large-scale models of civil structures and shows the construction process, including tunnel, concrete bridge, steel bridge, and embankment. It was established by "Gifu University Center for Infrastructure Asset Management Technology and Research (CIAM)", led by [redacted] of Gifu University, who gave the lecture in FY 2023. These facilities are available not only for a study tour but also for research on inspection and diagnosis, monitoring the behavior of structures, and training of bridge engineers through industry-government-academia collaboration.

Utilizing the Infrastructure Museum through industry-government-academia collaboration is considered effective in Sri Lanka for the future training of bridge engineers, as there were strong demands from the training participants. The Consultant will study the possibility of inclusion of a study tour to Infrastructure Museum at Gifu University in coordination with other training curriculums within the limited timeframe.

(2) Preparation and presentation of country report

For the training in Japan in FY2024, the Consultant will prepare the format and determine the limit of number of sheets for the country report and give guidance to the training participants how to prepare the country report. For the presentation, the Consultant will assign a timekeeper and manage the time strictly.

(3) Language used in lectures by training lecturers and interpretation

To secure the provision of easy-to-understand training contents to the training participants, the Consultant would like to adopt the following approaches in the training in Japan in FY2024.

- Lecturers, especially the university professors who are expected to give lectures with a high level of academic contents, are asked to give lectures in English to the extent possible.
- The Consultant will understand the interpretation ability of the training coordinator in the subject field.
- The Consultant will share the training material from the lecturers with the training coordinator at least one (1) month in advance, allowing the training coordinator to fully prepare.
- The Consultant will actively assist for the interpretation in collaboration with the training coordinator.

(4) Preparation and presentation of action plan

To prevent significant variation in terms of number of sheets and quality in the action plans, the Consultant would like to adopt the following approaches in the training in Japan in FY2024.

- The Consultant will prepare a format (table of contents and description to be given) and set a limit of number of sheets to be prepared for the Action Plan and provide guidance in the Guidance on Action Plan Preparation.
- The Consultant will assign a timekeeper and manage the time strictly.

(5) Implementation of evaluation meeting

The evaluation meeting is to distribute the Questionnaire to the training participants to hear from them about their views as to the details of the training program and curriculum, etc., and see the effectiveness of the training provided and refer the same as a reference for future trainings. The Consultant will secure sufficient time for the training participants to answer the Questionnaire and for the Consultant himself to organize all the answers before the evaluation meeting.

The following approaches will be taken for the training program for FY2024.

- Action plan presentation is scheduled on the morning of the last day.
- The evaluation meeting and closing ceremony are scheduled on the afternoon of the last day.
- The Consultant will provide guidance to the training participants on action plan preparation and training participants will prepare their action plans on all day before the last day.
- The Consultant will send the Questionnaire four (4) days before the evaluation meeting and collect the answers from the training participants two (2) days before the evaluation meeting.
- The Consultant will prepare the schedule for other curriculums in consideration of the above.

(6) Schedule of the training program

At the feedback meeting, it was pointed out that the training schedule was very tight.

In FY2023, lectures and practical training were basically given in Japanese by the lecturers through English interpretation. In response to the requests from training participants, the Consultant decided to implement the lectures and practical trainings directly in English to the extent possible in FY2024.

Therefore, the Consultant believes it is possible to have ample time in the training schedule. With this, the Consultant will be able to set the start time of the day’s training from 9:30 to 10:00 and the end time of 16:00 to 16:30, and to take a break between lectures and practical trainings not to give a burden to the training participants.

(7) Ensuring the initiative of training participants

In order to encourage training participants to actively participate in the training program, the Consultant will strive to create opportunities for training participants to take the initiative as follows:

- The Consultant will select a moderator from the training participants to prepare and present country reports and action plans.
- The Consultant will select a moderator from the training participants for discussion with international students from Osaka University on "Current status and issues of bridge management in Asian and African countries".

CHAPTER 4. Report on Training in Japan in Fiscal Year 2024

This chapter summarizes the results of a Country Focus Training for Capacity Development on Bridge Management in Japan held in FY2024.

4-1 Description of the Consulting Service in FY2024

1) Service Name: Consulting Service for Training in Japan on Capacity Development on Bridge Management for Democratic Socialist Republic of Sri Lanka (Country Focus Training)
2) Service Period: March 01, 2024 to November 29, 2024 (2nd year)
3) The Client: Japan International Cooperation Agency
4) The Consultant: Dainichi Consultant Inc. in Joint Venture with Dia Nippon Engineering Consultants Co., Ltd.

4-2 Review and Update of Inception Report in FY2024

The Consultant has reviewed the inception report prepared in FY2023 and confirmed no change was required.

4-3 Qualifications for Eligible Training Participants in FY2024

From lessons learned in FY2023, the Consultant maintained close contact with the JICA Sri Lanka Office with the cooperation of JICA Headquarters and JICA Kansai. Based on the goal, objectives and outputs of this training, and the experience of the training in FY2023, the Consultant studied the following "qualifications for eligible training participants" by the end of February 2024, approximately three (3) months before the start of the training in Japan in FY2024.

In order for the RDA, the road administrator in Sri Lanka, to achieve the five (5) outputs of this training, the Consultant considered the following positions and backgrounds/ experiences required for training participants of the training in Japan.

- A higher management in charge of bridge maintenance and management or a policy maker (Output-1)
- Bridge inspection practitioners (Output-2)
- Bridge repair design and construction practitioners (Output-3)
- Engineers who will be involved in the maintenance and management of the Golden Gate Kalyani Bridge (New Kelani Bridge), the first extradosed bridge and steel box girder bridge in Sri Lanka (Output-4)
- Those involved in training bridge engineers involved in bridge maintenance and management (Output-5)

All the 10 training participants in FY2023 were from Bridge Management & Assessment Unit (BM&AU) and Bridge Designs Office under Engineering Services Division of Road Development Authority (RDA), and there were no participation from institutions or departments responsible for design and operation of human resources development system for bridge engineers, or university faculty

members who act as lecturers for developing bridge engineers. In addition, it was found that almost all of the 10 training participants in FY2023 had previously participated in training in Japan.

Furthermore, considering the sustainability of the bridge maintenance and management capacity of RDA, it is not desirable for the training participants to leave RDA immediately after participating in training in Japan.

Other considerations included the JICA Global Agenda "Gender Equality and Women's Empowerment," and requirements stated in the Terms of Reference.

The qualifications for eligible training participants considered and proposed by the Consultant are given in Table 4-1.

Table 4-1 Proposed Qualifications for Eligible Training Participants in FY2024

No.	Qualifications	Output	Organization	Gender Perspective	Remarks
1	A higher management in charge of bridge maintenance and management or a policy maker	Output-1	Select a balanced mix of training participants from all levels, from policy makers/ executive officers, mid-level staff members, and field workers. Encourage participation from various organizations related to bridge maintenance and management.	Aim for a 50% female ratio. (JICA Global Agenda "Gender Equality and Women's Empowerment": New proposal)	
2	Engineers having at least one year bridge inspection experience.	Output-2			
3	Engineers having at least five years of experiences for new bridge design and construction for bridge repair.	Output-3			
4	Engineers who will be involved in the maintenance and management of the Golden Gate Kalyani Bridge (New Kelani Bridge), the first extradosed bridge and steel box girder bridge in Sri Lanka.	Output-4			
5	Those involved in training bridge engineers involved in bridge maintenance and management. Ex) staff in RDA Training Division, staff in RDA Planning Division, university faculty members.	Output-5			
6	Consent to work for at least five years at RDA or related organizations after the training in Japan.	Output-1 to Output-5			Suggestion
7	Applicants who have not previously participated in training in Japan.	-			Suggestion
8	Applicants who are in good health.	-			Requirement in ToR
9	Applicants who agree to the terms and conditions for manuscript preparation (copyright, etc.).	-			Requirement in ToR

After the qualifications for eligible training participants were suggested, the JICA Sri Lanka Office selected the training participants. However, such selection was difficult to the last minute before the start of the training in Japan, the Consultant could not have an opportunity to provide “advice on the determination of training participants”.

The training participants selected and determined by JICA Sri Lanka Office are given in Table 4-2.

Table 4-2 List of Training Participants in FY2024

No	Participant's Name	Job Title/ Position
1	[redacted]	Additional Director General (Engineering Services) Road Development Authority (RDA)
2	[redacted]	Senior Design Engineer Design Office (North Western Province) Provincial Director's Office Road Development Authority (RDA)
3	[redacted]	Additional Director Bridge Design Division Road Development Authority (RDA)
4	[redacted]	Design Engineer Bridge Designs Office, Engineering Services Division Road Development Authority (RDA)
5	[redacted]	Engineer Design Office - Kandy Road Development Authority (RDA)
6	[redacted]	Engineer Provincial Director's Office (Sabaragamuwa) Road Development Authority (RDA)
7	[redacted]	Engineer Bridge Management & Assessment Unit (BM&AU) Provincial Director's Office (Northern Province) Road Development Authority (RDA)
8	[redacted]	Design Engineer Bridge Designs Office, Structural Designs Division Road Development Authority (RDA)
9	[redacted]	Design Engineer Bridge Designs Office, Structural Designs Division Road Development Authority (RDA)
10	[redacted]	Design Engineer Design Office-Anuradhapura Road Development Authority (RDA)

As a result, all the training participants were selected from RDA and not from other related organizations.

4-4 Study and Preparation of Detailed Training Program for FY2024

Based on the training program for FY2023, and taking into account the lessons learned from the training in Japan in FY2023 and the approaches for incorporating them in the training program for FY2024, the Consultant, with the guidance of [redacted] at the Department of Civil Engineering, the Graduate School of Engineering, Osaka University, has studied the training program for FY2024 as follows.

(1) Training contents

The lectures on "Corrosion in Steel Bridges" and "Fatigue of RC Slab (Non-destructive Test)" were removed from the training program for FY2024, as there were comments from training participants in FY2023 that the lectures included the ones they had learned in the past.

The Consultant has received the comment from the road administrator that a practical training on the inspection and repair of an extradosed bridge on the expressway/ road in service was not possible due to safety reasons and traffic regulation, as well as the inability to adjust the schedule of inspection and repair work of the said bridge to coincide with the training period. However, since it was confirmed that Odawara Blue Way Bridge, the first extradosed bridge in the world, has records of several repairs in the past, the Consultant requested the road administrator, Isehara Maintenance and Customer Service Center of Central Nippon Expressway Company Limited to provide the lecture/ study tour and share the knowledge to the training participants.

A practical training on repair for other types of bridges could not be incorporated in the training program for FY2024 because no bridge repair sites were available during the training period.

The Consultant will organize practical training on bridge repair design including the quantity calculation for structural concrete restoration and crack injection methods based on the bridge defects maps.

For the repair of bridges subjected to minor scouring, the Consultant requested Railway Technical Research Institute (RTRI), Japan to more focus on the repair of bridge scouring and share the knowledge to the training participants, following the lecture titled “Diagnosis and Countermeasures (Repair) of Scoured Substructures for Railway Bridges” in the online seminar in FY2023.

The Consultant planned the practical training on the bridge inspection using an aerial drone on the bridge that the Consultant had obtained permission from the road administrator to use for training its employees. It includes a flight demonstration and an explanation of the advantages and disadvantages by the Consultant. A license is required to pilot an aerial drone in Japan and the training participants are not allowed to pilot.

The training participants in FY2023 desired to visit Infrastructure Museum at Gifu University, which was introduced as a system for training bridge engineers who involve in bridge maintenance and management through industry-government-academia collaboration. The said Infrastructure Museum consists of large-scale models of civil structures and shows the construction process, including tunnel, concrete bridge, steel bridge, and embankment. These facilities are available not only for a study tour but also for research on inspection and diagnosis as well as monitoring the behavior of structures, making it a model for training bridge engineers in Sri Lanka.

The Consultant requested [redacted] a Director of Center for Infrastructure Asset Management Technology and Research (CIAM) at Gifu University which operates and manages the Infrastructure Museum, to accept the study tour for the training participants from Sri Lanka and received the positive response.

As a new technology, the Consultant added practical training on a non-destructive testing solution that visualizes internal steel breakage of prestressed concrete structures with magnetic sensing and IoT (SenrigaN) developed by Konica Minolta.

Prior to the training in Japan in FY2024, one of the training participants in FY2023 requested training on verifying the reliability of inspection results using Finite Element Modelling (FEM). However, upon asking to [redacted] of Osaka University and [redacted] of Gifu University, it was confirmed that there was no track record of this in Japan. This training was not included.

(2) Language used in lectures by training lecturers and interpretation

To ensure that the training participants can correctly understand the lecture contents and make effective use of the time given, the Consultant decided to have the lecturers give their lectures in English. In particular, the Consultant requested university professors and associate professors to give lectures with advanced academic contents in English. In addition, for lectures given by the Consultant, the Consultant will give lectures directly in English by those who have language proficiency.

(3) Implementation of evaluation meeting

To implement an evaluation meeting in person in Japan, the Consultant has set up the schedule having one all day before the last day for guidance on action plan preparation by the Consultant and preparation of action plan by the training participants, and the last day for action plan presentation by the training participants in the morning as well as evaluation meeting and closing ceremony in the afternoon.

The Questionnaire Form to obtain feedback from the training participants to be used for evaluation meeting will be distributed to training participants on the Monday of the last week and the answers to the Questionnaire will be collected two (2) days before the evaluation meeting so that the said answers can be presented and shared at the evaluation meeting.

(4) Ensuring the initiative of training participants

To encourage the training participants to actively participate in the training program, the Consultant decided to select a moderator from the training participants in country report presentation, discussion with international students from Osaka University on "Current status and issues of bridge management in Asian and African countries", and action plan presentation.

(5) Schedule of the training program

In FY2024, training curriculums were scheduled mainly in the Kansai region in addition to two (2) training curriculums near Tokyo and practical training using the existing bridges in Gifu City, Gifu Prefecture. The Consultant therefore selected JICA Kansai as the training base, while the travel time increased. The Consultant requested JICA to extend the training period from two weeks to approximately 2.5 weeks and obtained the consent from JICA.

Considering the travel efficiency, the Consultant planned the lecture on maintenance and management of an extradosed bridge and site visit to Odawara Blue Way Bridge in Kanagawa Prefecture as well as the lecture by the Railway Technical Research Institute at JICA Tokyo as the training base for two days in the first week.

From the second week onwards, the training program was based at JICA Kansai and included lectures by professors and associate professors from several universities in the Kansai region as well as exchanges of opinions with international students from Osaka University on the theme “Current Situation & Issues on Bridge Management in Asian & African Countries”, and visits to Yokogawa Bridge Osaka Factory and Akashi Kaikyo Bridge.

For the first half of the third week, the Consultant planned to move to Gifu City and conduct in-

depth investigations using the existing bridges in service, as well as practical training on bridge inspection and bridge repair methods and materials. For the second half of the third week, the Consultant planned to return to JICA Kansai and implement Training Supplementary Programs.

It was pointed out in FY2023 that the training schedule was too tight. For the training program for FY2024, the Consultant requested the lecturers to give lectures and practical training directly in English as much as possible, which allowed us to have sufficient time for breaks in-between the curriculums as a whole.

In conclusion, the training contents are given in Attachment-13: Training Curriculums for FY2024. In addition, the Consultant developed a 2.5-week training program and compiled as given in Attachment-14: Schedule of Training in Japan in FY2024 (Detailed Training Program for FY2024 (Draft)) to implement these training contents.

As some organizations (particularly those related to the Ministries) require the official request through JICA for lectures, practices, and study tours in advance or have a designated point of contact for training requests, the Consultant discussed with JICA, confirmed such organizations, and coordinated the schedule.

The Consultant compiled these results into Attachment-15: Detailed Training Program for FY2024 (Final Version), including the location and address of training venues, travel routes to facilities and sites, mode of transportation, and other costs, and finalized the same approximately three (3) weeks prior to the start of the training in Japan.

4-5 Preparation for Implementation of Training in Japan in FY2024

4-5-1 Selection of Lecturers and Arrangement of Sites and Facilities for Study Tours

Based on the Detailed Training Program for FY2024 (Draft), the Consultant, with the assistance of [redacted], selected and secured lecturers and arranged the site visits as given in Table 4-3. In addition, the Consultant provided the lecturers and related facilities with information on the background and history of the training in Japan, as well as the objectives of the lectures, practical training, and study tours.

Table 4-3 List of Lecturers and Institutions in FY2024

Type of Training	Training Subject/ Theme	Lecturer/ Institution
Lecture	Diagnosis and Countermeasures (Repair) of Scoured Substructures for Railway Bridge	Railway Technical Research Institute
Lecture	Maintenance and Management of Odawara Blue Way Bridge	NEXCO Central
Study Tour	Odawara Blue Way Bridge	NEXCO Central
Lecture	Digital Asset Management: Introduction	Emeritus Professor [redacted] at Kyoto University
Lecture	Current Situation & Issues on Bridge Management in Asian & African Countries	International Students from Osaka University
Lecture	Human Resources Development System for Bridge Engineers (Industry-government-academia collaboration)	Professor [redacted] at Gifu University
Lecture	Statistical Deterioration Prediction Model Based on Actual Inspection Data	Specially Appointed Assistant Professor [redacted] at Osaka University
Lecture	Bridge Monitoring	Associate Professor [redacted] at Nagasaki University

Type of Training	Training Subject/ Theme	Lecturer/ Institution
Lecture	Planning and Design of Bridges for Better Maintenance	Dia Nippon Engineering Consultants Co., Ltd.
Lecture	Inspection, Diagnosis and Evaluation of Bridges	Dainichi Consultant Inc.
Lecture	Maintenance and Management of Prestressed Concrete (PC) Slab Bridge	Dainichi Consultant Inc.
Study Tour	Damaged Bridge Components, Causes of Deterioration, and Repair Methods at Ibaraki Technical Training Center	NEXCO West
Lecture	Bridge Repair Methods & Materials	Dainichi Consultant Inc.
Practice	Practical Training on Bridge Repair Design	Dainichi Consultant Inc.
Lecture	Inspection of Bridge Structures under Water	Dainichi Consultant Inc.
Lecture	Scour Survey	Dainichi Consultant Inc.
Study Tour	Akashi Kaikyo Bridge	Honshu-Shikoku Bridge Expressway Co., Ltd.
Lecture	Full Scale Drawing (From Drawing to 3D Modelling)	Yokogawa Bridge Osaka Factory
Study Tour	Factory Tour	Yokogawa Bridge Osaka Factory
Lecture	Quality Control for Steel Bridge Fabrication	Yokogawa Bridge Osaka Factory
Practice	Practical Training on Investigations Required for Bridge Repair Design	Dainichi Consultant Inc.
Practice	Learn about Bridge Repair Materials	Dainichi Consultant Inc.
Study Tour	Infrastructure Museum (Infrastructure Museum)	Center for Infrastructure Asset Management Technology and Research (CIAM) at Gifu University
Practice	Practical Training on Aerial Drone	Dainichi Consultant Inc.
Practice	Practical Training on River Scour Survey	Dainichi Consultant Inc.
Practice	Non-destructive Test on PC Bridge (SenrigaN)	Konica Minolta, Inc.
Lecture	Introduction of Bridge Maintenance Management System	Dia Nippon Engineering Consultants Co., Ltd.
Practice	Actual Inspection using a tablet	Dia Nippon Engineering Consultants Co., Ltd.

4-5-2 Assistance in Establishing a System for Prior Arrangements

The Detailed Training Program for FY2024 (Draft) included Central Nippon Expressway Company Limited (NEXCO Central), West Nippon Expressway Company Limited (NEXCO West), and Honshu-Shikoku Bridge Expressway Company Ltd. as destinations for lectures and study tours. For these three (3) institutions, JICA needed to communicate the basic information to the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) at least two (2) months before the start of the training in Japan for MLIT to examine how to respond to the requested training curriculums.

Therefore, the Consultant provided the required information to JICA Headquarters, such as background and purpose of the overall training, the background and purpose of the request to these three (3) institutions, the overall schedule of the training (draft), the nationality, number, and organization of the training participants, and whether or not high-ranked administrative officers participate.

4-5-3 Assistance in Preparing Country Report

The Consultant provided guidance online how to prepare the country report to the training participants two (2) weeks before the start of the training in Japan.

The Consultant prepared the format of Country Report with contents to be described and limit in number of sheets in advance and shared the same to the training participants. The Consultant also guided the

training participants (i) not to include the introduction of Sri Lanka in the country report as this is a country focus training, and (ii) to prepare the country report on the issues/ challenges given to each participant.

The country reports were submitted by all the training participants one (1) week before the start of the training in Japan.

4-6 Implementation of Training in Japan in FY2024

Prior to the implementation of the training in Japan, the Consultant established a Contact Details and Emergency Liaison Mechanism in FY2024.

4-6-1 Presentation of Country Report

The Consultant organized the opportunity for the training participants to present their country reports, which helped the Consultant to understand the current issues and future challenges on bride management in Sri Lanka and enhance the mutual understanding and sharing of the same among the participants.

From the lessons learned from the training program in FY2023, the Consultant prepared the prescribed format of Country Report and set a time limit for presentation in advance, which allowed us to manage presentation time well. In addition, the Consultant was able to have sufficient time to ask questions to training participants.

4-6-2 Lecture

The training in Japan lasted for approximately 2.5 weeks. In the first week, the Consultant organized the lecture titled “Diagnosis and Countermeasures (Repair) of Scoured Substructures for Railway Bridges” by lecturers from Railway Technical Research Institute (RTRI) at JICA Tokyo as well as the lecture titled “Maintenance and Management of Odawara Blue Way Bridge” by lecturers from Central Nippon Expressway Company Limited (NEXCO Central) at Isehara Maintenance and Customer Service Center.

In the second week, the training participants moved to JICA Kansai and were provided with lecturers by professors and an associate professor invited from Kyoto University, Gifu University, Nagasaki University and Osaka University, as well as by the Consultant. These were for establishing a management cycle and elemental techniques on maintenance and management, including Digital Asset Management, Human Resources Development System for Bridge Engineers (industry-government-academia collaboration), Statistical Deterioration Prediction Model Based on Actual Inspection Data, Bridge Monitoring, Planning and Design of Bridges for Better Maintenance, Inspection, Diagnosis and Evaluation of bridges, Maintenance and Management of Prestressed Concrete (PC) Slab Bridge that are the main bridge type constructed in Sri Lanka, Bridge Repair Methods and Materials, Inspection of Bridge Structures under Water and Scour Survey that are the current maintenance and management issues in Sri Lanka.

In the first half of the third week, the training participants moved to Gifu Prefecture, and the Consultant gave a lecture titled “Introduction of Bridge Maintenance Management System using a tablet system”.

4-6-3 Practice

The practical trainings were carried out by the Consultant at JICA Kansai in the middle of the second week, and at Uzura Ohashi Bridge, Oguma Takakuwa Ohashi Bridge, and Hachiman Ohashi Bridge, all

of which cross the Sakai River running through Gifu City, Gifu Prefecture, in the first half of the third week. These included practical training on bridge repair design, in-depth investigation necessary for bridge repair design (neutralization test, RC radar survey, Schmidt Hammer Test), structural concrete restoration work (polymer cement mortar) and concrete crack injection work (epoxy resin injection material) using models, flight demonstration of an aerial drone, scour survey with a boat, staff, hand lead line, and Fish Finder, non-destructive testing solution that visualizes internal steel breakage of prestressed concrete structures with magnetic sensing and IoT (SenrigaN), and inspection using an integrated tablet system.

The training participants had many inquiries about all the equipment used in the practical training and demonstration, including specifications, costs, and precautions for the work. In addition, there was a request from the training participants to provide one RC radar (rebar detection). It was apparent that there was a high level of interest from the training participants in utilizing these equipment and materials in Sri Lanka.

4-6-4 Study Tour to Sites and Facilities Related to Bridge Management

In order to enable the training participants to acquire more practical knowledge and skills, study tours to the following five (5) related facilities were conducted.

- Odawara Blue Way Bridge managed by NEXCO Central.
- Ibaraki Technical Training Center (I-TR) at NEXCO West.
- Akashi Kaikyo Bridge managed by Honshu-Shikoku Bridge Expressway Co., Ltd.
- Fabrication of steel girders at Osaka Factory, Yokogawa Bridge.
- Infrastructure Museum in Center for Infrastructure Asset Management Technology and Research (CIAM), Gifu University.

The training participants visited Odawara Blue Way Bridge located on Seisho Bypass in Odawara City, Kanagawa Prefecture, after attending a lecture on the morning of the same day. Since the bridge is currently in service, the participants did not get off the vehicle on the bridge for safety reasons, instead they observed the bridge from a distance from below the bridge. As was the same with the visit to Tsukuhara Bridge in FY2023, the training participants could not get of the vehicle and inspect the bridge on the expressway in service. However, there was no complaint from the training participants because they learned about the track records of maintenance and repair of Odawara Blue Way Bridge since its opening to traffic and received reference materials on the procedure for replacing stay cables during the lecture.

At Ibaraki Technical Training Center, the training participants learned the causes of damage and the corresponding repair methods, demonstrated through exhibits featuring cut-outs of damaged bridge components from the sites. They showed interest in the repair methods of reinforced concrete damaged by salt attack and actively asked questions and held discussions. They also showed a high level of interest in the “ultra-high durable slab (Dura-Slab)” using aramid fibre reinforced plastic (FRP) rods instead of steel reinforcement and prestressing steels, which are jointly developed by NEXCO West and Sumitomo Mitsui Construction Co., Ltd., as well as porous asphalt pavement used on the expressways.

The study tours to Akashi Kaikyo Bridge and Yokogawa Bridge Osaka Factory were conducted for the training participants to experience Japan's world-renowned long-span suspension bridge technology and

broaden the knowledge on manufacturing process of steel box girders and its quality control respectively, both of which cannot be experienced in Sri Lanka.

At the Infrastructure Museum, Gifu University, the training participants had a high level of interest in the exhibited structures of the steel bridge (including composite/ non-composite girders, pavement, RC/ PC deck slabs, deck waterproofing, surface painting, steel bearings, and jacks for replacing bridge bearings), prestressed concrete bridge (including laminated rubber bearings, transversal prestressing, upper edge anchorages, rubber bridge expansion joints, and concrete surface coated with surface penetrant material), embankment (mechanically-stabilized earth retaining wall with geogrid/ non-woven fabric, gravity retaining wall, concrete block retaining wall, embankment with light-weight material: urethane, ground anchor), and tunnel (sheet pile method, NATM method). The participants asked a lot of questions to [redacted] and [redacted] during the tour.

4-6-5 Preparation and Presentation of Action Plans

The Consultant prepared a prescribed format for the Action Plan, assigned the theme to each training participant, limited presentation time to seven (7) minutes and questions and answers session to five (5) minutes, and explained how to prepare the Action Plan during the guidance. The action plan included activities to be performed after the training in Japan by the training participant individually and as an organization, and in a short-term and a mid-to-long term. As a result, all the training participants prepared presentation material of approximately 10-12 pages.

The Consultant assigned a timekeeper to manage the presentation of action plans and Q&A session , and as a result the session could be completed as scheduled.

The outline of the action plans prepared by the training participants is given in Attachment-16: List of Action Plans Prepared by Training Participants in FY2024.

4-6-6 Distribution and Responses of Questionnaires

In order to obtain lessons learned from the training participants regarding the training program, the subjects and contents of the curriculums, the presentation and training materials made by the lecturers, the support from the Consultant and a coordinator, and the facilities at JICA Center for future training, JICA Kansai prepared a Questionnaire and distributed it to the training participants four (4) days before the evaluation meeting. Responses were submitted by all training participants two (2) days before the evaluation meeting.

The following were learned from the responses to the Questionnaire. Details of the questions and responses from the training participants are given in Attachment-17: Questionnaire and Responses from Training Participants in FY2024.

(1) Overall training program

All the training participants participated in the training in Japan with a thorough understanding of the goal, objectives and contents of the training, and responded that they achieved the training outputs and they will be able to utilize the knowledge and experience gained during the training in Japan in their day-to-day works in Sri Lanka.

However, the achievement levels of Output-3 (bridge repair methods) and Output-4 (inspection and repair methods for extradosed bridge and steel box girder bridge) were lower than those of the other Outputs. This is because the training participants could not receive practical trainings on inspection and repair of the extradosed bridge, and on the repair of other types of bridges.

Some training participants responded that they will not be able to utilize the knowledge and experience gained through the training in Japan in their daily work because the necessary equipment are not available in Sri Lanka.

All the training participants responded that the overall structure of the training program was appropriate.

Regarding the period of the training program, almost all the participants responded that two (2) weeks was appropriate, but some responded that four (4) weeks would have been better as the learning contents would have been more detailed regarding bridge maintenance and management.

As to the number of training participants in the training, almost all participants responded that 10 people was appropriate. However, there were some comments that more participants should be trained.

(2) Subjects and contents of the curriculums of the training in Japan

Almost all the training participants were satisfied with the subjects and contents of the training curriculum. Among the subjects and contents, the most useful were for digital asset management, bridge repair methods and materials in both lecture and practical training, learning about the causes of damage and repair methods through damaged bridge components exhibited at Ibaraki Technical Training Center, and bridge inspection using a tablet system.

On the other hand, subjects and contents of the curriculum that were not covered in the training but should have been covered included: (i) practical training on bridge inspection and repair having in-depth contents, (ii) study tour to bridge construction sites, (iii) inspection and repair of bridge bearings, and (iv) study tour to bridge repair/ rehabilitation sites.

(3) Lecturer's presentation, materials used and training support

For the presentations and explanations given by the lecturers and the presentation materials used, all the training participants responded that they were easy to understand and of high quality. Additionally, they indicated that the lecturers had excellent knowledge of their subjects and contents.

In FY2024, the Consultant requested the lecturers to give lectures directly in English as much as possible. In some lectures and practical training conducted by the Consultant, the lecturers explained in Japanese through an English interpreter. As a result, almost all training participants responded that the lectures by the lecturers and interpreters were easy to understand.

Almost all the training participants responded that the assistance provided by the training facilitator was “effective” indicating that the participants were very satisfied.

(4) Expectations for future collaboration with JICA

The training participants expressed the following expectations.

- I expect more trainings and assistance to Sri Lanka.
- Communication was very difficult without internet access. Kindly arrange for this, especially when we go outside JICA Centers and hotels.
- Please provide continuous support to us for developing our knowledge about the new technologies.
- If some different repair, retrofitting or any special works related bridges and roads are done in Japan, we also like to participate through any virtual platform for the discussion.
- We need assistance in providing equipment, and we expect your support in our country while we conduct training programs for other relevant personnel.

4-6-7 Evaluation Meeting

The evaluation meeting was planned and organized to share the responses to the Questionnaire among all the training participants, and for the Consultant to hear a wide range of opinions regarding the training program from the participants.

At the evaluation meeting, the Consultant received the following messages in addition to the responses to the Questionnaire.

- In general, the training participants should have been provided with a trainee guidebook (Kenshu-in Guidebook) and an introduction to basic living in Japan (CD) by JICA Sri Lanka Office before we leave for Japan, but these were not provided this time.
- The training schedule was tight and tough to follow. We expected to have Japanese classes and to participate in Japanese cultural activities such as a tea ceremony, practice of wearing a kimono, and Japanese calligraphy at JICA Kansai.

4-6-8 Feedback Meeting

The feedback meeting was held on June 18, 2024 online with the attendance of JICA Headquarters, JICA Kansai, and the Consultant to discuss the issues to be improved and reflected to the future training program in response to the responses to the Questionnaire and the results of the evaluation meeting.

As the lessons learned from the training program for FY2023 were incorporated in FY2024, there were no major issues at the feedback meeting in FY2024, except the following comments.

(1) Training schedule

In FY2024, there were a lot of travels from Tokyo to Kobe, Kobe to Gifu, and Gifu to Kobe, and the training participants needed to pack and find a place to eat at each destination. It has become a burden for them. It was also pointed out that the training participants could not have enough free time because they moved on weekends.

From the experience in FY2023, the Consultant prepared the training program to allow ample time with extended training period to approximately 2.5 weeks, giving a break in-between the

curriculums, and starting time at 10:00 and ending time at 16:00-16:30. However, one of the training participants pointed out that the schedule was too tight. At the feedback meeting, there were different opinions from the attendees that the schedule was tight and not too tight. Considering the purpose of the training in Japan, the training schedule for FY2024 seemed to be just the right one.

(2) Dietary restrictions by religions

There was a question that securing food was an issue for training participants comprising Buddhists, Hindus and a Muslim in FY2024.

During the training program at JICA Center, there was no issue as Halal foods and vegetarian foods are served in the cafeteria. However, when the training program was outside JICA Center, it was difficult to secure foods that meet religious dietary restrictions or were suitable for vegetarians. The Consultant requested the training participants to purchase and bring foods in advance if necessary. As a result, there were no complaints from the training participants.

(3) Dining during lunch break outside JICA facilities

If the training participants go to a restaurant for lunch on the way to the destination for a study tour or a lecture outside JICA Center, the cost of the meal would be high, and it would be time-consuming to choose the meal and wait, which could have delayed their arrival at the destination. Therefore, the Consultant decided to stop at a convenience store, buy food and eat it in the car.

At the feedback meeting, it was pointed out that the Consultant should have arranged a place for the training participants to eat at a table.

(4) Safety equipment

As a safety measure, the Consultant provided the training participants with work clothes and helmets that would be needed for practical trainings and study tours to related facilities. However, it is not advisable to carry the helmets when moving to training sites, as there is a risk that the equipment will be lost.

It was pointed out that the Consultant should have considered sending the equipment by courier or borrowing it at the destination of a study tour or a practical training.

4-7 Schedule Adjustment for Training Supplementary Programs in FY2024

The Consultant has adjusted the time schedule for the lectures, practices, and study tours to related facilities and activities so that the JICA Kansai can implement the training supplementary programs listed in Table 4-4 without any schedule conflicts.

Table 4-4 Training Supplementary Programs for FY2024

No.	Supplementary Program	Schedule	Description
1	Briefing	At the start of the training in Japan	• Briefing on the status of each training participant, how to use cash card and medical card, transportation in Japan, etc., and verification of passport and visa expiration.
2	Program Orientation	At the start of the training in Japan	• Explanation about the training program schedule, goal, purpose and objectives, outline, and precautions.
3	Evaluation Meeting	Before departure	• Hear from the training participants about their views as to the details of the training program and curriculum, etc. to see the effectiveness of the training provided and refer the same as a reference for future trainings. The training participants will be asked to fill out the prescribed questionnaire in advance.
4	Closing Ceremony	Before departure	• JICA will award a "Certificate of Completion" to training participants who have successfully completed the training and have met JICA's criteria for certificate.

4-8 Review Activity in FY2024

In order to contribute to the development and strengthening of bridge maintenance and management capacity of Road Development Authority (RDA) and their organizations, the training participants compiled the actions to be implemented after they return to Sri Lanka, utilizing the knowledge and experience on bridge inspection, diagnosis, in-depth investigation, and repair as well as an understanding of bridge asset management gained during the training in Japan.

The Consultant conducted a review with the purpose of confirming the status of the horizontal expansion of the said knowledge and experience as well as the implementation status of the action plans.

4-8-1 Development of Review Plan

The Consultant prepared the Review Plan for FY2024 as in Attachment-18 for the review activity scheduled in the beginning of September 2024 (three (3) months after the end of training in Japan in FY2024) and submitted it to JICA by the beginning of July 2024, one (1) month prior to the implementation of review (two (2) months after the end of the training in Japan in FY2024).

The review plan included (i) the date and time of the review implementation, (ii) the method of the review, (iii) the format for the training participants to report the implementation status of the action plan in Sri Lanka (Review Questionnaire Form), (iv) the deadline for submitting the Review Questionnaire Form. The Review Questionnaire Form involves the activities planned in the action plan, activities already conducted to date, the effects/ influences of the activities to the organization, activities that were planned but could not be implemented and the reasons/ causes thereof, future activity plans, and activities that were not planned in the action plan but conducted, influence of the training in Japan to the participant him/ herself, and other free comments such as the need for support from the Japanese side and suggestions for improvement in the future JICA training programs.

The Consultant sent the training participants the review plan and Review Questionnaire Form on August 19, 2024, and requested that completed written forms must be submitted by September 09, 2024.

4-8-2 Implementation of Reviews

The Consultant conducted a review based on the written Review Questionnaire Form received by September 09, 2024.

(1) Method of review

The Consultant conducted the review in accordance with the following method.

a. The activities described in the Review Questionnaire Form from each training participant were qualitatively evaluated in 4 stages.

b. The implementation status was evaluated based on the planned action plans of each training participant prepared during the training in Japan.

c. Confirmed the activities already completed in the action plan.

d. Confirmed the reasons/ causes for activities that were planned but could not be completed.

e. Confirmed the activities that were not included in the action plan and implemented such as horizontal expansion of knowledge and experiences within the organization.

f. Organized free comments, requests for support, or others from training participants.

(2) Review results

The evaluation results for the activities outlined in the Review Questionnaire Form submitted by the training participants were as given in Table 4-5. The evaluation results are distributed among the top three (3) out of four (4) stages. In FY2023, some training participants who received relatively low evaluation replied that they could not fulfill the planned activities due to poor weather conditions during the rainy season. However, in FY2024, the Consultant believed that the training participants were able to carry out the activities planned in the action plan smoothly without being affected by rainfall in the dry season.

In consideration of these circumstances, the Consultant can evaluate that all the training participants earnestly engaged in activities planned in the action plan.

Table 4-5 Evaluation Results in FY2024

Rating	Very Good	Good	Satisfactory	Unsatisfactory
Response	1	7	2	0
(%)	10%	70%	20%	0%

The main achievements recorded in the written Review Questionnaire Form are given below.

- The board papers were submitted to the RDA Board of Directors for approval to purchase the required equipment for bridge inspection in each Province.
- A report has been submitted for transfer of trained technical personnel to BM&AU.
- A total budget allocation of LKR 5.26 billion for bridge management related activities was requested to the Treasury of MOF in the Annual Budget Plan 2025.
- 180 days Bridge Inspection Program for all the Provinces was developed to update databases of BM&AU.
- Coordination between design staff and maintenance staff was conducted based on proper guidance and checklist.
- Bridge inspections were improved to follow the proper inspection schedule and checklist.
- RDA Management was convinced by discussion with 12 engineers who participated in

trainings in Japan on the necessity of equipment.

- Knowledge was shared with young bridge design engineers. A few seminars were organized for interested engineers in RDA Head Office.
- Method statements for cleaning bridge decks and repairing bridge expansion joints were developed.
- The situation has been improved on vehicles and fuel used for bridge inspections.
- The present database was studied to develop a new database.
- Quantity surveyors were trained on bridge repair methods.
- Waterproofing was added on bridge deck designs and included in Bill of Quantity (BoQ) items in the recent estimate.
- A comprehensive article is in preparation to be published in an annual RDA Engineers Association Magazine.
- Instructions were given to Provincial Directors to utilize BM&AU engineers attached to Provincial Offices only for BM&AU activities.

On the other hand, the following factors were cited as constraints on the implementation of the action plans.

- Postponement of internal personnel transfer (personnel change) affected by the Presidential Election held on 21 September 2024.
- Difficulty in managing time due to other organizational work.
- Decrease of capable and experienced engineers in RDA.
- Difficulty in inspecting the soffit of bridge deck due to constant water flow throughout the year (Northern Province). In some areas, bridge inspection access is limited (North Central Province).
- Current difficult economic situation in Sri Lanka.

Additionally, for other significant feedback from the training participants, the following two (2) comments were received:

- It was reported that the importance of inspecting the defects in drainage facilities and bridge expansion joints in bridge maintenance was recognized anew. It is believed that the contents of the lectures in Japan were properly understood.
- It was also reported that RDA executives came to understand that proper maintenance is necessary to use bridges safely for a long time. It is a great achievement.

(3) Suggestions/ encouragements from the Consultant

All the training participants submitted the answers to the Review Questionnaire Form. The Consultant expresses gratitude for their cooperation to the review activity.

Judging from the answers submitted by the training participants, it was highly evaluated that all the training participants have earnestly conducted activities in line with their Action Plans after they

returned to Sri Lanka.

There seems to be no doubt that the training participants have been applying knowledge and experiences obtained during JICA training in Japan in their services and disseminating such knowledge to other colleagues. If all the training participants continue activities based on their action plans in the mid to long term, the effects of JICA training would contribute to the gradual improvement of capacity not only training participants but also their organizations.

It was confirmed that issues, challenges and opinions were exchanged between the design staff and maintenance staff after the training program in Japan in FY2023 and FY2024. The Consultant expects that highly durable bridge designs will be realized in the future. It is highly recommended that the BM&AU staff have opportunities to give feedback to the bridge design staff based on the findings from bridge inspection and diagnosis.

The Consultant suggests that the training participants write reports/ articles regularly in RDA Engineers Association Magazine. Such public relations activities will be an opportunity for BM&AU staff to have pride in their work and it will be important to raise awareness of the importance of bridge maintenance and management for RDA management and engineers.

4-8-3 Sharing Review Results with Training Participants

The Consultant shared the review results mentioned above with the training participants online on September 26, 2024.

4-8-4 Preparation and Submission of Review Related Reports

The Consultant prepared the Review Results Report for FY2024 as in Attachment-19 and submitted the same to JICA on September 30, 2024.

4-9 Public Relations Activity in FY2024

From the experience of training in FY2023, in order for RDA to enhance the capacity of bridge maintenance and management, the Consultant recognized that it is essential to (i) procure the necessary materials and equipment and secure sufficient financial resources for bridge maintenance and management, (ii) promote understanding of the importance of bridge maintenance and management within RDA, (iii) promote participation of RDA engineers in bridge maintenance and management, and (iv) elicit understanding of bridge maintenance and management activities as well as cooperation from the Sri Lankan people. Therefore, the Consultant planned the public relations activities in Sri Lanka and carried out two (2) activities given in Table 4-6.

Table 4-6 Public Relations (PR) Activities and Its Purpose and Target Audiences

No.	PR Activity	Purpose	Target Audience
1	Posting the articles about the Training in Japan on RDA website	• To solicit understanding of the importance of bridge maintenance and management. • To solicit understanding for allocation of sufficient budget for bridge maintenance. • To encourage RDA staff to participate in bridge maintenance activities.	• Ministry of Finance (MoF) • Ministry of Transport and Highways (MoTH) • RDA Staff
2	Publishing the Articles about Training in Japan on local newspapers	• To solicit understanding of the importance of bridge maintenance. • To solicit understanding and cooperation for bridge maintenance activities of RDA.	• Sri Lankan people

(1) Posting articles about Training in Japan on RDA website

After the training in Japan in FY2024, the Consultant prepared a draft article and finalized it with incorporation of feedback from the training participants. A request letter was sent from the JICA Supervising Officer to the Director General of RDA on July 11, 2024 to have the article published on the RDA website, and the article was published on July 15, 2024. The published article is given in Attachment-23.

(2) Publishing articles about Training in Japan on local newspapers

After posting an article about the training in Japan on RDA website, the Consultant has worked to have the article published on local newspapers in order to elicit understanding of the importance of bridge maintenance and RDA's activities as well as cooperation from the people of Sri Lanka.

The Consultant received the advice from RDA that the selection of the newspaper is of great importance to maximize the effectiveness of public relations activities. Therefore, the Consultant developed the following criteria for selection of local newspapers.

- Government newspapers will be basically selected for high reliability thereof compared to private newspapers.
- The target audience will be the general public. Therefore, newspapers with a high number of copies printed will be selected. Additionally, the Consultant will consider publications in three different languages, namely English, Sinhala, and Tamil.
- To ensure easy access to the specific article, the number of pages and supplementary materials should be kept to a minimum. A weekday newspaper is preferred rather than a weekend newspaper.

As a result, the Consultant selected three newspapers: Daily News for English, Dinamina for Sinhala, and Thinakaran for Tamil.

When an article is published on a local newspaper, the Ministry of Transport and Highways (MoTH) and RDA may receive inquiries about the article from the public. Therefore, RDA advised the Consultant to send a letter to the Secretary of the Ministry of Transport and Highways (MoTH) to obtain the consent in advance.

Following this advice, a request letter was sent from the JICA Supervising Officer to the Secretary of the Ministry of Transport and Highways (MoTH) for his consent on October 03, 2024 and the approval letter was received on October 23, 2024. A newspaper article was finally published on Daily News (English) and Dinamina (Sinhala) on November 12,2024 and on Thinakaran (Tamil) on November 14, 2024. The published articles are given in Attachment-24.

4-10 Verification of Effectiveness of Training in Japan in FY2024

Based on the responses to the Questionnaire distributed to the training participants prior to the evaluation meeting in FY2024 and the comments from the training participants at the evaluation meeting, it can be said that the evaluation of the training program for FY2024 was generally high. In addition, it can be said that the five outputs were largely achieved by all of the training participants.

From the review results conducted in the middle of September 2024 and comments from the training participants at the review result sharing meeting held in late September 2024, it was found that the training participants were proactively implementing their action plans despite being busy with other organizational works.

Among the training participants in FY2024, there was an Additional Director General (Engineering Services) of RDA, whose leadership and guidance helped the participants implement many of the action plans, from the preparation of action plans to the implementation of the action plans after returning Sri Lanka.

The Additional Director General (Engineering Services) himself has been actively engaged with RDA higher management and other relevant ministries and agencies, including (i) preparation and submission of documents for RDA board meetings regarding the procurement of equipment related to bridge maintenance and the transfer of trained personnel to BM&AU, (ii) preparation and submission of a concept paper requesting the Ministry of Transport and Highways (MoTH) to establish a new budget item dedicated to bridge maintenance and management and to increase the budget thereof, and (iii) proposal to the Department of External Resources (ERD) on grants and technical cooperation from international organizations. Other training participants have taken the initiative to improve the day-to-day bridge maintenance and management operations including (i) sharing the knowledge and experience gained through training in Japan within their organizations, (ii) establishment of a system to provide feedback to bridge design engineers on the knowledge gained through bridge maintenance and management, and (iii) preparation of method statements for maintenance of bridge deck slabs and bridge expansion joints.

Moreover, during the review activity in FY2024, it was found that it is under the preparation of a seminar titled "Bridge Management in RDA, Sri Lanka" scheduled in the middle of December 2024 with the participation of all RDA staff and publishing an article about the training in Japan in the RDA Engineers Association Magazine scheduled in April 2025.

In this way, the training participants gained new insights through their approximately two-week training in Japan and have continued to work energetically to enhance the capacity of bridge maintenance and management of their own organizations and themselves after they returned to Sri Lanka. It can be said that the training in Japan was highly effective. Furthermore, the training participants reported the results of the training in Japan to RDA higher management and they have recognized the importance of proper maintenance to extend the service life of bridges. It is expected to have a significant ripple effect in the mid to long term.

4-11 Lessons Learned from the Training in Japan and Suggestions for Future JICA Training Programs

This consulting service was to provide a two-week training in Japan (country focus training) with its associated activities for 10 officials from Road Development Authority (RDA) of Sri Lanka in each FY2023 and FY2024 respectively to enhance the capacity of RDA on bridge management.

At the end of the training program for FY2023, lessons learned were compiled and reflected in the training program for FY2024. From the experiences of training in Japan in FY2023 and FY2024, the Consultant has learned lessons and will summarize the recommendations/ suggestions as below for future JICA training programs.

(1) Prior acquisition of requests from training participants for training contents/ curriculums

In the first fiscal year in FY2023, the Consultant developed the training program based on the training contents specified in ToR. However, the training participants in FY2023 requested improvements on and additions to the training contents/ curriculums proposed by the Consultant as the training curriculums in FY2023 included the contents already learned in the past training and did not include demanded curriculums such as practical training on bridge repair design and bridge repair work.

To enable the Consultant to prepare the training program that meet the demands of training participants from the first year, it is highly recommended that the demands on the training contents/ curriculums from the counterparts in the beneficiary country be collected in advance by the local JICA Office and attached in Tender Documents in addition to the ToR when bidding.

(2) Training program for multiple years

Related to the above (1), in one-year training program in Japan, it will be difficult to achieve the training outputs if the training program is not prepared fully meeting the demands of the training participants, though the ToR provides the outline of the required training contents. Therefore, it is recommended that the training program in Japan be for multiple years so that the Consultant can obtain the feedback from the training participants in the first year and develop a training program for subsequent years that addresses the issues from the feedback as well as ensure achieving the training outputs.

(3) Language used for lectures

In FY2023, the lecturers provided lectures in Japanese through English interpretation and some of the training participants pointed out that they could not understand the English interpretation and the time could not be used efficiently within the given two-week duration. Lectures through English interpretation take twice as long, and the number of curriculums must be reduced in the limited training period, which reduces efficiency. In addition, in an effort to complete the necessary curriculums, the daily schedule can become very tight, from early morning to late evening.

It is recommended that the lectures be generally conducted in the official language of the beneficiary country or in English and interpreters be used to the minimum necessary.

(4) Composition of training participants

The Additional Director General (Engineering Services) of RDA participated in the training in Japan in FY2024.

The Review Results Report for FY2024 showed that the implementation of the action plans was highly successful. It is considered that a common understanding of issues and action plans with the Additional Director General (Engineering Services) along with the ability to seek advice and support as needed facilitated active sharing of knowledge and experience gained through the training in Japan within their organizations and implementation of action plans by the training participants. The Additional Director General himself prepared and submitted documents for RDA board meetings and actively engaged with RDA higher management and other relevant ministries and agencies for enhancing the capacity of RDA on bridge management. These initiatives have

contributed to the achievement of training outputs and will have a significant ripple effect in the mid to long term.

In the future JICA training programs, it is considered highly effective that the higher management officer(s) participate in the training together with other participants.

(5) Training program with ample time

If the training program is too packed, it becomes difficult for the training participants to understand and process all the information. As a result, there is a high possibility of leading to a decline in motivation. Furthermore, if the training participants feel distressed by the training, they will lose their motivation to acquire new knowledge and skills. In order to maintain and improve the effectiveness of the training, it is important to provide an appropriate amount of information and create an environment in which it can be absorbed. Moreover, too much information can conversely reduce the ability to comprehend meaning and impair the learning effect. Appropriate breaks are essential to deepen understanding during the training.

It is recommended that one training session/ curriculum be limited to 90 minutes or less with a break of 10 to 15 minutes in between and training time for a day be limited to six (6) hours so that the training participants can keep their concentration in a session/ curriculum and avoid reducing the effectiveness of their learning due to fatigue and stress.

(6) Support from local JICA Office in public relations activity

In this consulting service, the Consultant had to carry out the public relations (PR) activities from Japan. In order to enhance the capacity of RDA on bridge management, it is considered important to procure the necessary materials and equipment for bridge maintenance and management, secure sufficient financial resources, promote the understanding and participation of RDA engineers in bridge maintenance and management, and elicit understanding of bridge maintenance and management activities as well as cooperation from the people of Sri Lanka. Therefore, the Consultant decided that PR activities be carried out in Sri Lanka.

When conducting PR activities in the beneficiary country, using social media operated by the local JICA Office, posting an article on the counterpart website, and/or publishing an article on local newspapers would be possible options. Publishing an article on local newspapers would require prior explanation to and approval from the relevant organizations. The Consultant will basically request the training participants to cooperate in public relations activities and take an active role in them. However, support from the local JICA Office may also be effective in some cases.

It is suggested ToR clearly specify that support will be provided by the local JICA Office so that the Consultant can securely carry out the PR activities, if the consulting service for training programs includes public relations activities in the beneficiary country from Japan.

(7) Provision of Kenshu-in Guidebook and an introduction to basic living in Japan (CD)

There was a request from the training participants in FY2024 that they would have liked to be provided with a "Trainee Guidebook (Kenshu-in Guidebook)" and a "Japanese Language Textbook and CD ("Simple Conversation in Japanese")" before coming to Japan. According to information from a JICA coordinator, these seem to be available at the local JICA Office for the training

participants who will be coming to Japan.

In the future training programs, it is recommended that Kenshu-in Guidebook be provided to the training participants so that they can spend time efficiently in Japan.

Attachment-1: Training Curriculums for FY2023

Training Program Curriculum	Type of Training	Lecturers	Description
Digital Asset Management: Introduction	Lecture	Emeritus Professor [redacted] at Kyoto University	• Introduction of the definition of asset management and examples of asset management in Japan and overseas. • Overview of the concept of digital asset management, which is an advanced research example.
Current Situation & Issues on Bridge Management in Asian & African Countries	Lecture	International Students from Osaka University	• Current issues and challenges on road and bridge management in developing countries by the international students at Osaka University under JICA's Road Asset Management Platform (RAMP). • Exchange of views on road and bridge management among the training participants from Sri Lanka and international students.
Human Resources Development System for Bridge Engineers (Industry-government-academia collaboration)	Lecture	Professor [redacted] at Gifu University	• Outline of the training course for infrastructure maintenance expert (ME) at Gifu University. • Industry-government-academia collaboration on training the MEs.
Bridge Monitoring	Lecture	Associate Professor [redacted] at Nagasaki University	• Outline of the bridge monitoring based on the vibration characteristics and examples of social implementation on existing bridges in service. • Example of the vibration monitoring as well as diagnosis method by image measurements and artificial intelligence (AI) in Laos.
Damaged Bridge Components, Causes of Deterioration, and Repair Methods	Study Tour	NEXCO West	• Visit the Ibaraki Technical Training Center to see damaged bridge components exhibited and learn about the causes of damage and repair methods.
Maintenance and Management of Tsukuhara Bridge (Extradosed Bridge)	Lecture	NEXCO West	• Overview of maintenance and management of an extradosed bridge. ✓ Types of defects, damage, and deterioration detected on extradosed bridges ✓ Inspection methods and points of attention on inspection. ✓ Diagnosis and points of attention on diagnosis. ✓ Repair methods of each type of defect, damage, and deterioration, materials and equipment used, budget. ✓ Bridge management plan
Extradosed Bridge Site (Tsukuhara Bridge)	Study Tour	NEXCO West	• Site visit to Tsukuhara Bridge (extradosed bridge) with explanation of bridge maintenance and management.
Statistical Deterioration Prediction Model Based on Actual Inspection Data	Lecture	Professor [redacted] at Osaka University	• Outline of the statistical deterioration prediction method using visual inspection records (Markov deterioration hazard model). • Database of input data necessary for deterioration prediction and interpretation of the outputs.
Corrosion in Steel Bridges	Lecture	Associate Professor [redacted] at Osaka University	• Overview of the corrosion mechanism, focusing on steel bridges, particularly the girder ends. • Introduction of corrosion prevention methods. • Introduction of cutting-edge technologies with practical applicability, such as the estimation of corrosion levels using AI image processing and advanced techniques like heat-induced anti-corrosion paint removal.

Training Program Curriculum	Type of Training	Lecturers	Description
Fatigue of RC Slab (Non-destructive Test)	Lecture	Assistant Professor [redacted] at Osaka University	• Overview explanation of the fatigue generation mechanism and actual damage cases related to reinforced concrete (RC) deck slabs. • Lecture on non-destructive test methods for horizontal crack assessment within RC deck slab using techniques like elastic wave method, as well as acoustic emission (AE) method and electromagnetic induction methods.
Akashi-Kaikyo Bridge	Study Tour	Honshu-Shikoku Bridge Expressway Co., Ltd.	• Experience a world-class suspension bridge in Japan
Full Scale Drawing (From Drawing to 3D Modelling)	Lecture	Yokogawa Bridge Osaka Factory	• Introduce full scale drawing. • Explain the overview of 3D modeling from drawing.
Factory Tour	Study Tour	Yokogawa Bridge Osaka Factory	• Factory tour in fabrication of steel girder.
Quality Control for Steel Bridge Fabrication	Lecture	Yokogawa Bridge Osaka Factory	• Factory fabrication process and inspection of steel bridges. • Dimensional control and non-destructive testing of welding.
Inspection, Diagnosis and Evaluation of Bridges	Lecture	Dainichi Consultant Inc.	• Basics of bridge inspection and diagnosis (maintenance cycle). • Type of defects, damage, and deterioration detected on each bridge type. • Repair design of defects, damage, and deterioration (costs included).
Maintenance and Management of Prestressed Concrete (PC) Slab Bridge	Lecture	Dainichi Consultant Inc.	• Management of pre-stressed concrete slab bridges (construction, inspection, diagnosis, repair, recording)
Bridge Repair Methods & Materials	Lecture	Dainichi Consultant Inc.	• Structural concrete restoration (Polymer-modified Cement Mortar). • Crack injection method (Epoxy-Resin)
Practical Training on Investigations Required for Repair Design	Practice	Dainichi Consultant Inc.	• Neutralization test • RC radar survey • Schmidt hammer test (compressive strength estimation)
Learn about Bridge Repair Materials	Practice	Dainichi Consultant Inc.	• Structural concrete restoration (Polymer-modified Cement Mortar). • Crack injection method (Epoxy-Resin).
Inspection of Bridge Structures under Water	Lecture	Dainichi Consultant Inc.	• Inspection of structures under water in Japan. • Example of bridge foundation scouring in Gifu Prefecture
Scour Survey	Lecture	Dainichi Consultant Inc.	• Methods for scour survey. • Preparation of scour survey.
Practical Training on River Scour Survey	Practice	Dainichi Consultant Inc.	• Scouring survey by boat & hand lead meter. • Safety measures (Toolbox Meeting). • Operate underwater drone from the shore and view actual images.
Introduction of Bridge Maintenance Management System	Lecture	Dia Nippon Engineering Consultants Co., Ltd.	• Introduction of integrated tablet system that combines bridge inspection and diagnosis with support for damage cause presumption and remedial measure methods selection.

Training Program Curriculum	Type of Training	Lecturers	Description
Actual Inspection using a Tablet	Practice	Dia Nippon Engineering Consultants Co., Ltd.	• Inspection practice using an integrated tablet system.
Planning and Design of Bridges for Better Maintenance	Lecture	Dia Nippon Engineering Consultants Co., Ltd.	• Planning and design of the bridges not to expedite the defects, damage, and deterioration.

Attachment-2: Schedule of Training in Japan in FY 2023 (Detailed Training Program for FY2023 (Draft))

Day		Time	Type of Training	Training Details	Lecturer	Training Venue
8/27	Sun.	-	-	Arrival at Kansai International Airport		
Day 1 (8/28)	Mon.	10:00-12:00		Briefing		JICA Kansai
		12:00-13:00		Lunch (JICA Kansai Cafeteria)		
		13:00-15:15	Presentation	Country Report Presentation		JICA Kansai
		15:30-17:30	Lecture	Digital Asset Management: Introduction	Emeritus Professor [redacted] at Kyoto University	JICA Kansai
Day 2 (8/29)	Tue.	09:30-12:00	Lecture	Current Situation & Issues on Bridge Management in Asian & African Countries	International Students from Osaka University	JICA Kansai
		12:00-13:00		Lunch (JICA Kansai Cafeteria)		
		13:00-15:00	Lecture	Human Resources Development System for Bridge Engineers (industry-government-academia collaboration)	Professor [redacted] Gifu University	JICA Kansai
		15:20-17:20	Lecture	Bridge Monitoring	Associate Professor [redacted] at Nagasaki University	JICA Kansai
		17:20-18:00		Accommodation Fee Withdrawal		
Day 3 (8/30)	Wed.	09:00-09:50		Travel (JICA Kansai → Ibaraki Technical Training Center)		
		10:00-12:00	Study Tour	Damaged Bridge Components, Causes of Deterioration, and Repair Methods	NEXCO West, [redacted] (Manager)	Ibaraki Technical Training Center
		12:00-14:00		Lunch and Travel (Ibaraki Technical Training Center → Kobe Expressway Office)		
		14:00-15:00	Lecture	Maintenance and Management of Tsukuhara Bridge (Extradosed Bridge)	NEXCO West, [redacted] (Manager)	Kobe Expressway Office
		15:00-16:00		Travel (Kobe Expressway Office → Tsukuhara Lake Observatory Parking Lot → (15-minute walk) → Tsukuhara Bridge)		
		16:00-17:30	Study Tour	Extradosed Bridge Site (Tsukuhara Bridge)	NEXCO West, [redacted] (Manager)	Tsukuhara Bridge Site (Kobe City)
		17:30-18:30		Travel (Tsukuhara Bridge → JICA Kansai)		
Day 4 (8/31)	Thu.	10:00-12:00	Lecture	Statistical Deterioration Prediction Model Based on Actual Inspection Data	Professor [redacted] at Osaka University	JICA Kansai
		12:00-13:00		Lunch (JICA Kansai Cafeteria)		
		13:00-15:00	Lecture	Corrosion in Steel Bridges	Associate Professor [redacted] at Osaka University,	JICA Kansai
		15:20-17:20	Lecture	Fatigue of RC Slab (Non-destructive Test)	Assistant Professor [redacted] at Osaka University,	JICA Kansai
Day 5 (9/1)	Fri.	08:00-08:50		Travel (JICA Kansai → Akashi Kaikyo Bridge)		
		09:00-11:00	Study Tour	Akashi-Kaikyo Bridge	Honshu-Shikoku Bridge Expressway Co., Ltd., [redacted] (Manager)	Akashi-Kaikyo Bridge Site (Hyogo Prefecture)
		11:00-13:20		Lunch and Travel (Akashi Kaikyo Bridge → Yokogawa Bridge Osaka Factory)		
		13:40-14:00	Lecture	Full Scale Drawing (From Drawing to 3D Modelling)	Yokogawa Bridge, [redacted] Makoto (Supervisor)	Osaka Factory (Sakai City)

Day		Time	Type of Training	Training Details	Lecturer	Training Venue
		14:00-15:15	Study Tour	Factory Tour	Yokogawa Bridge Osaka Factory, [redacted] (Manager)	Osaka Factory (Sakai City)
		15:15-15:30		Break		
		15:30-16:30	Lecture	Quality Control for Steel Bridge Fabrication and Q&A	Yokogawa Bridge Osaka Factory, [redacted] (Manager)	Osaka Factory (Sakai City)
		16:40-18:00		Travel (Yokogawa Bridge Osaka Factory → JICA Kansai)		
Day 6 (9/2)	Sat.	09:00-10:50		Travel (JICA Kansai→Kiyomizu Temple)		
		11:00-12:00		Kiyomizu Temple	Dainichi Consultant Inc., [redacted]	Kiyomizu Temple
		12:00-12:30		Kiyomizu Temple → Parking Lot (Souvenir Purchases, etc.)		
		12:30-13:10		Travel (Kiyomizu Temple → AEON Mall Kyoto Gojo)		
		13:20-14:50		AEON Mall Kyoto Gojo (Lunch)		
		15:00-15:40		Travel (AEON Mall Kyoto Gojo → Kinkaku-ji / The Golden Pavilion)		
		15:50-16:50		Kinkaku-ji/ The Golden Pavilion		The Golden Pavilion
		17:00-18:30		Travel (The Golden Pavilion → JICA Kansai)		
Day 7 (9/3)	Sun.	15:30-18:00		Travel (JICA Kansai → Comfort Hotel Gifu)		
Day 8 (9/4)	Mon.	09:00-09:30		Travel (Comfort Hotel Gifu → Dainichi Consultant)		
		09:30-10:30	Lecture	Inspection, Diagnosis and Evaluation of Bridges	Dainichi Consultant Inc., [redacted] (Group Leader)	Dainichi Consultant Inc., Head Office
		10:30-11:00	Lecture	Maintenance and Management of Prestressed Concrete (PC) Slab Bridge	Dainichi Consultant Inc., [redacted] (Group Leader)	Dainichi Consultant Inc., Head Office
		11:00-11:15		Break		
		11:15-12:15	Lecture	Bridge Repair Methods & Materials	Dainichi Consultant Inc., [redacted] (Group Leader)	Dainichi Consultant Inc., Head Office
		12:15-13:15		Lunch at Conference Room, Dainichi Consultant		
		13:20-13:30		Travel (Dainichi Consultant → Uzura Ohashi Bridge)		
		13:30-15:00	Practice	Practical Training on Investigations Required for Repair Design: Neutralization test, RC radar survey, Schmidt hammer test	Dainichi Consultant Inc., [redacted] (Group Leader)	Uzura Ohashi Bridge (Uzura, Gifu City)
		15:00-15:30		Break		
		15:30-17:00	Practice	Learn about Bridge Repair Materials	Dainichi Consultant Inc., [redacted] (Group Leader)	Uzura Ohashi Bridge (Uzura, Gifu City)
		17:00-17:30		Travel (Uzura Ohashi Bridge → Comfort Hotel Gifu)		
Day 9 (9/5)	Tue.	09:00-09:30		Travel (Comfort Hotel Gifu → Dainichi Consultant)		
		09:30-10:30	Lecture	Inspection of Bridge Structures under Water	Dainichi Consultant Inc., [redacted] (Group Leader)	Dainichi Consultant Inc., Head Office
		10:30-10:45		Break		
		10:45-11:30	Lecture	Scour Survey		Dainichi Consultant Inc., Head Office

Day		Time	Type of Training	Training Details	Lecturer	Training Venue
		11:30-12:30		Lunch at Conference Room, Dainichi Consultant		
		12:40-12:50		Travel (Dainichi Head Office → Uzura Ohashi Bridge)		
		13:00-16:30	Practice	Practical Training on River Scour Survey: 1) Board a boat to survey the riverbed elevation, 2) Operate underwater drones from the shore to view actual images	Dainichi Consultant Inc., [redacted] (Group Leader)	Uzura Ohashi Bridge (Uzura, Gifu City)
		16:30-17:00		Travel (Uzura Ohashi Bridge → Comfort Hotel Gifu))		
Day 10 (9/6)	Wed.	09:00-09:30		Travel (Comfort Hotel Gifu → Dainichi Consultant)		
		09:30-12:00	Lecture	Introduction of Bridge Maintenance Management System	Dia Nippon Engineering Consultants Co., Ltd., [redacted] (Deputy Director)	Dainichi Consultant Inc., Head Office
		12:00-13:00		Lunch at Conference Room, Dainichi Consultant		
		13:10-13:20		Travel (Dainichi Head Office → Uzura Ohashi Bridge)		
		13:30-16:00	Practice	Actual Inspection using a Tablet	Dia Nippon Engineering Consultants Co., Ltd., [redacted] (Deputy Director)	Uzura Ohashi Bridge (Uzura, Gifu City)
		16:00-19:00		Travel (Uzura Ohashi Bridge → JICA Kansai)		
Day 11 (9/7)	Thu.	10:00-12:00	Lecture	Planning and Design of Bridges for Better Maintenance	Dia Nippon Engineering Consultants Co., Ltd., [redacted] (Advisor)	JICA Kansai
		12:00-13:00		Lunch (JICA Kansai Cafeteria)		JICA Kansai
		13:00-15:00		Guidance for Action Plan Preparation		JICA Kansai
		15:30-17:30		Preparation of Action Plan		JICA Kansai
Day 12 (9/8)	Fri.	10:00-12:00		Preparation of Action Plan		JICA Kansai
		12:00-13:00		Lunch (JICA Kansai Cafeteria)		
		13:00-15:30	Presentation	Action Plan Presentation		JICA Kansai
		16:00-17:00		• Evaluation Meeting • Closing Ceremony		JICA Kansai
9/9	Sat.	-	-	Departure		

Attachment-3: Detailed Training Program for FY2023 (Final Version)

Training Course Name	Training in Japan on Capacity Development on Bridge Management for Sri Lanka
Training Course No.	202108740J001
Training Period	27 August 2023 - 9 September 2023

Training Program Name	Training in Japan on Capacity Development on Bridge Maintenance and Management
Training Program No.	Country Focus Training
No. of Trainees	10

Kansai Center, Training Program Division
[redacted]

Date of Printing	10-August-2023
Contact Details	[redacted]
Contact Details	[redacted]
Contact Details	
Contact Details	

JICA Division			
Manager		Program Officer	

Date	Time		Type of Training	Training Details	Lecturer and Person in Charge of Practice and Study Tour			Language Used in Lecture	Prefecture	Training Venue	Accommodation	Remarks	Subject Group	Training Trip, Short Distance Travel Itinerary										Expenses for Trainees and Coordinators				Facility entrance fee for technical training purpose			For the purpose of understanding Japanese culture Entrance Fee (Maximum amount 2,000 yen/person)			Other Expenses		Days of deployment of coordinators	
					Name (Titles are omitted)	Position & Institution	Contact Number							- Training trip details should include transportation modes (train name, flight number, rented vehicle type/quantity, departure and arrival times). - Provide the itinerary for short distance travel.						Number of tickets			No. of Passengers	Billing Address		Transportation expenses (Short distance travel only)			Taxi Fare												
														Mode of Transportation	Departure Time	Departure Location	Transit Location	Arrival Time	Destination Location	Trainees	Coordination	Companion		JICA	Others	Rate	No. of People	Amount		Rate	No. of People	Amount	Rate	No. of People	Amount	Details	Amount	1	2
8/26 (Sat)				Departure from Colombo																																
8/27 (Sun)				Arrival at Kansai International Airport							JICA Kansai																										
8/28 (Mon)	10:00	12:00		Briefing					Hyogo	JICA Kansai (SR41)	JICA Kansai																									1.0	
	12:00	13:00		Lunch (JICA Kansai Cafeteria)	-	-	-			-																											
	13:00	15:15	Presentation	Country Report Presentation					Hyogo	JICA Kansai (SR41)																											
	15:30	17:30	Lecture	Digital Asset Management: Introduction	[redacted]	Professor Emeritus, Graduate School of Management Distinguished Professor at Kyoto University	[redacted]	English		JICA Kansai (SR41)																											
8/29 (Tue)	09:30	12:00	Lecture	Current Situation & Issues on Bridge Management in Asian & African Countries	[redacted]	Osaka University	[redacted]	English	Hyogo	JICA Kansai (SR41)	JICA Kansai																									1.0	
	12:00	13:00		Lunch (JICA Kansai Cafeteria)	-	-	-			-																											
	13:00	15:00	Lecture	Human Resources Development System for Bridge Engineers (industry-government-academia collaboration)	[redacted]	Professor, Research Center for Infrastructure Management Technology, Faculty of Engineering, Gifu University	[redacted]	Japanese	Hyogo	JICA Kansai (SR41)																											
	15:20	17:20	Lecture	Bridge Monitoring	[redacted]	Associate Professor, Nagasaki University	[redacted]	English		JICA Kansai (SR41)																											
	17:20	18:00		Accommodation Fee Withdrawal (Mitsui Sumitomo Bank ATM)	[redacted]					Blumer HAT Kobe Branch Office																											
8/30 (Wed)	09:00	09:50		Travel (JICA Kansai → Ibaraki Technical Training Center)	-	-	-			-	JICA Kansai			JICA Bus	9:00	JICA Kansai		9:50	West Nippon Expressway Ibaraki Technical Training Center	0	0	0	15	1	0	0	0	0	0							1.0	
	10:00	12:00	Study Tour	Damaged Bridge Components, Causes of Deterioration, and Repair Methods	[redacted]	Manager, Technical Training and Development Section, West Nippon Expressway Co., Ltd.	[redacted]	Japanese	Osaka	Ibaraki Technical Training Center				JICA Bus	12:00	West Nippon Expressway Ibaraki Technical Training Center	Nishinomiya Najio SA (lunch break)	14:00	West Nippon Expressway Kobe Expressway Office	0	0	0	15	1	0	0	0	0	0								
	12:00	14:00		Travel (Ibaraki Technical Training Center → Nishinomiya Najio Service Area (Lunch) → Kobe Expressway Office)	-	-	-							JICA Bus	15:00	West Nippon Expressway Kobe Expressway Office		16:00	Tsukuhara Bridge (Tsukuhara Lake Observation Parking Lot)				15	1													
	14:00	15:00	Lecture	Maintenance and Management of Tsukuhara Bridge (Extradosed Bridge)	[redacted]	Manager, Maintenance and Planning Section, Kobe Expressway Office, Kansai Branch, West Nippon Expressway Co., Ltd.	[redacted]	Japanese	Hyogo	Kobe Expressway Office Parking: 5				JICA Bus	17:30	Tsukuhara Bridge (Tsukuhara Lake Observation Parking Lot)		18:30	JICA Kansai				15	1												
	15:00	16:00		Travel (Kobe Expressway Office → Tsukuhara Lake Observatory Parking Lot → (15-minute walk) → Tsukuhara Bridge)	-	-	-			-																											
	16:00	17:30	Study Tour	Extradosed Bridge Site (Tsukuhara Bridge)	[redacted]	Manager, Maintenance and Planning Section, Kobe Expressway Office, Kansai Branch, West Nippon Expressway Co., Ltd.	[redacted]	Japanese	Hyogo	Tsukuhara Bridge Getting on/ off at the Tsukuhara Lake Observatory Parking Lot																											
	17:30	18:30		Travel (Tsukuhara Bridge → JICA Kansai)	-	-	-			-																											
8/31 (Thu)	10:00	12:00	Lecture	Statistical Deterioration Prediction Model Based on Actual Inspection Data	[redacted]	Associate Professor, Osaka University	[redacted]	Japanese	Hyogo	JICA Kansai (SR41)	JICA Kansai																									1.0	
	12:00	13:00		Lunch (JICA Kansai Cafeteria)	-	-	-			-																											
	13:00	15:00	Lecture	Corrosion in Steel Bridges	[redacted]	Associate Professor, Osaka University	[redacted]	Japanese	Hyogo	JICA Kansai (SR41)																											
	15:20	17:20	Lecture	Fatigue of RC Slab (Non-destructive Test)	[redacted]	Assistant Professor, Osaka University	[redacted]	Japanese		JICA Kansai (SR41)																											

Training Course Name	Training in Japan on Capacity Development on Bridge Management for Sri Lanka
Training Course No.	202108740J001
Training Period	27 August 2023 - 9 September 2023

Training Program Name	Training in Japan on Capacity Development on Bridge Maintenance and Management
Training Program No.	Country Focus Training
No. of Trainees	10

Kansai Center, Training Program Division
[redacted]

Date of Printing	10-August-2023
Contact Details	[redacted]
Contact Details	[redacted]
Contact Details	
Contact Details	

JICA Division	
Manager	Program Officer

Date	Time		Type of Training	Training Details	Lecturer and Person in Charge of Practice and Study Tour			Language Used in Lecture	Prefecture	Training Venue	Accommodation	Remarks	Subject Group	Training Trip, Short Distance Travel Itinerary										Expenses for Trainees and Coordinators				Facility entrance fee for technical training purpose			For the purpose of understanding Japanese culture Entrance Fee (Maximum amount 2,000 yen/person)			Other Expenses		Days of deployment of coordinators	
					Name (Titles are omitted)	Position & Institution	Contact Number							- Training trip details should include transportation modes (train name, flight number, rented vehicle type/quantity, departure and arrival times). - Provide the itinerary for short distance travel.						Number of tickets			No. of Passengers	Billing Address		Transportation expenses (Short distance travel only)			Taxi Fare												
														Mode of Transportation	Departure Time	Departure Location	Transit Location	Arrival Time	Destination Location	Trainees	Coordinator	Companion		JICA	Others	Rate	No. of People	Amount		Rate	No. of People	Amount	Rate	No. of People	Amount	Details	Amount	1	2
9/1 (Fri)	08:00	08:50		Travel (JICA Kansai→Akashi Kaikyo Bridge)	-	-	-			-	JICA Kansai	※Please prepare lunch. (For eating in the car)		JICA Bus	8:10	JICA Kansai		8:50	Akashi Kaikyo Bridge				15	1														1.0	
	09:00	11:00	Study Tour	Akashi Kaikyo Bridge	[redacted]	Deputy Manager, Management Planning Department / Personnel Department, Honshu-Shikoku Bridge Expressway Co., Ltd.	[redacted]	Japanese	Hyogo	Akashi Kaikyo Bridge				JICA Bus	11:00	Akashi Kaikyo Bridge		11:20	Family Mart Nishimaiko				15	1															
	11:00	13:20		Travel (Akashi Kaikyo Bridge → Family Mart Nishimaiko Store [Purchase lunch] → Yokogawa Bridge Osaka Factory) / Lunch (Eating in the car)	-	-	-							JICA Bus	11:40	Family Mart Nishimaiko		13:20	Yokogawa Bridge Osaka Factory				15	1															
	13:40	14:00	Lecture	Full Scale Drawing (From Drawing to 3D Modelling)	[redacted]	Supervisor, Digital Engineering Department, Design Division, Yokogawa Bridge	[redacted]	Japanese	Osaka	Osaka Factory				JICA Bus	16:40	Yokogawa Bridge Osaka Factory	Sumitomo Mitsui Banking Corporation Hamadera Branch	18:30	JICA Kansai				15	1															
	14:00	15:15	Study Tour	Factory Tour	[redacted]	Manager, Fabrication Department 1, Yokogawa Bridge Osaka Factory	[redacted]	Japanese		As above																												
	15:15	15:30		Break	-	-	-			-																												
	15:30	16:30	Lecture	Quality Control for Steel Bridge Fabrication and Q&A	[redacted]	Manager, Quality Assurance Department, Yokogawa Bridge Osaka Factory	[redacted]	Japanese	Osaka	As above																												
	16:40	18:00		Travel (Yokogawa Bridge Osaka Factory → Sumitomo Mitsui Bank Corporation, Hamadera Branch ATM → JICA Kansai)	-	-	-			-																													
9/2 (Sat)	09:00	10:50		Travel (JICA Kansai→Kiyomizu Temple)	[redacted]	Dainichi Consultant Inc.	[redacted]				JICA Kansai			Chartered Bus	9:00	JICA Kansai		10:50	Kiyomizu Temple				14	1									500	11	5,500			1.0	
	11:00	12:00		Kiyomizu Temple					Kyoto	Kiyomizu Temple		Admission Fee: General 400 Yen Parking: Kiyomizu-zaka Kanko Parking Lot (Reservation Required) Up to 2 hours from entry: 3,000 Yen, then 1,500 Yen per hour		Chartered Bus	12:30	Kyoto City Kiyomizu-zaka Tourist Parking Lot		13:10	AEON MALL Kyoto Gojo				14	1								400	11	4,400				
	12:00	12:30		Kiyomizu Temple → Parking Lot (Souvenir Purchases, etc.)										Chartered Bus	15:00	AEON MALL Kyoto Gojo		15:40	Golden Pavilion Temple				14	1															
	12:30	13:10		Travel (Kiyomizu Temple → AEON Mall Kyoto Gojo)										Chartered Bus	17:00	The Golden Pavilion Temple		18:30	JICA Kansai				14	1															
	13:20	14:50		AEON Mall Kyoto Gojo (Lunch) ※								Bus is out of service																										
	15:00	15:40		Travel (AEON Mall Kyoto Gojo → Kinkaku-ji / The Golden Pavilion)																																		
	15:50	16:50		Kinkaku-ji/ The Golden Pavilion						The Golden Pavilion Temple		Entrance fee: General: 500 yen Parking: 1,300 yen for the first 60 minutes, 650 yen per 30 minutes *No reservations																										
	17:00	18:30		Travel (The Golden Pavilion → JICA Kansai)																																		
9/3 (Sun)	15:30	18:00		Travel (JICA Kansai → Comfort Hotel Gifu)	-	-	-			-	Comfort Hotel Gifu			Chartered Bus	15:30	JICA Kansai			Comfort Hotel Gifu				14	1														1.0	
9/4 (Mon)	09:00	09:30		Travel (Comfort Hotel Gifu → Dainichi Consultant)	-	-	-			-	Comfort Hotel Gifu			Chartered Bus	9:00	Comfort Hotel Gifu		9:30	Dainichi Consultant Inc.				15	1														1.0	
	09:30	10:30	Lecture	Inspection, Diagnosis and Evaluation	[redacted]	Group Leader, Bridge and Structure Department 3G, Dainichi Consultant Inc.	[redacted]	Japanese	Gifu	Dainichi Consultant Inc., Head Office				Chartered Bus	13:20	Dainichi Consultant Inc.		13:30	Uzura Ohashi Bridge				15	1															
	10:30	11:00	Lecture	Maintenance and Management of Prestressed Concrete (PC) Slab Bridge	[redacted]	Group Leader, Bridge and Structure Department 3G, Dainichi Consultant Inc.	[redacted]	Japanese		As above				Chartered Bus	17:00	Uzura Ohashi Bridge		17:30	Comfort Hotel Gifu				15	1															
	11:00	11:15		Break	-	-	-			-																												
	11:15	12:15	Lecture	Bridge Repair Methods & Materials	[redacted]	Group Leader, Bridge and Structure Department 3G, Dainichi Consultant Inc.	[redacted]	Japanese	Gifu	As above																												
	12:15	13:15		Lunch at Conference Room, Dainichi Consultant	-	-	-			-																												
	13:20	13:30		Travel (Dainichi Consultant → Uzura Ohashi Bridge)																																		
	13:30	15:00	Practice	Practical training on investigations required for repair design: Neutralization test, RC radar survey, Schmidt hammer test (compressive strength estimation)	[redacted]	Group Leader, Bridge and Structure Department 3G, Dainichi Consultant Inc.	[redacted]	Japanese	Gifu	Uzura Ohashi Bridge (Uzura, Gifu City) Map available. (3) Parking: Roadside Station "Yanaizu"		Permission has been obtained from the road administrator. Near the roadside station "Yanaizu".																										
	15:00	15:30		Break	-	-	-			-																												
	15:30	17:00	Practice	Learn about repair materials	[redacted]	Group Leader, Bridge and Structure Department 3G, Dainichi Consultant Inc.	[redacted]	Japanese	Gifu	Uzura Ohashi Bridge (Uzura, Gifu City)		Permission has been obtained from the road administrator.																										
	17:00	17:30		Travel (Gifu City → Comfort Hotel Gifu)	-	-	-			-																												

Training Course Name	Training in Japan on Capacity Development on Bridge Management for Sri Lanka
Training Course No.	202108740J001
Training Period	27 August 2023 - 9 September 2023

Training Program Name	Training in Japan on Capacity Development on Bridge Maintenance and Management
Training Program No.	Country Focus Training
No. of Trainees	10

Kansai Center, Training Program Division
[redacted]

Date of Printing	10-August-2023
Contact Details	[redacted]
Contact Details	[redacted]
Contact Details	
Contact Details	

JICA Division	
Manager	Program Officer

Date	Time		Type of Training	Training Details	Lecturer and Person in Charge of Practice and Study Tour			Language Used in Lecture	Prefecture	Training Venue	Accommodation	Remarks	Subject Group	Training Trip, Short Distance Travel Itinerary						Number of tickets			No. of Passengers	Billing Address		Expenses for Trainees and Coordinators					Facility entrance fee for technical training purpose			For the purpose of understanding Japanese culture Entrance Fee (Maximum amount 2,000 yen/person)			Other Expenses		Days of deployment of coordinators	
					Name (Titles are omitted)	Position & Institution	Contact Number							- Training trip details should include transportation modes (train name, flight number, rented vehicle type/quantity, departure and arrival times). - Provide the itinerary for short distance travel.						Trainees	Coordinator	Companion		JICA	Others	Transportation expenses (Short distance travel only)			Taxi Fare												1	2
														Mode of Transportation	Departure Time	Departure Location	Transit Location	Arrival Time	Destination Location							Rate	No. of People	Amount		Rate	No. of People	Amount	Rate	No. of People	Amount	Details	Amount		
9/5 (Tue)	09:00	09:30		Travel (Comfort Hotel Gifu → Dainichi Consultant)	-	-	-			-	Comfort Hotel Gifu			Chartered Bus	09:00	Comfort Hotel Gifu		9:30	Dainichi Consultant Inc.				15	1																1.0	
	09:30	10:30	Lecture	Inspection of Bridge Structures under Water	[redacted]	Group Leader, Bridge and Structure Department 3G, Dainichi Consultant Inc.	[redacted]	Japanese	Gifu	Dainichi Consultant Inc., Head Office				Chartered Bus	12:40	Dainichi Consultant Inc.		12:50	Parking lot of Roadside Station "Yanaizu (The training location is Uzura Ohashi Bridge)				15	1																	
	10:30	10:45		Break	-	-	-			-				Chartered Bus	16:30	Parking lot of Roadside Station "Yanaizu		17:00	Comfort Hotel Gifu				15	1																	
	10:45	11:30	Lecture	Scour Survey	[redacted]	Group Leader, Bridge and Structure Department 3G, Dainichi Consultant Inc.	[redacted]	Japanese	Gifu	Dainichi Consultant Inc., Head Office																													
	11:30	12:30		Lunch at Conference Room, Dainichi Consultant	-	-	-			-		If you want to have lunch at Dainichi's cafeteria, the order is required before 09:30.																											
	12:40	12:50		Travel (Dainichi Head Office → Uzura Ohashi Bridge (Roadside Station "Yanaizu")																																			
	13:00	16:30	Practice	Practical training on River Scour Survey: 1) Board a boat to survey the riverbed's elevation, 2) Operate underwater drones from the shore to view actual images.	[redacted]	Group Leader, Bridge and Structure Department 3G, Dainichi Consultant Inc.	[redacted]	Japanese	Gifu	Uzura Ohashi Bridge (Uzura, Gifu City) (3) To the parking lot of Roadside Station		Permission has been obtained from the road administrator. Near the roadside station "Yanaizu".																											
	16:30	17:00		Travel from Uzura Ohashi Bridge (Yanaizu Road Station) to Comfort Hotel Gifu.	-	-	-			-																													
9/6 (Wed)	09:00	09:30		Travel (Comfort Hotel Gifu → Dainichi Consultant)	-	-	-			-	JICA Kansai			Chartered Bus	9:00	Comfort Hotel Gifu		9:30	Dainichi Consultant Inc.				15	1																1.0	
	09:30	12:00	Lecture	Introduction of Bridge Maintenance Management System	[redacted]	Deputy Director, Infrastructure Technology Research Institute, Dia Nippon Engineering Consultants Co., Ltd.	[redacted]	Japanese	Gifu	Dainichi Consultant Inc., Head Office				Chartered Bus	13:10	Dainichi Consultant Inc.		13:20	Parking lot of Roadside Station "Yanaizu (The training location is Uzura Ohashi Bridge)	0	0	0	15	1	0	0	0	0	0										
	12:00	13:00		Lunch at Conference Room, Dainichi Consultant	-	-	-			-		If you want to have lunch at Dainichi's cafeteria, the order is required before 09:30.		Chartered Bus	16:00	Parking lot of Roadside Station "Yanaizu (The training location is Uzura Ohashi Bridge)		19:30	JICA Kansai	0	0	0	15	1	0	0	0	0	0										
	13:10	13:20		Travel (Dainichi Head Office → Uzura Ohashi Bridge (Roadside Station "Yanaizu")	-	-	-			-																													
	13:30	16:00	Practice	Actual Inspection using a tablet	[redacted]	Deputy Director, Infrastructure Technology Research Institute, Dia Nippon Engineering Consultants Co., Ltd.	[redacted]	Japanese	Gifu	Uzura Ohashi Bridge (Uzura, Gifu City) (3) To the parking lot of Roadside Station "Yanaizu		Permission has been obtained from the road administrator. Near the roadside station "Yanaizu".																											
	16:00	19:00		Travel (Uzura Ohashi Bridge (Roadside Station "Yanaizu") → JICA Kansai)	-	-	-			-																													
9/7 (Thu)	10:00	12:00	Lecture	Planning and Design of Bridges for Better Maintenance	[redacted]	Advisor, Overseas Business Department, Dia Nippon Engineering Consultants Co., Ltd.	[redacted]	English	Hyogo	JICA Kansai (SR31→32)	JICA Kansai																												1.0	
	12:00	13:00		Lunch (JICA Kansai Cafeteria)	-	-	-			-																													
	13:00	15:00		Guidance for Action Plan Preparation	-	-	-		Hyogo	JICA Kansai (SR31→32)																															
	15:30	17:30		Preparation of Action Plan	-	-	-			JICA Kansai (SR31→32)																															
9/8 (Fri)	10:00	12:00		Preparation of Action Plan	-	-			Hyogo	JICA Kansai (SR31→32)	JICA Kansai			Taxies for unforeseen events during the training period.						0	0	0	0	0	0	0	0	0	20,000										1.0	
	12:00	13:00		Lunch (JICA Kansai Cafeteria)	-	-	-			-																													
	13:00	15:30	Presentation	Action Plan Presentation	-	-	-		Hyogo	JICA Kansai (SR31→32)																															
	16:00	17:00		Evaluation meeting Closing ceremony (*Closing ceremony is on SR41)	-	-	-			JICA Kansai (SR31+32) SR41 (Closing Ceremony)																															
9/9 (Sat)				Departure																							Total		0	20,000			0			9,900		0	12.0	0.0

Attachment-4: List of Action Plans Prepared by Training Participants in FY2023

Name of Participant	Description of Action Plan
[redacted]	• Procure and maintain the equipment below that can be used for bridge maintenance and management. ✓ Underwater Drone for inspection of structures under water and scour survey. ✓ Aerial Drone for inspection of bridges that cannot be inspected with a pole camera or bridge inspection vehicle due to high girder depth or wide bridge width. ✓ Steel Reinforcement Detector to obtain the necessary information needed for repair design (locations of steel reinforcements in concrete). ✓ Others. • Conduct training on the appropriate use of procured equipment.
[redacted]	• Conduct training sessions on bridge maintenance, management and assessment. • Conduct small-scale on-site training on bridge repair programs on selected bridges. • Conduct technical improvement programs for engineers through industry-government-academia collaboration to train local government and construction industry engineers. • Establish a “Infrastructure Museum” for providing educational resources for Engineers and Undergraduates.
[redacted]	• Organize training programs to develop the capacity on concrete technology and good practices in construction initially for RDA staff and expand to contractor’s staff later. • Upgrade the Bridge Design Standards practiced in Bridge Designs Office.
[redacted]	In the Easter Province, the following will be carried out: • Conduct seminars for Executive Engineers (EEs), regional engineers and Technical Officers (TOs) to revalidate the concept of Bridge Management. • Procure necessary machinery, equipment, and tools for in-depth investigation and bridge repair work. • Establish the human resources development mechanism not only for RDA staff (government), but also for private consultants and contractors (industry). • Implement bridge repairs even on a few bridges successfully and prove the effectiveness of bridge asset management/ preventive maintenance to the regional office staff for mind setting.
[redacted]	• Plan and design the bridges to have appropriate access to the underneath of the bridge deck or to consider the location of attached utilities not to bother the inspection and maintenance. • Improve the BMS to properly prioritize bridge inspections and repairs. For the time being, the priority output by the BMS will be manually corrected. • Use the underwater drone/ fish finder for inspection or future advance technology.
[redacted]	In the Uva Province, the following will be carried out: • Procure the Personal Protective Equipment (PPE) as a safety measure for workers during bridge inspections. • Advise RDA higher management to purchase insurance equivalent to workers' accident compensation insurance as compensation in the event of on-site accident. • Procure the materials and equipment necessary for bridge inspections. • Conduct programs/ campaigns to prevent trash from being thrown away at bridge locations and facilitate bridge inspections. • Arrange onsite training program for RDA Technical staff.
[redacted]	In the Southern Province, the following will be carried out: • Conduct small-scale practical training to upgrade the knowledge of technical staff related to bridge inspection and repair. In the long term, workshops will be held throughout Sri Lanka. • Identify and update shortcomings of the BMS. • Suggest the application of corrosion resistance epoxy resins on rebars and bridge soffits or any other means to design office for consideration for bridges that are subject to salt damage. • Properly supervise the construction in quality. • Request advance inspection and investigation tools to the higher management.

Name of Participant	Description of Action Plan
[redacted]	• Study the shortcomings in the existing bridge design and structural details and then suggest improvements. • Conduct in-house training for design engineers. • Securing the budgets. • Revise bridge design standards and structural details. • Conduct on-site training on revised bridge design standards and structural details.
[redacted]	• Evaluation of cost-effective methods for RC slab bridge repair based on damage severity. ✓ Study the structural concrete restoration methods of concrete structures. ✓ Search for introducing concrete repair methods in terms of contractor's technical capacity and availability of materials and equipment. ✓ Evaluate the cost of each repair method. Establish an accumulation system. ✓ Share the finding outcomes with the technical staff in Engineering Services Division.
[redacted]	In the Central Province, the following will be carried out: • Create a team for each Executive Engineer's Office and give them continuous training programs on bridge maintenance by Engineers in BM&AU and Provincial Director. • Provide inspection paths for bridges at a high elevation (maintenance purpose). • Encourage Research and Development activities in the field of Bridge Maintenance and Construction like Infrastructure Museum. • Introduce the new technologies for inspection of structures under water such as "underwater drone", modern diving equipment, etc. • Carry out on-site training programs and provide necessary safety equipment. • Introduce new regulations to safeguard the bridges from unauthorized mining activities.

Attachment-5: Questionnaire and Responses from Training Participants in FY2023

No.	Question	Responses
1.	I had a clear understanding of the purpose and contents of this program before the participation.	• Strongly Agree: 7 • Agree: 3 • Neither: 0 • Disagree: 0 • Strongly Disagree: 0
2.	I have achieved the course objective.	• Fully Achieved: 4 • Almost Achieved: 6 • Neither: 0 • Partially Achieved: 0 • Not Achieved: 0
3.	The knowledge and experience gained from this program can be fully utilized in my work.	• Strongly Agree: 7 • Agree: 3 • Neither: 0 • Disagree: 0 • Strongly Disagree: 0
4.	Reason and comments or suggestions, especially if your rating is "Disagree/ Strongly Disagree" in the above No. 1- No. 3.	N/A
5.	The structure of the curriculum was appropriate.	• Strongly Agree: 6 • Agree: 4 • Neither: 0 • Disagree: 0 • Strongly Disagree: 0
6.	The duration of this course was appropriate.	• Yes, Appropriate: 8 • No, Too short: 2 • No, Too long: 0
7.	The number of participants in the course was appropriate.	• Yes, Appropriate: 10 • No, Too little: 0 • No, Too many: 0
8.	Any comments or suggestions, especially if you did not rate the above 3 statements No. 5- No. 7 as appropriate.	• It is better that more than 10 participants are trained. • It would be much better if the duration could be at least 4 weeks, we could gain much more knowledge in terms of theory & practical.
9.	Subjects and contents that were especially useful for each output. (lectures, workshop, learning materials etc.)	• All the things were really interesting, that is lectures, workshop etc. • Underwater inspection methods for bridges, deterioration models, bridge inspection using tablets, and planning and design of bridges for better maintenance. • Bridge inspection, diagnosis and evaluation, bridge repair methods and materials, planning and design of bridges for better maintenance are very useful for us. • All are very useful. • Almost all the subjects and contents were insightful and eye openers. • Almost all lectures, workshops, learning materials & on the job training were very useful.
10.	Subjects and contents that were not necessary for each output.	• None.

No.	Question	Responses
11.	Subjects and contents that were not covered but should have been included for each Output.	• Workshop of steel bridge repairing. • An overview of bridge management manuals produced for Japan. • Post-tensioned bridge repair methods. • Monitoring and maintenance management of geotechnical structures such as pile foundation, slopes, micro piles soil/ rock anchoring's cable systems. • Repair design. • Management of historical bridges for conservation, reuse of bridge items for erecting new bridges where necessary(cost effective method we following now), focus on pedestrian over pass bridges. • On-site training on maintenance & repair of extradosed bridges & steel box girders.
12.	Reason and comments for the above No.9 - No.11.	• I worked as a bridge engineer at BM&AU. • Scour of foundation of a few bridges were identified and repaired. So, we need to investigate other bridges before any failure. Many post-tensioned superstructures are available all over the country and notice some minor damage. Therefore, we need to carry out repairs immediately to avoid possible failures. • Seminars on repair design should be held. (For example: limiting vehicle load with existing defects) • According to the present economic situation, removed bridge parts have to be reused. Some iconic bridges has to be conserved for the purpose of heritage and for tourism purposes. • If the consultancy contract was awarded to an expressway maintenance institution by JICA, we would have got an opportunity to have on-site training on maintenance & repair of extradosed bridges & steel box girders.
13	The presentations and explanations by the lecturers were easy to understand.	• Strongly Agree: 4 • Agree: 6 • Neither: 0 • Disagree: 0 • Strongly Disagree: 0
14	The lecturers were highly knowledgeable about the topics.	• Strongly Agree: 6 • Agree: 4 • Neither: 0 • Disagree: 0 • Strongly Disagree: 0
15	The learning materials are high quality and useful.	• Strongly Agree: 6 • Agree: 4 • Neither: 0 • Disagree: 0 • Strongly Disagree: 0
16	Sharing of knowledge among participants was effective.	• Strongly Agree: 7 • Agree: 3 • Neither: 0 • Disagree: 0 • Strongly Disagree: 0
17	The Japanese course leader/ facilitator provided effective supports and guidance to participants. (e.g. promoting participants' proactive discussions, giving appropriate feedback)	• Strongly Agree: 7 • Agree: 3 • Neither: 0 • Disagree: 0 • Strongly Disagree: 0

No.	Question	Responses
18	Interpretation was easy to understand.	• Strongly Agree: 3 • Agree: 7 • Neither: 0 • Disagree: 0 • Strongly Disagree: 0
19	Any comment or suggestions, especially if you "Disagree/ Strongly Disagree" in the above No. 13- No. 18.	• All lecturers have better knowledge in their subjects, some of the lecturers were unable to deliver the lectures in English. I understood they have sufficient English knowledge to conduct in English. If they could do it without using interpreter, it would be much better for us. • If the interpreter is a person with highly technical background, there won't be any difficulties in interpreting latest highly technical subjects. The participants can gain more.
20	If you have any expectations for future collaboration with JICA, please describe it.	• I request JICA to help to improve existing BMS/BRMS software, if possible new pole camera set because in Sri Lanka pole camera not available, fund for bridge repair/ repair knowledge transfer. • Arranging of training programs for more participants. • I would like to get technical assistance and knowledge from JICA on bridge repair methods that will help to improve the expected design life of bridges. • If you can share the Japanese Standards on Bridge Design, Inspection and maintenance that will be helpful for us to compare the current practices in Sri Lanka and upgrade the required areas. • Expect to know about the Bridge maintenance manual of JAPAN and the method of bridge maintenance and management system of JAPAN in order to utilize its outcome to bridges in Sri Lanka. • I'm willing to participate in "Comprehensive Bridge Engineering Program". • Bridge Inspector Certificate program, further knowledge sharing in Asset management. • All lectures are good but English lectures are very effective. • With the prevailing economic situation, Sri Lanka is in a difficult situation for funding new technologies and equipment for this purpose. And also migration of skilled personnel is a problem. Therefore we need help from organizations like JICA to assist us in future. • We strongly hope the JICA will help us share the latest technologies involved in bridge management & assessment through this type of training programs from time to time in future.
21	Any other comments in regard to the program.	• I wish to focus on bridge design and bridge inspection separately and spend more time in each section, each topic only 1-2 hours, needed more time on e.g. deterioration practical test for each participant. • Some topics were already learned in Japan, therefore add new topics. • I was not satisfied with the terms and conditions of the Agreement signed at the last day since it is one sided. • Almost all the resource personnels were able to understand our questions in English, even though their lectures were in Japanese. English is not the mother tongue to both the resource personnels and the participants. So no one is expected to be very fluent in English. In future, the resource personnels can present their presentation in English if they can manage in English (as all of their presentation material was in English). The interpreter can play his/ her role during question

No.	Question	Responses
		& answer sessions. This will improve more interaction with the resource personnels and effectively use their allocated time duration with us. Nearly 50% of the allocated time duration is spent in interpretation.

Attachment-6 Response from Training Participants on Achievement Level for Each Training Output in FY2023

1. Response to achievement levels of individuals in each training output below requested at the evaluation meeting.

The participants were asked to self-evaluate their level of achievement for each of the following five training outputs.

Output-1: The training participants can explain the concept of bridge management (concept of road asset management).

Output-2: The training participants can explain bridge inspection methods other than visual inspection.

Output-3: The training participants can explain the repair methods for bridge components, including abutments and piers, girders and beams, and bridge expansion joints.

Output-4: The training participants can explain bridge inspection and repair methods for extradosed bridge and steel box girder bridge.

Output-5: The training participants will develop an action plan to improve the bridge maintenance and management situation as well as the training program for bridge engineers involved in bridge management in Sri Lanka and can explain and share the future challenges and plans to be addressed to their organizations.

Table-1 Achievement Level in Each Training Output

No.	Name of Participant	Achievement Level in Each Training Output (Self-evaluation)				
		Output-1	Output-2	Output-3	Output-4	Output-5
01	[redacted]	1	1	2	4	1
02	[redacted]	1	2	3	4	1
03	[redacted]	1	2	3	4	1
04	[redacted]	1	2	3	4	1
05	[redacted]	2	1	2	4	1
06	[redacted]	1	2	3	4	1
07	[redacted]	2	2	3	4	2
08	[redacted]	1	2	2	4	1
09	[redacted]	1	2	2	4	1
10	[redacted]	1	4	3	5	3

Table-2 Achievement Level Indicator

Level of Achievement	
Fully Achieved	1
Almost achieved	2
Averagely Achieved	3
Partially Achieved	4
Not Achieved	5

The results were as given in Table-1. Almost all the training participants reported that they had achieved satisfactory results for Output-1 (concept of bridge management), Output-2 (inspection

methods other than visual inspection), and Output-5 (improvement of bridge maintenance management situation and bridge maintenance management engineer training system in Sri Lanka).

On the other hand, regarding Output-3 (bridge repair methods), many participants responded that the level of achievement was average. It can be assumed that this response was the result of their desire on-the-job training related to repair design, rather than lecture-based training.

Regarding Output-4 (inspection and repair methods for extradosed bridges and steel box girder bridges), the training content was limited to lectures and site visits to the existing extradosed bridge in service from below the deck and was not practical training. Almost all of the training participants answered that the results were not achieved.

2. Response to the inquiry about what kind of contents you would like to receive with regard to the on-the-job training on bridge repair design

The training participants were asked to select from the following three options and to write their preference in a free format regarding what kind of training they would like for the on-the-job training on bridge repair design. As a result, the training participants responded that they preferred "Option-1."

Option-1: Based on the inspection data and in-depth investigation results such as carbonation depth, chloride ion penetration depth, etc., bridge repair design training will be conducted in Japan.

Option-2: Receive a lecture on bridge repair design from a lecturer.

Option-3: Others

The following were written in free form:

- I would like to participate in a workshop in Japan on bridge repair design based on inspection data and detailed survey results.
- The program should consist of the repair methods of extradosed bridges and steel box girder bridges, bridge bearings and bridge expansion joints, remedial measures for scouring and erosion of bridge foundations.
- There is only one extradosed bridge in Sri Lanka, the New Kelani Bridge, which was opened to traffic in November 2021. Since it has been in service for only a short period of time, there is little damage and it is very unlikely that major repairs will be made in the near future. However, we would like to receive training on how to repair the extradosed bridge.

Attachment-7: Review Plan for FY2023

Capacity Development on Bridge Management in Sri Lanka

REVIEW PLAN: Progress Survey of Action Plan Implementation Status

1. Purposes of the Survey

This survey is intended to monitor the progress of your action plan, which was submitted at the end of JICA training in Japan. You are supposed to disseminate the knowledge obtained during the training in Japan on inspection, assessment, survey, and repair of bridges, as well as the understanding of bridge management concepts with your organization.

2. Submission of Questionnaire

Each training participant is supposed to submit the attached Review Questionnaire Form by December 15, 2023. JICA and the Consultant will evaluate the progress of your activities through the submitted answers and prepare the report to seek necessary advice or actions if necessary.

Due Date: December 15, 2023

3. Method of Survey

1) You will receive the Review Questionnaire Form and must return it with answers.
2) The survey is conducted in line with action plan submitted by each training participant.
3) You must describe the activities already conducted.
4) If you have failed to conduct planned activities, describe reasons/ causes.
5) If you have conducted additional activities which are not included in the action plan, describe the details.
6) If you want additional advice or support, describe the details with reasons.

4. Person in charge of Survey

Name: [redacted]
Organization: Dia Nippon Engineering Consultants Co., Ltd.

5. Names of training participants to JICA Training

Table-1 List of Training Participants, Road Development Authority, Sri Lanka (FY2023)

Name	ID N0.	Position, Organization
[redacted]	[redacted]	Additional Director, Bridge Management & Assessment Unit
[redacted]	[redacted]	Senior Design Engineer, Engineering Service Division
[redacted]	[redacted]	Senior Design Engineer, Engineering Service Division
[redacted]	[redacted]	Engineer, Bridge Management & Assessment Unit
[redacted]	[redacted]	Engineer, Bridge Management & Assessment Unit
[redacted]	[redacted]	Engineer, Bridge Management & Assessment Unit
[redacted]	[redacted]	Senior Engineer, Bridge Management & Assessment Unit
[redacted]	[redacted]	Senior Design Engineer, Engineering Service Division
[redacted]	[redacted]	Design Engineer, Bridge Designs Office
[redacted]	[redacted]	Engineer, Bridge Management & Assessment Unit

6. Supplemental Interview (Tentative)

Supplemental online interviews may be held to clarify the answers to the Review Questionnaire Form if necessary. Several people may attend the interviews depending on the subjects.

- Date：Middle of December, 2023 (Tentative)
- Time：13:00 to 15:00 (Sri Lanka Time)

7. Report of Survey Results

The report of survey prepared by the Consultant will be submitted to JICA as an internal reference. The report will include present progress/ status of action plans, challenges in implementation of action plans with reasons, prospect of solving the problem, challenges, necessity of Japan's support, recommendations to the next training, and other important comments and information.

8. Questionnaire

1) The questionnaire will be sent to each training participant two (2) weeks before the due date.
2) Each training participant is supposed to return the Review Questionnaire Form with honest answers and opinions.
3) Write your answers by items, clearly and concisely.

Review Questionnaire Form

Name: ID : D230XXXX Position, Organization:
Short-term activities in your Action Plan: (Copied from your action plan) 1. 2. 3. 4.
Activities already conducted: 1. 2.
Effects/ Influences of your activities to your organization: (Subjective Evaluation) 1.
Reasons/ Causes which hampered your activities: 1.
Expectation on achievement of your activities: (Subjective Evaluation) 1.
Describe any activities if you have conducted excluding your action plan: (Subjective Evaluation) 1.
Influence of the training in Japan to you: (Subjective Evaluation) 1.
Others (Free comments, regardless of whether they are positive or negative): 1.

Review Questionnaire Form (EXAMPLE)

Name: XXXXX XXXXX XXXXX ID : D230XXXX Position, Organization:
Short-term activities in your Action Plan: (Copied from your action plan) 1. Hold an internal meeting to explain the importance of safety access route to bearings. 2. 3. 4.
Activities already conducted: 1. Held internal meetings twice to explain the effectiveness of safety access in inspection. 2. 3. 4.
Effects/ Influences of your activities to your organization: (Subjective Evaluation) 1. Maintenance section have decided to request budget to procure 12 safety belts. 2. 3. 4.
Reasons/ Causes which hampered your activities: 1. Tight budget does not allow us to purchase necessary units of safety belts. 2. I had no time to explain my experiences to my co-workers. 3.
Expectation on achievement of your activities: (Subjective Evaluation) 1. I expect around 65% achievement of XXXX by the end of the next fiscal year. 2. 3.
Describe any activities if you have conducted excluding your action plan: (Subjective Evaluation) 1. Several trainees held a meeting to improve inspection methods.
Influence of the training in Japan to you: (Subjective Evaluation) 1. I realized the importance of cultural exchange with foreigners.
Others (Free comments, regardless of whether they are positive or negative): 1. Japan’s railway system is fine but not suitable in Sri Lanka.

Attachment-8: Review Results Report for FY2023

Report of Progress Survey of Action Plan Implementation Status (FY2023)

1. Purposes of the Survey

This survey is intended to monitor the progress of Action Plans, which was submitted by training participants at the end of JICA training in Japan in FY2023. Training participants are supposed to disseminate the knowledge obtained during the training on inspection, assessment, survey, and repair of bridges, as well as the understanding of bridge management concepts with their organizations.

It is also intended to find any difficulties in implementing their planned activities.

2. Survey Schedule

- Time of the survey: 3 months after the Training in Japan
- Sending of Review Questionnaire Form: October 19, 2023
- Collection of Review Questionnaire Form: December 15, 2023

3. Method of Survey

Progress of Action Plans was surveyed by evaluating answers to the Review Questionnaire Form prepared by the Consultant. By comparing each training participant's answer with the planned actions described in the Action Plan submitted at the end of the training in Japan, the Consultant evaluated the achievement in their plans. Evaluation is based on subjective judgement by the experienced Consultant because the numerical evaluation is not appropriate in this survey.

- Activities reported in Review Questionnaire Form were graded in 4 stages by the Consultant.
- Reported activities were compared with the planned activities described in Action Plan and the progress of implementation was evaluated with the activities already conducted by the training participants.
- Confirm the reasons/ causes if the planned activities were not conducted.
- Training participants were requested to provide information about other activities such as disseminating what they obtained in JICA Training and to provide free comments, request of support, and any challenges.

4. List of Training Participants

Table-1 List of Training Participants, Road Development Authority, Sri Lanka

Name	ID N0.	Position, Organization
[redacted]	[redacted]	Additional Director, Bridge Management & Assessment Unit
[redacted]	[redacted]	Senior Design Engineer, Engineering Service Division
[redacted]	[redacted]	Senior Design Engineer, Engineering Service Division
[redacted]	[redacted]	Engineer, Bridge Management & Assessment Unit
[redacted]	[redacted]	Engineer, Bridge Management & Assessment Unit
[redacted]	[redacted]	Engineer, Bridge Management & Assessment Unit
[redacted]	[redacted]	Senior Engineer, Bridge Management & Assessment Unit
[redacted]	[redacted]	Senior Design Engineer, Engineering Service Division
[redacted]	[redacted]	Design Engineer, Bridge Designs Office
[redacted]	[redacted]	Engineer, Bridge Management & Assessment Unit

5. Response Rate

- Number of Training Participants: 10
- Number of respondents: 10
- Response rate: 100%

6. State of Progress

Overall evaluation of all the responses is summarized in Table-2 below. Some training participants who got relatively low evaluation replied that they could not fulfill the planned field actions due to poor weather conditions during rainy season.

Considering such disadvantages to some training participants, it is fair to say that they sincerely made efforts to fulfill their Action Plans.

Table-2 Evaluation Result

Rating	**Very Good**	**Good**	**Satisfactory**	**Unsatisfactory**
Response	2	5	3	0
(%)	20%	50%	30%	0%

7. Examples of Achievement

- Using the savings from New Kelani Bridge (NKB) Project, the purchase list of equipment was prepared and forwarded to JICA.
- Discussed with Directors (Training, Engineering Services) to conduct a few seminars on concrete technology and repair work.
- Organized a few seminars for interested engineers in RDA Head Office.
- Reviewed literature to find a proper durability standard for bridge design. Reviewed data to find possible causes for cracks occurring on casted concrete segmental box girder.
- Study of shortcomings in current design practices and design detailing is in progress.
- Improved design standards and detailing have been introduced in the upcoming 3 bridge projects.
- Bridge maintenance teams were formed in 3 Executive Engineer's Offices in Eastern Province.
- Manually modified BMS outputs on priority order function.
- Submitted cost for repairing of pole camera and purchasing supporting equipment including one for scour analysis for further discussion with higher management.
- Held meeting/ telephone conversations with Executive Engineers regarding the correction of structure numbering and cleaning of bridge sites for inspection.
- In addition to structural diagnosis, on-site surveys were conducted to enhance practical knowledge in identifying various types of damage.
- For engineers of Engineering Services Division, organized an awareness session on RC bridge repair method and conducted a knowledge sharing session.

8. Reasons Which Hampered Action Plan

Major reasons/ causes which hinders their activities are:

- Poor weather conditions (rainy season) for site activities.
- Shortage of necessary budget.
- Unavailability of some of internationally accepted codes of design practices to review the existing bridge design standards in Sri Lanka.
- Busy working situation toward the end of the fiscal year.
- Repair of damaged pole camera is difficult because it is hard to obtain supplies in Sri Lanka.

9. Other Important Comments

- Lectures in the training in Japan should be provided in English directly for more success.
- Request of provision of Japanese Design Specifications for Highway Bridges to improve design standards of Sri Lanka.
- A considerable number of staff members left RDA for better foreign employment opportunities.
- Knowledge transfer of BMS/BRMS software for future development plan was insufficient. Deficiency may be in software. Improved version of BMS/BRMS is requested.

10. Suggestions/ Encouragements from the Consultant

- Almost all the training participants submitted the answers to the Review Questionnaire Form. The Consultant expresses gratitude for their cooperation to the progress study.
- Judging from the submitted answers, it was highly evaluated that all the training participants have earnestly conducted activities in line with their Action Plans after returning to Sri Lanka.
- There seems to be no doubt that the training participants have been applying knowledge and experiences obtained during the training in Japan in their services and disseminating such knowledge to other colleagues who did not participate the training.
- Although some participants replied that they could not manage to conduct planned activities due to inclement weather and busy period of fiscal year, their future activities following the action plan will benefit their organizations.
- A respondent reported that he modified BMS function manually. Another training participant answered that he is studying foreign design standards. These activities imply that their performance is positive and active.
- If all the training participants continue activities based on the Action Plans, the effect of JICA training would contribute to the improvement of capacity of not only training participants but also their organizations.
- Your colleagues may come to have pride for bridge maintenance work. You can explain the importance of bridge maintenance with confidence.
- It is better for Japan’s training organizer to understand the comments/ recommendations/ requests submitted by the training participants to improve the next training program for better outcome.

11. Answers from the Training Participants to Questionnaire Form

The answers to the Review Questionnaire Form submitted from the training participants are given below. The grey shaded comments in the answers are by the reviewer for evaluation.

Review Questionnaire Form

Name: [redacted] ID: [redacted]
Position, Organization: Additional Director, BM&AU

Short-term activities in your Action Plan: (Copied from your action plan).

1. Explanation to higher management on the requirement of equipment. (100%)
2. Preparation of necessary specifications and bidding documents through Director (Procurement).
3. No allocation is available to purchase the relevant equipment using the local fund.
4. Decide to utilize the savings from New Kelani Bridge (NKB) Project. (100%)

Activities already conducted:

1. The list of items to be procured using the savings in NKB was already forwarded to JICA for their favorable consideration.
2.

Effects/ Influences of your activities to your organization:
(Subjective Evaluation)

1. If the proposed items are procured, a lot of difficulties in maintaining the NKB in near future will be addressed. (Very Good)
2. The underwater inspection of multi span bridges will be completed to make the available bridge database more reliable. (Very Good)

Reasons/ Causes which hampered your activities:

1. The prevailing economic crisis in our country.
2.

Expectation on achievement of your activities:
(Subjective Evaluation)

1. I hope our proposal on procurement of necessary equipment will be favorably considered by JICA.

Describe any activities if you have conducted excluding your action plan:
(Subjective Evaluation)

1. Some defects were identified in the NKB almost at the end of defect liability period. Those issues are handled by me as the Chairman of the Technical Evaluation Committee (TEC). (Good)

Influence of the training in Japan to you:
(Subjective Evaluation)

1. The training program was designed focusing on Planning, Designing, maintenance, management and repair works of bridges. As the Director (Engineering Services) & Additional Director (BM&AU), almost all the lectures, site visits & on the job training are very useful in my day-to-day activities.

Others (Free comments, regardless of whether they are positive or negative):

1. I have no hesitation to mention that this training program enhanced our knowledge and experience drastically in handling the issues related to the bridges in Sri Lanka.

Overall evaluation by Consultant: Good

Early detection of defects at the New Kelani Bridge is good information. When you conduct the necessary repair, please try to find the causes of these defects. Your finding may be a hint to prevent same phenomena in the new bridges in Sri Lanka.

Review Questionnaire Form

Name: [redacted] ID: [redacted]
Position, Organization: Senior Design Engineer, Engineering Services Division

Short-term activities in your Action Plan: (Copied from your action plan)

1. Discussion with related Directors to enhance knowledge and skills of staff. (100%)
2. Organizing training sessions on bridge maintenance, management, and assessment. (75%)
3. Collection of information on interested staff to shortlist for the first training. (100%)
4. Organizing small-scale on-site training on bridge maintenance, management, and assessment.
5. Organizing small-scale on-site training on bridge repair.

Activities already conducted:

1. Discussed with Director (Training) and Director (Engineering Services) of RDA to conduct a few seminars to enhance knowledge and skills on concrete technology and repair work and a few practical sessions on the same. (Good)
2. Organized a few seminars with the help of resource personnel for interested Engineers in Head Office. (Very Good)

Effects/ Influences of your activities to your organization:
(Subjective Evaluation)

1. The knowledge gained as per above is planned to apply for rectifying bridges instead directly recommending for reconstruction.

Reasons/ Causes which hampered your activities:

1. Due to the lack of funds allocated for the Training Division, organizing training for the Engineers in Provincial Offices other than the Head office is difficult. (Understandable)

Expectation on achievement of your activities:
(Subjective Evaluation)

1. Organizing a few training sessions on bridge repair and maintenance were achieved.
2. Organizing a few more related training sessions need to be proposed even with the limited budget allocations for the Training Division.

Describe any activities if you have conducted excluding your action plan:
(Subjective Evaluation)

1. Involved in reviewing data on cracks appeared on newly constructed bridge structures and remedial measures are to be studied with the Design team. (Very Good)

Influence of the training in Japan to you:
(Subjective Evaluation)

1. The training program was mainly focused on Planning, Designing, maintenance, management and repair works of bridges. I feel as a designer that almost all the lectures were very useful in assessing and selecting already constructed bridges for future improvement plans.

Others (Free comments, regardless of whether they are positive or negative):

1. If the specifications for bridges currently practicing in Japan can be referred, Sri Lankan standards can further be upgraded in the future for better utilization. (Useful comment. I understand your situation)

Overall evaluation by Consultant: Good

Thank you for your efforts. Please try to organize on-site seminars and continue disseminating findings you obtained with JICA Training in Japan.

Review Questionnaire Form

Name: [redacted] ID: [redacted]
Position, Organization: Senior Design Engineer, Engineering Services Division

Short-term activities in your Action Plan: (Copied from your action plan) (100%)

1. Upgrade of Bridge Design Standards (especially to secure durability).
2. Revision of Bridge Design Manual (RDA has commenced to revise the Bridge Design Manual with the funding assistance of World Bank). (100%)
3. Introduction of proper curing systems for concreting. (100%)

Activities already conducted:

1. Literature reviewed to find a proper durability standard for Bridge design. (BS 8500-1:2015+A2:2019: Concrete – Complementary British Standard to BS EN 206 is identified as the best).
2. Reviewed the data to find the possible reasons for the cracks occurred on top flange of a segmental box girder casted for Slave Island flyover project and cracks occurred on deck slab of the bridge no. 3/5 on BattuluOya – Udappuwa - Andimunai (B614) Road.

Effects/ Influences of your activities to your organization:
(Subjective Evaluation)

1. Introduction of proper durability standards for the designs will give more durable structures and hence it can reduce the maintenance cost of the bridges. (Very Good)
2. Lessons learnt from above case 2 can be applied to the construction of bridges to improve the quality of the construction and hence reduce the maintenance cost. (Good)

Reasons/ Causes which hampered your activities:

1. Difficult to acquire correct data of cracks occurred at initial stages of the construction projects since the principles of the projects do not expose the things considering the possible contractual issues. (Good supervision leads to durable structures)
2. Construction project staff are reluctant to change their current practices in curing. (Common problem in many countries)

Expectation on achievement of your activities:
(Subjective Evaluation)

1. Introduction of durability standards is almost achieved. Now Director (Engineering Services) of RDA has to circulate the recommendations. (i.e. BS 8500-1:2015+A2:2019: Concrete – Complementary British Standard to BS EN 206).
2. A few trials for initial curing will be conducted with the help of Project Directors to convince them of the limitations of the current practices in curing.

Describe any activities if you have conducted excluding your action plan:
(Subjective Evaluation)

1. Discussed with the Director (Training) of RDA to conduct a few seminars on concrete technology for the project staff to improve their knowledge and practice the same in the projects. (But this will be an issue due to lack of allocations for the Training Division).

Influence of the training in Japan to you:
(Subjective Evaluation)

1. The training program was planned from bridge planning and design to construction, monitoring and maintenance of the bridges. Out of those areas, I personally focused to bridge planning and designs and quality control during construction to develop my action plan. Further, if we addressed these areas properly, the maintenance cost of the bridges can be cut down.

Others (Free comments, regardless of whether they are positive or negative):

1. If you can provide Specifications for Highway Bridges of Japan Road Association, we can enhance the practicing design standards of bridges in Sri Lanka. Further, it will help us to design more durable structures in future. (I understand your situation)

Overall evaluation by Consultant: Good

Bridge engineers in many countries have noticed the importance of durable designs after facing poor conditions of existing bridges. It is necessary to refer to the latest international design specifications to achieve maintenance-oriented structures.

Review Questionnaire Form

Name: [redacted] ID: [redacted] Position, Organization: Engineer, BM&AU
Short-term activities in your Action Plan: (Copied from your action plan) 1. Dissemination of the importance of bridge maintenance and management to regional office staff. 2. Organizing office-wise Bridge Maintenance Team. 3. Knowledge sharing with Engineers and Technical Officers.
Activities already conducted: 1. Had meeting and telephone conversations with Chief Engineers and Executive Engineers to solicit the importance of bridge maintenance and management. (Very Good) 2. Bridge Maintenance Teams were formed in three Executive Engineer's Offices in the Province. (Very Good)
Effects/ Influences of your activities to your organization: (Subjective Evaluation) 1. Ease the workload of Executive Engineers. Therefore, they can focus on law enforcement and road maintenance. (Good) 2. Dedicated team will concentrate on bridges. (Very Good) 3. Enthusiastic officer/ worker can become expert in bridge maintenance. (Very Good) 4. Repair costs and reconstruction costs will be saved. (Good) 5. Highlighted the importance of maintenance of bridges among regional staff. (Very Good)
Reasons/ Causes which hampered your activities: 1. Regional engineers have doubt on Sustainability of BM&AU in RDA due to proposed SoR. Therefore, they are reluctant to invest their time on new activities at present. 2. No dedicated budget is available to implement bridge maintenance in regional level. 3. Increased workload and time constraints due to Rural Road Program and Rural Bridge Program in provincial offices. 4. Adverse climate. 5. Restriction on fuel usage.
Expectation on achievement of your activities: (Subjective Evaluation) 1. Sustainable functioning of bridge maintenance teams in their respective divisions. 2. Keep all the bridges clean in the region.
Describe any activities if you have conducted excluding your action plan: (Subjective Evaluation) 1. Encourage the regional engineers to request for repair of long span bridges in their region. (Very Good) 2. Helped them to figure out estimated costs. (Good)
Influence of the training in Japan to you: (Subjective Evaluation) 1. It has created confidence in Bridge Management Cycle and Bridge Maintenance System, as developed countries like Japan also invest in asset management. 2. Exposure to different latest techniques which are engaged in Japan, also enlightened the bridge repair methods and inspection methods.
Others (Free comments, regardless of whether they are positive or negative): 1. Due to monsoon rain, established bridge maintenance team cannot commence their activities immediately. 2. Executive Engineers have shortage of resources (skilled labour, vehicle and material). 3. Considerable number of labours left RDA for foreign employment. Hence dedicated labours could not engage in Bridge Maintenance Teams.
Overall evaluation by Consultant: Good Please continue to support and assist the regional engineering staff.

Review Questionnaire Form

Name: [redacted] ID: [redacted]
Position, Organization: Engineer, BM&AU

Short-term activities in your Action Plan:(Copied from your action plan)

1. Preparation of inspection plan during dry season.
2. Repair of existing cameras.
3. Improvement in BMS functions. (Very Good)
4. Request of necessary fund. (Good)

Activities already conducted:

1. Improvement in BMS functions
   - Priority order of Bridge repair/ reconstruction is modified manually from BMS output data's extract.
2. Request of necessary fund
   - Conveyed the Repairing & Purchasing cost of existing pole camera, supporting equipment and new equipment (Dainichi Consultant Inc. trained regarding bridge scour analysis) to Deputy Director (Bridge Management and Assessment Unit) for further discussion with Higher Management.

Effects/ Influences of your activities to your organization:
(Subjective Evaluation)

1. Based on BMS, prepared the bridge priority order manually, where it will optimize reconstruction/ repair cost in a long term. (Very Good)
2. The accuracy level of inspection will be increased if RDA higher management is convinced and decided to buy new technology equipment. (Good)

Reasons/ Causes which hampered your activities:

1. Improvement in BMS functions
   - Need JICA Support to make improvement in BMS/BRMS since it is fully developed by JICA.
2. Repair of existing cameras
   - It is difficult to repair the damaged pole camera system. Because it is hard to find pole camera suppliers in Sri Lanka.
3. Preparation of inspection plan during dry season
   - Prepared the list of bridges which might be affected by scour. But still could not inspect the Bridges due to Sri Lanka Northeast Monsoon season from October-January and water level reduction might take another 2-3 months. Therefore, I will conduct the inspection during 2nd quarter of 2024.

Expectation on achievement of your activities:
(Subjective Evaluation)

1. Sustain bridge inspections system for a long term.
2. Identify and implement new technology in bridge inspection.
3. Optimize reconstruction/repair cost in a long term.

Describe any activities if you have conducted excluding your action plan:
(Subjective Evaluation)

1. ----------

Influence of the training in Japan to you:
(Subjective Evaluation)

1. Statistical deterioration prediction model based on actual inspection data.
   - I have understood the basics of deterioration prediction model in Japan and try to develop deterioration prediction method in Sri Lanka bridges. (Good)
2. Digital Asset Management
   - The knowledge which I gained from training about digital asset management in Japan will help me to implement the system in RDA.

Others (Free comments, regardless of whether they are positive or negative):

There was a lack of knowledge in transferring BMS/BRMS software for future development plan under the "**Project for Capacity Development on Bridge Management in Sri Lanka (2015-2018)"**. Therefore, kindly I am requesting JICA to identify the deficiency in the software and provide improved version of BMS/BRMS.

Overall evaluation by Consultant: Good

Your effort is highly evaluated in modifying BMS manually. Comparison of what you learned during JICA Training and actual situations in Sri Lanka will give you great inspiration, I hope.

Review Questionnaire Form

Name: [redacted] ID: [redacted] Position, Organization: Engineer, BM&AU
Short-term activities in your Action Plan: (Copied from your action plan) 1. Purchase of necessary equipment. 2. Arrangement of online training program. 3. Correction of structure numbering. (100%) 4. Request to Executive Engineers and local authorities for cleaning around bridges. 5. Request for safety equipment.
Activities already conducted: 1. Meeting and telephone conversation with Executive Engineers (EE) regarding importance of Structure numbering correction and cleaning of bridge location for inspection. EEs agree to correct structure numbering and discuss with local authorities. (Good)
Effects/ Influences of your activities to your organization: (Subjective Evaluation) 1. It is easy to identify the bridge for inspection. 2. Easy to access bridge location for inspection and bridge appearance very good.
Reasons/ Causes which hampered your activities: 1. RDA staff attended passable the road and repair due to bad weather condition. 2. Cost cutting for fuel, etc.
Expectation on achievement of your activities: (Subjective Evaluation) 1. Fulfill the shortage of safety equipment. 2. Establish bridge maintenance teams. 3. See the attractive and clean bridges.
Describe any activities if you have conducted excluding your action plan: (Subjective Evaluation) 1.
Influence of the training in Japan to you: (Subjective Evaluation) 1. No waste material in bridge location because identified one place ‘Garbage disposal is prohibited under the Bridge”. 2. All bridge inspectors used safety equipment properly when inspecting the bridges.
Others (Free comments, regardless of whether they are positive or negative): 1.
Overall evaluation by Consultant: Satisfactory As you point out cleaning, the wastes disposed around the bridges should be strongly urged to prevent unhealthy environment. Continue requesting necessary safety equipment to improve working conditions for both engineers and workers.

Review Questionnaire Form

Name: [redacted] ID: [redacted]
Position, Organization: Senior Engineer, BM&AU

Short-term activities in your Action Plan: (Copied from your action plan)

1. Conducting small scale practical sessions to upgrade knowledge of technical staff.
2. Accelerate regular inspection of bridges to identify health index level.

Activities already conducted:

1. Awareness programs in each Executive Engineer's Office. (Good)
2. Field visits to improve the practical knowledge in diagnosing and rectifying different types of damage on bridges. (Good)

Effects/ Influences of your activities to your organization:
(Subjective Evaluation)

1. Saving money of the organization by improving the life time of the bridges in the division.

Reasons/ Causes which hampered your activities:

1. Lack of funds for rectifying.
2. Prevailing showers and floods during the last 2-3 months.
3. Lack of Resources.

Expectation on achievement of your activities:
(Subjective Evaluation)

1. Providing safe travelling to Road Users.
2. Less in risk factors.
3. Improving confidence of the Technical Staff in any risk.
4. Becoming the Technical Staff to a "Smart Staff"' with new updated knowledge and techniques.

Describe any activities if you have conducted excluding your action plan:
(Subjective Evaluation)

1. Some of the Bridges found in very weak condition, have been directed for designing purposes.

Influence of the training in Japan to you:
(Subjective Evaluation)

1. Improving the knowledge in diagnosing the damage of bridges.
2. Upgrading the knowledge in construction by the series of lectures.

Others (Free comments, regardless of whether they are positive or negative):

1. If the lectures were conducted in English directly, it would have been more successful. (Thank you for valuable comment)

Overall evaluation by Consultant: Satisfactory

It is understandable that your activities were affected by rainy season. You are supposed to fulfill the action plan steadily in the next dry season.

Review Questionnaire Form

Name: [redacted] ID: [redacted]
Position, Organization: Senior Design Engineer, Engineering Services Division

Short-term activities in your Action Plan: (Copied from your action plan)

1. Study shortcomings in current design and details. (100%)
2. Proposal for improved design and details. (100%)
3. Organizing in-house training for design engineers.
4. Request for necessary budget.
5. Organizing on-site training.

Activities already conducted:

1. Study of shortcomings in current design practices and design detailing is in progress. (Good)
2. Awareness discussion is in progress with target design engineers. (Good)
3. In three upcoming bridge projects, improved design and detailing have already been introduced. (Very Good)

Effects/ Influences of your activities to your organization:
(Subjective Evaluation)

1. As I am working in Bridge Designs Office, improvements activities on designs & detailing are very important to face the future maintenance and management challenges of bridges in Sri Lanka.
2. The strategy would be very effective to implement through our division and ease maintenance of bridges in future.

Reasons/ Causes which hampered your activities:

1. Some countries' design code of practices & detailing are waiting to be collected for study.
2. Organizing in-house training for design engineers is delaying because of year-end work tasks in our office.

Expectation on achievement of your activities:
(Subjective Evaluation)

1. With routine work commitments, some activities have already been achieved and some are in progress.
2. I strongly believed that I am on a correct track to achieve my objectives.

Describe any activities if you have conducted excluding your action plan:
(Subjective Evaluation)

1.

Influence of the training in Japan to you:
(Subjective Evaluation)

1. Training in Japan on Capacity Development on Bridge Management has given me a very good initiative and confidence that to implement for planning and design of Bridges to prevent deterioration and for ease of maintenance works through our design division.

Others (Free comments, regardless of whether they are positive or negative):

1. It would be much grateful, if you could provide Japanese design code of practices & detailing for bridges.

Overall evaluation by Consultant: Very Good

I expect you to discover the best design practices to materialize much durable structures in Sri Lanka. Several site visits are also recommended to observe the actual construction situations.

Review Questionnaire Form

Name: [redacted] ID: [redacted]
Position, Organization: Design Engineer, Bridge Designs Office

Short-term activities in your Action Plan: (Copied from your action plan)

1. Study on structural concrete restoration methods. (100%)
2. Study of contractors' technical capacity and availability of materials and equipment. (100%)
3. Evaluation of cost of each restoration method. (100%)
4. Sharing the findings with technical staff of Engineering Service Division. (100%)

Activities already conducted:

1. Study on structural concrete restoration methods.
   - Studied the several references on concrete restoration methods (Plastering, Shotcreting).
   - Recognized that "BS EN 1504 – Products and systems for the protection and repair of concrete structures" should be used for the concrete repair of bridges in Sri Lanka to maintain the integrity among the design, construction and maintenance as European standards are already used for the design and construction of structures in Sri Lanka.
2. Study of contractors' technical capacity and availability of materials and equipment
   - Organized an awareness session on RC Bridge Repair and Methods for Engineers of Engineering Services Division, RDA, in coordination with a Sri Lankan company providing repair materials and construction works for civil engineering work.
3. Evaluation of cost of each restoration method
   - Evaluated the cost per m2 of each repair method (plastering, wet and dry mixed shotcrete, grouting) based on the cost norms provided in the training program. Market prices of materials required for repairs obtained from a Sri Lankan supplier of materials were used in the cost breakdown to estimate actual costs.
4. Sharing the findings with technical staff of Engineering Services Division
   - Conducted a knowledge sharing session for engineers in Engineering Services Division to share the knowledge gained during the training program in Japan and the findings of the activities done to accomplish the tasks of the action plan.

Effects/Influences of your activities to your organization:
(Subjective Evaluation)

1. Educating the technical staff of the Engineering Services Division about the possible concrete repair methods for bridges in Sri Lanka. (Very Good)
2. Proposing the repair method for three bridges damaged due to spalling of concrete in RC slab. (Bridge No. 58/1 on Colombo – Galle – Hambantota – Wellawaya Road (A002), Bridge No. 22/5 on Ambalangoda - Elpitiya - Pitigala Road (B014), Bridge No. 49/1 on Nagoda – Kalawellawa – Bellapitiya Road (B304)). (Very Good)

Reasons/Causes which hampered your activities:

1. Nothing hampered my activities.

Expectation on achievement of your activities:
(Subjective Evaluation)

1. Almost the expected results have already been achieved for the above-mentioned activities in the action plan.

Describe any activities if you have conducted excluding your action plan:
(Subjective Evaluation)

1. None.

Influence of the training in Japan to you:
(Subjective Evaluation)

1. The lecture on "Bridge Repair Methods and Materials" motivated me to implement the action plan related to RC slab repair. Also, the practical session associated with the above lecture helped me to understand the methodology and effectiveness of each repair method.

Others (Free comments, regardless of whether they are positive or negative):

1. In estimating costs for repair methods, I had some clarifications regarding the construction capacity of each method. However, when I asked the training program resource persons about it, I was informed that since Sri Lanka is in the initial stages of introducing such repair works, the construction capacities used

for the given cost norms are assumed to be relatively low, considering the skill level of the contractors. Furthermore, I was advised to revise those construction capacities after collecting the data during the actual practices of such repairs. However, during my action plan activities, I felt that the costs I discovered for repair methods were high, compared to the contractors' costs. Therefore, I have a challenge to find out the actual construction capacity and potential level of the contractors in the repair works being carried out in Sri Lanka.
Overall evaluation by Consultant: Very Good Estimate and cost of repair works are important issues for every Governments. Evaluation of contractor's capacity too. I understand your challenges.

Review Questionnaire Form

Name: [redacted] ID: [redacted]
Position, Organization: Engineer, BM&AU

Short-term activities in your Action Plan: (Copied from your action plan)

1. Creation of a team to give continuous training programs on bridge maintenance. (75%)
2. Release of (budget) allocation for urgent bridge maintenance. (50%)

Activities already conducted:

1. Proposal for team members called from Executive Engineers to carry out Bridge Maintenance.
2. Requested allocation for weak bridges in Central Province from Director (Maintenance Management) of RDA.

Effects /Influences of your activities to your organization:
(Subjective Evaluation)

1. Central Province has a large number of bridges and heavy rainfall throughout the year. In recent past 2 bridges damaged due to their weakness causing closure of the road for traffic. Those two bridges were identified in high priority to repair or reconstruction by BM&AU. Also the bridges for which allocation requested for year 2924 were identified by BM& AU activities. (Good)

Reasons/ Causes which hampered your activities:

1. Proposed teams to conduct bridge maintenance and monitoring in Central Province to each Executive Engineer's Office. Provincial Director agreed to conduct a training session in the 1st week of December. But due to heavy damage to national roads and bridges in prevailed bad weather conditions in this period, that was postponed.

Expectation on achievement of your activities:
(Subjective Evaluation)

1. To expedite the program to avoid sudden damage.
2. To get immediate solutions to repair the damage.
3.

Describe any activities if you have conducted excluding your action plan:
(Subjective Evaluation)

1. None.

Influence of the training in Japan to you:
(Subjective Evaluation)

1. Though I am new to this group, I gained sufficient knowledge about the importance of BM&AU activities. In addition to BM&AU works I engaged in preparing action plan for Roads and bridge maintenance works in Central Province. In this case I will pay attention to get more proposals from Executive Engineers for bridges maintenance. (Very Good)

Others (Free comments, regardless of whether they are positive or negative):

1. None.

Overall evaluation by Consultant: Satisfactory

I hope you can give important information on bridge maintenance to your colleagues. Short meetings and discussions with your colleagues will be effective for you to share your knowledge.

Attachment-9: Detailed Online Monitoring and Seminar Plan for FY2023

Training in Japan on Capacity Development on Bridge Management (Country Focus Training)

Detailed Online Monitoring and Seminar Plan for FY2023

1. Purpose of Online Monitoring

Online monitoring is for the Consultant to monitor the status of action plan implementation by the training participants online based on the Review Questionnaire Forms submitted on 15 December 2023 by the training participants.

2. Purpose of Online Seminar

The training participants has gained knowledge and experience through the training in Japan, which served as an opportunity to resolve issues faced in daily bridge maintenance and management works in Sri Lanka.

However, when formulating the training program, there was no opportunity for the Consultant to receive the requests from training participants regarding the curriculum in advance, and not all the training curriculums were necessarily what the training participants desired. As proof of this, several requests were raised as below by the training participants in their responses to the Review Questionnaire Form and at the evaluation meeting held after the completion of the training in Japan.

- Workshop on repair design and on-the-job training of repair works for extradosed bridge, steel bridge, and pre-stressed concrete bridge.
- Remedial measures (repair works) for bridge substructures and foundations that have been scoured.
- Bridge inspection using a drone (unmanned aerial vehicle: UAV).
- Introduction of “Bridge Inspector Certification Program”.

The purpose of the online seminar is to supplement the training program held in Japan from late August to early September 2023. The Consultant will select a suitable subject that can be provided remotely from the subjects demanded by the training participants.

3. Methodology of Online Monitoring

One month after the completion of the training in Japan, the Consultant prepared a review plan and shared it with the training participants. This review plan includes a Review Questionnaire Form for the training participants to report on the implementation status of the action plans they have implemented in their organizations for three months after the training in Japan. The Consultant requested training participants to submit the answers to the Review Questionnaire Form by December 15, 2023.

Based on the answers to the Review Questionnaire Form submitted by the training participants, the Consultant will confirm the following contents, conduct additional online interviews as necessary to confirm the contents of the Review Questionnaire Form, and submit the review results report to JICA.

- Activities planned in the action plan that have already been completed.
- Activities that were planned but could not be completed, and the reasons why.
- Horizontal expansion activities that were not included in the action plan but were implemented within the organization, if any.
- Requests for additional advice and assistance from the training participants or challenges the participants encountered.

Online monitoring will be of a group meeting that all the training participants should attend.

During the online monitoring, the details of the answers to the Review Questionnaire Form, including activities that have been smoothly progressed and activities that have not been well progressed due to difficulties or constraints, will be shared with all the training participants. Afterwards, all the participants will discuss on how to deal with the difficulties and constraints encountered by the training participants in order to continue implementing the action plans. This discussion will encourage training participants to provide advice, share information, and collaborate with each other, as well as to reach out to higher officials within the organization to ensure that the action plans can be continuously implemented.

4. Methodology of Online Seminar

In this online seminar, the Consultant selected the subject “Repair methods for bridge foundation scours” among several subjects demanded by training participants, which can be provided remotely, and provide the same as a lecture.

In Japan, the railway sector has advanced technology for remedial measures against scoured bridge substructures and foundations. Therefore, the Consultant decided to invite a lecturer from the Railway Technical Research Institute, Japan (RTRI) to give a lecture entitled “Diagnosis and remedial measures (repairs) for bridge substructures/ foundations that have been scoured”.

5. Agenda for Online Monitoring and Seminar

The online monitoring and online seminar will be held on the same day, and will be held on 17 January 2024 (Wed.), one month after the review activity in FY2023. The meeting time will be 10:00-13:00 Sri Lanka Standard Time: SST (13:30-16:30 Japan Standard Time: JST).

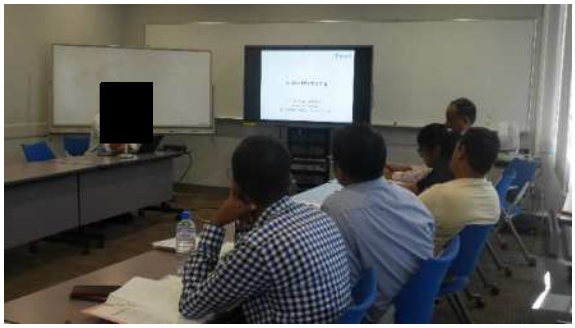
The agenda of the online monitoring and seminar (draft) is as given in Table-1.

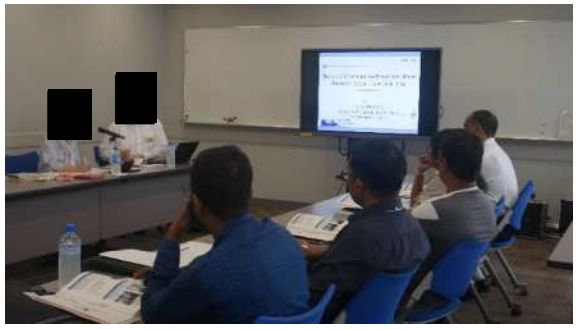
Table-1 Agenda of Online Monitoring and Seminar (Draft)

Time: SST (JST)	Curriculum	Presenter
10:00-10:05 (13:30-13:35)	Opening address	[redacted]
10:05-10:10 (13:35-13:40)	Address by JICA	[redacted]
10:10-10:15 (13:40-13:45)	Outline of online seminar	[redacted]
10:15-10:55 (13:45-14:25)	Online seminar: Diagnosis and repair for bridge substructures/ foundations that have been scoured	Railway Technical Research Institute, Japan
10:55-11:10 (14:25-14:40)	Online seminar: Q&A session	–

Time: SST (JST)	Curriculum	Presenter
11:10-11:20 (14:40-14:50)	Break	–
11:20-11:50 (14:50-15:20)	Online monitoring: Sharing the results of review result reports prepared by participants.	[redacted]
11:50-12:50 (15:20-16:20)	Online monitoring: Discuss how to deal with difficulties and constraints toward implementing and continuing the action plan.	Chaired by [redacted]
12:50-12:55 (16:20-16:25)	Closing remarks	[redacted]

Attachment-10: Photos of Activities in Training in Japan in FY2023

August 28, 2023 Briefing @ JICA Kansai	August 28, 2023 Country Report Presentation @ JICA Kansai
	
August 28, 2023 **Lecture:** Digital Asset Management Introduction by Emeritus Professor [redacted] at Kyoto University @ JICA Kansai	August 29, 2023 **Lecture:** Current Situation & Issues on Bridge Management in Asian & African Countries by International Students from Osaka University @ JICA Kansai
	
August 29, 2023 **Lecture:** Human Resources Development System for Bridge Engineers (industry-government-academia collaboration) by Professor [redacted] at Gifu University @ JICA Kansai	August 29, 2023 **Lecture:** Bridge Monitoring by Associate Professor [redacted] at Nagasaki University @ JICA Kansai
	

August 30, 2023 **Study Tour:** Damaged Bridge Components, Causes of Deterioration, and Repair Methods by [redacted], Manager of NEXCO West @ Ibaraki Technical Training Center	August 30, 2023 **Lecture:** Maintenance and Management of Extradosed Bridge (Tsukahara Bridge) by [redacted], Manager of NEXCO West @ Kobe Expressway Office
	
August 30, 2023 **Study Tour:** Tsukahara Bridge Site by [redacted], Manager of NEXCO West	August 31, 2023 **Lecture:** Statistical Deterioration Prediction Model Based on Actual Inspection Data by Professor [redacted] at Osaka University @ JICA Kansai
	
August 31, 2023 **Lecture:** Corrosion in Steel Bridges by Associate Professor [redacted] at Osaka University @ JICA Kansai	August 31, 2023 **Lecture:** Fatigue of RC Slab (Non-destructive Test) by Assistant Professor [redacted] at Osaka University @ JICA Kansai
	

September 1, 2023 **Study Tour:** Akashi-Kaikyo Bridge by [redacted], Deputy Manager of Honshu-Shikoku Bridge Expressway Company Limited	September 1, 2023 **Lecture:** Full Scale Drawing (From Drawing to 3D Modelling) by [redacted], Supervisor of Yokogawa Bridge @ Osaka Factory (Sakai City)
	
September 1, 2023 **Study Tour:** Explanation of Factory Tour by [redacted], Manager of Yokogawa Bridge @ Osaka Factory (Sakai City)	September 1, 2023 **Study Tour:** Factory Tour by [redacted], Manager of Yokogawa Bridge @ Osaka Factory (Sakai City)
	
September 1, 2023 **Lecture:** Quality Control for Steel Bridge Fabrication and Q&A by [redacted], Manager of Yokogawa Bridge @ Osaka Factory (Sakai City)	September 4, 2023 **Lecture:** Inspection, Diagnosis and Evaluation of Bridges by [redacted], Group Leader of DAINICHI @ Dainichi Consultant Inc., Head Office
	

September 4, 2023 **Lecture:** Maintenance and Management of Prestressed Concrete (PC) Slab Bridge by [redacted], Group Leader of DAINICHI @ Dainichi Consultant Inc., Head Office	September 4, 2023 **Lecture:** Bridge Repair Methods & Materials by [redacted], Group Leader of DAINICHI @ Dainichi Consultant Inc., Head Office
	
September 4, 2023 **Practice:** Practical Training on Investigations Required for Repair Design: Neutralization test, RC radar survey, Schmidt hammer test (compressive strength estimation) by [redacted], Group Leader of DAINICHI @ Uzura Ohashi Bridge (Uzura, Gifu City)	September 4, 2023 **Practice:** Learn About Bridge Repair Materials by [redacted], Group Leader of DAINICHI @ Uzura Ohashi Bridge (Uzura, Gifu City)
	
September 5, 2023 **Lecture:** Inspection of Bridge Structures under Water by [redacted], Group Leader of DAINICHI @ Dainichi Consultant Inc., Head Office	September 5, 2023 **Lecture:** Scour Survey by [redacted], Group Leader of DAINICHI @ Dainichi Consultant Inc., Head Office
	

September 5, 2023 **Practice:** Practical Training on River Scour Survey by [redacted], Group Leader of DAINICHI @ Uzura Ohashi Bridge (Uzura, Gifu City)	September 6, 2023 **Lecture:** Introduction of Bridge Maintenance Management System by [redacted], Deputy Director of DNE @ Dainichi Consultant Inc., Head Office
	
September 6, 2023 **Practice:** Actual Inspection using a Tablet by [redacted], Deputy Director of DNE @Uzura Ohashi Bridge (Uzura, Gifu City)	September 7, 2023 **Lecture:** Planning and Design of Bridges for Better Maintenance by [redacted], Advisor of DNE @ JICA Kansai
	
September 7, 2023 Guidance for Action Plan @ JICA Kansai	September 8, 2023 Preparation of Action Plan @ JICA Kansai
	

September 8, 2023 Closing Ceremony @ JICA Kansai	January 17, 2024 Online Monitoring and Seminar
	

Attachment-11: Use Conditions of Copyrighted Works - Agreement in FY2023

Form 5

Use conditions of copyrighted works / Agreement

1. List of Texts and Contents of License

Course Name : Training in Japan on Capacity Development on Bridge Management for Democratic Socialist Republic of Sri Lanka

Course No. : 202108740J001

No.	Text Name	Lecture Name	Lecturer	Organization	Date of Lecture	Contents of License (1) Way of Use	(2) Users	(3) Form	Remarks
1	Digital Asset Management: Introduction	Digital Asset Management: Introduction	[redacted] (Professor Emeritus)	Kyoto University	28-Aug-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☑ 2	☑ 1 ☐ 2	
2	Road Asset Management Practice in Ethiopia	Current Situation & Issues on Bridge Management in Asian & African Countries	[redacted]	Osaka University	29-Aug-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☐ 2	☐ 1 ☑ 2	
3	Infrastructure Management in Nepal: Road	Current Situation & Issues on Bridge Management in Asian & African Countries	[redacted]	Osaka University	29-Aug-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☐ 2	☐ 1 ☑ 2	
4	Infrastructure Management in Ghana	Current Situation & Issues on Bridge Management in Asian & African Countries	[redacted]	Osaka University	29-Aug-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☐ 2	☐ 1 ☑ 2	
5	Infrastructure Asset Management Practice in Cambodia	Current Situation & Issues on Bridge Management in Asian & African Countries	[redacted]	Osaka University	29-Aug-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☐ 2	☐ 1 ☑ 2	
6	Introduction Road Asset Management System in Lao PDR	Current Situation & Issues on Bridge Management in Asian & African Countries	[redacted]	Osaka University	29-Aug-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☐ 2	☐ 1 ☑ 2	
7	Introduction of Center for Infrastructure Asset Management Technology and Research (CIAM)	Human Resources Development System for Bridge Engineers	[redacted] (Professor)	Gifu University	29-Aug-2023	☑ 1 ☐ 2 ☐ 3	☐ 1 ☑ 2	☑ 1 ☐ 2	
8	Bridge Monitoring	Bridge Monitoring	[redacted] (Associate Professor)	Nagasaki University	29-Aug-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☑ 2	☑ 1 ☐ 2	
9	I-TR Brochure	Damaged Bridge Components, Causes of Deterioration, and Repair Methods	[redacted] (Manager)	West Nippon Expressway Co., Ltd.	30-Aug-2023	☑ 1 ☑ 2 ☐ 3	☑ 1 ☐ 2	☐ 1 ☑ 2	
10	Maintenance and Management of Tsukuhara Bridge	Maintenance and Management of Extradosed Bridge	[redacted] (Manager)	West Nippon Expressway Co., Ltd. Kansai Branch	30-Aug-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☑ 2	☑ 1 ☐ 2	
11	Statistical Deterioration Prediction Model Based on Actual Inspection Data	Statistical Deterioration Prediction Model Based on Actual Inspection Data	[redacted] (Associate Professor)	Osaka University	31-Aug-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☐ 2	☑ 1 ☐ 2	
12	Corrosion in Steel Bridges	Corrosion in Steel Bridges	[redacted] (Associate Professor)	Osaka University	31-Aug-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☐ 2	☐ 1 ☑ 2	
13	Fatigue of RC Slab (Non-destructive Test)	Fatigue of RC Slab (Non-destructive Test)	[redacted] (Assistant Professor)	Osaka University	31-Aug-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☐ 2	☐ 1 ☑ 2	
14	Akashi Kaikyo Bridge	Akashi Kaikyo Bridge	[redacted] (Deputy Manager)	Honshu-Shikoku Bridge Expressway Co., Ltd.	01-Sep-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☑ 2	☑ 1 ☐ 2	
15	Full Scale Drawing	Full Scale Drawing (From Drawing to 3D Modelling)	[redacted] (Supervisor)	Yokogawa Bridge	01-Sep-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☐ 2	☑ 1 ☐ 2	
16	Explanation of Factory Tour (Overview) (Explanatory Material)	Factory Tour (Overview) (Explanatory Material)	[redacted] (Manager)	Yokogawa Bridge Osaka Factory	01-Sep-2023	☑ 1 ☐ 2 ☐ 3	☑ 1 ☐ 2	☑ 1 ☐ 2	
17	Quality Control for Steel Bridge Fabrication	Quality Control for Steel Bridge Fabrication and Q&A	[redacted] (Manager)	Yokogawa Bridge Osaka Factory	01-Sep-2023	☑ 1 ☑ 2 ☐ 3	☑ 1 ☑ 2	☑ 1 ☐ 2	
18	Inspection, Diagnosis and Evaluation	Inspection, Diagnosis and Evaluation	[redacted] (Group Leader)	Dainichi Consultant Inc.	04-Sep-2023	☑ 1 ☑ 2 ☐ 3	☑ 1 ☑ 2	☑ 1 ☐ 2	
19	Maintenance and Management of Prestressed Concrete (PC) Slab Bridge	Maintenance and Management of Prestressed Concrete (PC) Slab Bridge	[redacted] (Group Leader)	Dainichi Consultant Inc.	04-Sep-2023	☑ 1 ☑ 2 ☐ 3	☑ 1 ☑ 2	☑ 1 ☐ 2	
20	Bridge Repair Methods & Materials	Bridge Repair Methods & Materials	[redacted] (Group Leader)	Dainichi Consultant Inc.	04-Sep-2023	☑ 1 ☑ 2 ☐ 3	☑ 1 ☑ 2	☑ 1 ☐ 2	

Form 5

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1. List of Texts and Contents of License

Course Name : Training in Japan on Capacity Development on Bridge Management for Democratic Socialist Republic of Sri Lanka

Course No. : 202108740J001

No.	Text Name	Lecture Name	Lecturer	Organization	Date of Lecture	Contents of License (1) Way of Use	(2) Users	(3) Form	Remarks
21	Inspection of Bridge Structures under Water	Inspection of Bridge Structures under Water	[redacted] (Group Leader)	Dainichi Consultant Inc.	05-Sep-2023	☑ 1, ☑ 2, ☐ 3	☑ 1, ☑ 2	☑ 1, ☐ 2	
22	Scour Survey	Scour Survey	[redacted] (Group Leader)	Dainichi Consultant Inc.	05-Sep-2023	☑ 1, ☑ 2, ☐ 3	☑ 1, ☑ 2	☑ 1, ☐ 2	
23	Introduction of Bridge Maintenance Management System	Introduction of Bridge Maintenance Management System	[redacted] (Deputy Director)	Dia Nippon Engineering Consultants Co., Ltd.	06-Sep-2023	☐ 1, ☐ 2, ☐ 3	☑ 1, ☐ 2	☐ 1, ☑ 2	
24	Planning and Design of Bridges for Better Maintenance	Planning and Design of Bridges for Better Maintenance	[redacted] (Advisor)	Dia Nippon Engineering Consultants Co., Ltd.	07-Sep-2023	☐ 1, ☐ 2, ☐ 3	☑ 1, ☐ 2	☐ 1, ☑ 2	
25	Diagnosis and Countermeasures of scoured substructures for Railway Bridges	Diagnosis and Countermeasures of scoured substructures for Railway Bridges	[redacted]	Railway Technical Research Institute	17-Jan-2024	☑ 1, ☐ 2, ☐ 3	☑ 1, ☐ 2	☑ 1, ☐ 2	

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Form 5A

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1. List of Texts and Contents of License

Course Name : Training in Japan on Capacity Development on Bridge Management for Democratic Socialist Republic of Sri Lanka

Course No. : 202108740J001

No.	Text Name	Lecture Name	Lecturer	Organization	Date of Lecture	Contents of License						Remarks
						(1) Way of Use		(2) Users		(3) Form		
25	Diagnosis and Countermeasures of scoured substructures for Railway Bridges	Diagnosis and Countermeasures of scoured substructures for Railway Bridges	[redacted]	Railway Technical Research Institute	17-Jan-2024	☑	1	☑	1	☑	1	
						☐	2	☐	2	☐	2	
						☐	3					

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Attachment-12: Presentation Materials in FY2023

Presentation Material		Lecturer
(1)	Country Report by Training Participants	
	1) Country Report	[redacted]
	2) Country Report	[redacted]
	3) Country Report	[redacted]
	4) Country Report	[redacted]
	5) Country Report	[redacted]
	6) Country Report	[redacted]
	7) Country Report	[redacted]
	8) Country Report	[redacted]
	9) Country Report	[redacted]
	10) Country Report	[redacted]
(2)	Action Plan by Training Participants	
	1) Action Plan	[redacted]
	2) Action Plan	[redacted]
	3) Action Plan	[redacted]
	4) Action Plan	[redacted]
	5) Action Plan	[redacted]
	6) Action Plan	[redacted]
	7) Action Plan	[redacted]
	8) Action Plan	[redacted]
	9) Action Plan	[redacted]
	10) Action Plan	[redacted]

(1) Country Report by Training Participants

1) Country Report by [redacted]

COUNTRY REPORT

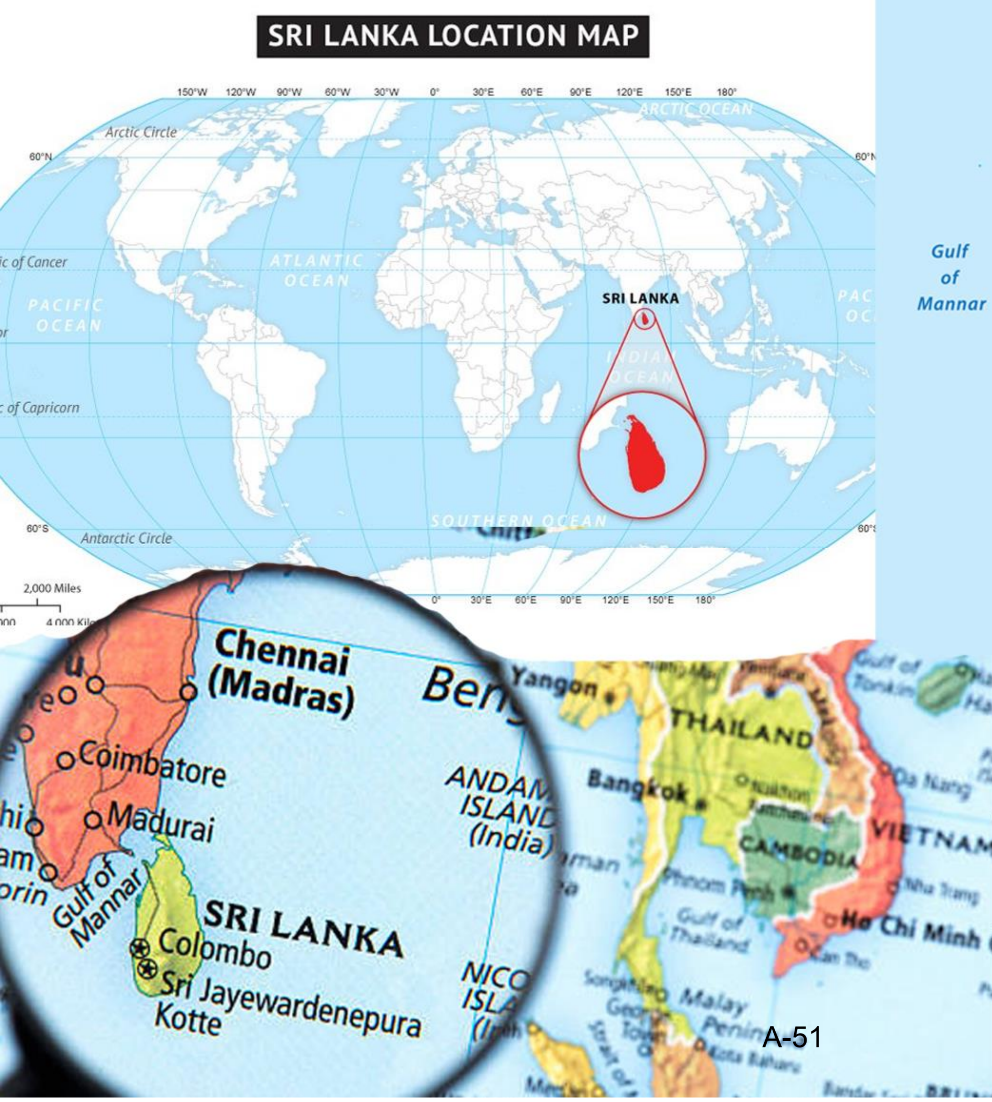
TRAINING ON CAPACITY DEVELOPMENT ON BRIDGE MANAGEMENT IN SRI LANKA

Presented by

[redacted]

BSc. Eng (Hons); MEng(Struc); C Eng; MIE(SL)

DIRECTOR (ENGINEERING SERVICES) (A.D)
& ADDITIONAL DIRECTOR (BM&AU)
ROAD DEVELOPMENT AUTHORITY
SRI LANKA



Brief Description on Sri Lanka

Sri Lanka is a tropical island surrounded by the Indian Ocean and its history dates back to over 2500 years

The central part of the Island is hill country about 1000-6000 ft above the mean sea level. Kandy, the ancient capital of Sri Lanka is at 1500ft above mean sea level. Hilly terrain at centre, hot plain beaches along the coast, ancient historic ruins and monuments and varying climate condition are attractive features of Sri Lanka.

It is a popular tourist destination also.

Road Net Work of Sri Lanka had been owned and maintained by …..

- Public Works Department (PWD) up to 1971
- Territorial Civil Engineering Organization (TECO) from 1971 to 1978
- Department of Highways (DH) from 1978 to 1985
- Road Development Authority (RDA) from 1986-

Presently..

- Road Development Authority
- Provincial Councils
- Municipal Councils

ROAD DEVELOPMENT AUTHORITY

MINISTRY OF HIGHWAYS

SRI LANKA

- The Road Development Authority (RDA) is the Principal Highway Authority for the construction and maintenance of National Highways Network of Sri Lanka.

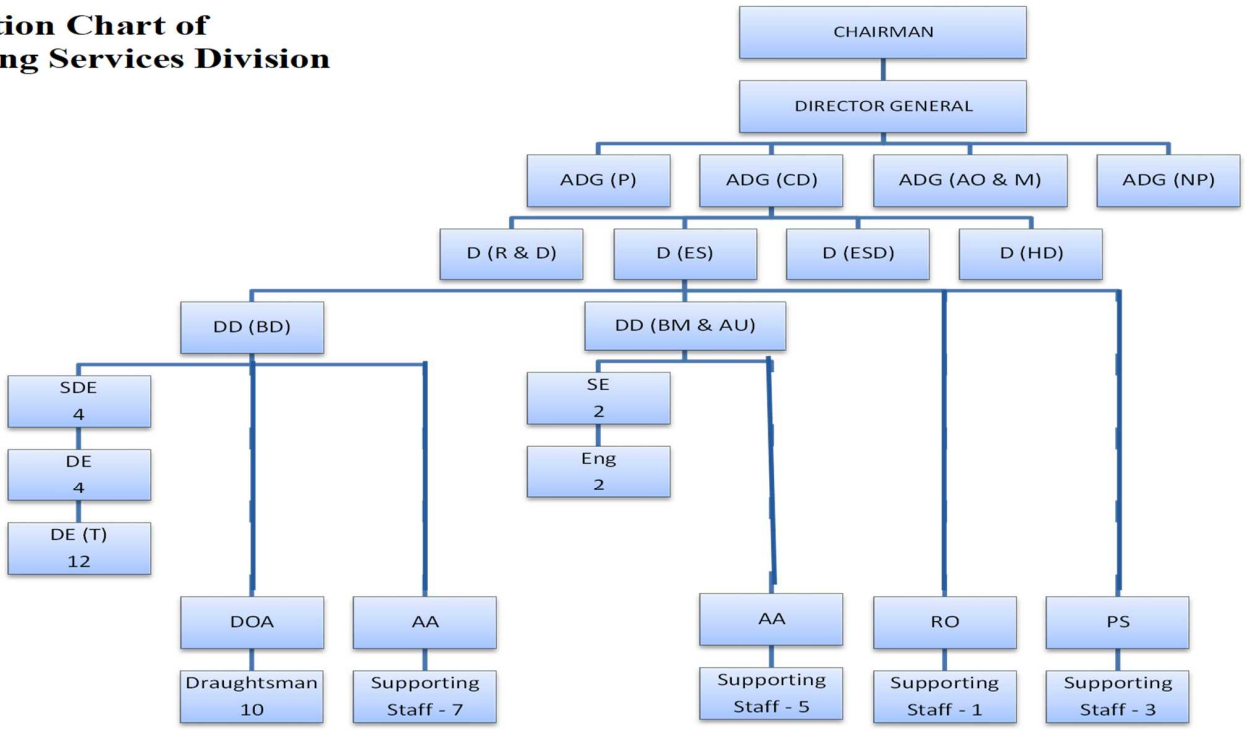
Functional Divisions in RDA

- **Administration**
- **Construction**
- **Engineering Services**
- **Environmental & Social Development**
- **Expressway Operation Maintenance & Management**
- **Finance**
- **Highway Designs**
- **Infrastructure, Road Safety & Traffic Management**
- **Internal Audit**
- **Lands**
- **Legal**
- **Maintenance Management**
- **Mechanical**
- **Planning**
- **Property Management & Revenue**
- **Quality Assurance & Progress Monitoring**
- **Research and Development**
- **Training**
- **Project Management Units**

The main functions performed by the RDA are….

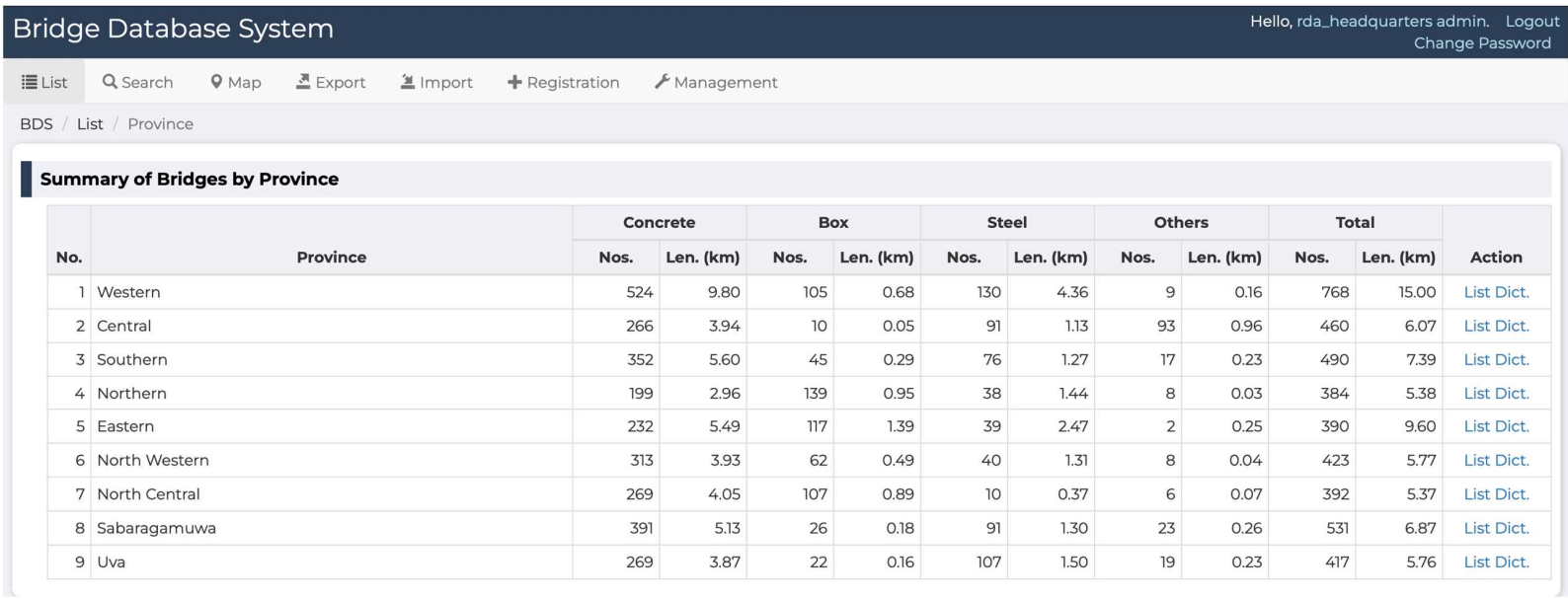
- **Recommending highway investment program to the Government**
- **Planning, design, construction and maintenance of roads and bridges**
- **Administration of foreign aided projects.**
- **Implementing measures for reducing urban traffic problems and improving traffic safety.**
- **Research work for highways and bridges.**

Organization Chart of Engineering Services Division



ADG (CD)	-	Additional Director General (Construction & Designs)
D (ES)	-	Director (Engineering Services)
DD (BD)	-	Deputy Director (Bridge Designs)
DD (BM & AU)	-	Deputy Director (Bridge Management & Assessment Unit)
SDE	-	Senior Design Engineer
SE	-	Senior Engineer
DE	-	Design Engineer
Eng.	-	Engineer
DE (T)	-	Design Engineer (Training)
DOA	-	Drawing Office Assistant
RO	-	Record Officer
AA	-	Administrative Assistant
PS	-	Personal Secretary

Detail of Inspected Bridges by BM&AU



Bridge Database System

Hello, rda_headquarters admin. Logout
Change Password

List | Search | Map | Export | Import | Registration | Management

BDS / List / Province

Summary of Bridges by Province

No.	Province	Concrete		Box		Steel		Others		Total		Action
		Nos.	Len. (km)	Nos.	Len. (km)	Nos.	Len. (km)	Nos.	Len. (km)	Nos.	Len. (km)	
1	Western	524	9.80	105	0.68	130	4.36	9	0.16	768	15.00	List Dict.
2	Central	266	3.94	10	0.05	91	1.13	93	0.96	460	6.07	List Dict.
3	Southern	352	5.60	45	0.29	76	1.27	17	0.23	490	7.39	List Dict.
4	Northern	199	2.96	139	0.95	38	1.44	8	0.03	384	5.38	List Dict.
5	Eastern	232	5.49	117	1.39	39	2.47	2	0.25	390	9.60	List Dict.
6	North Western	313	3.93	62	0.49	40	1.31	8	0.04	423	5.77	List Dict.
7	North Central	269	4.05	107	0.89	10	0.37	6	0.07	392	5.37	List Dict.
8	Sabaragamuwa	391	5.13	26	0.18	91	1.30	23	0.26	531	6.87	List Dict.
9	Uva	269	3.87	22	0.16	107	1.50	19	0.23	417	5.76	List Dict.

Major causes of bridge damage or bridge replacement

The major causes for bridge damage

The corrosion of reinforcement in reinforced / prestressed concrete bridges specially in coastal area

The corrosion of structural elements in the steel bridges due to poor maintenance system.

Any settlement or failure in substructures, due to illegal sand mining close to the bridges or scouring.

The bridges are replaced generally

- When they reach their design life time

- If there is any considerable weakness found that it is not safe to the traffic

- During the major rehabilitation of roads, if the bridges are found bottlenecks / black spots, depends on the condition they are widened or re-decked or reconstructed.

- If any bridge and its immediate approaches are well below the high flood level

---

- Bridge No 25/6 on Negombo - Mirigama Road (B324)
- The overall length & effective width of this single span bridge are 4m and 7.6m respectively. The abutments & wingwalls looks very weak with loosen boulders/rubbles.

Weak abutment

Weak abutment with loose boulders

- Bridge No on 11/3 Udugampola - Divulapitiya Road (B430)

- The overall length & effective width of this single span bridge is 4.4m & 7.5m respectively. The abutments are in poor condition with loss of bricks & loose boulders.

Weak abutment with loss of bricks

- Bridge No 13/3 on Akuressa - Kamburupitiya Road (B003)

- The overall length & effective width of this single span arch bridge are 4.2m and 4.2m respectively. The barrel is cracked, looks very weak.

Cracks on arch barrel

Foundation is scoured

• Bridge No 25/1 on Jaffna - Ponnalai - Point Pedro Road (AB021)

- The overall length & effective width of this single span arch bridge are 3.5m and 3.3m respectively. The barrel is propped by timber logs, looks very weak with loss of boulders.

Arch propped by timber logs

Loss of boulders

• Bridge No 27/1 on Jaffna - Manipay - Karainagar Road (AB017)

- The overall length & effective width of this single span arch bridge are 3.7m and 7m respectively. The part of the arch barrel already failed & filled by boulders.

Existing arch bridge collapsed, temporary arrangement with boulder fill

Waterway is filled by boulders

- Bridge No 113/3 on Maradankadawela Habarana Tirikkondiadimadu Road (A011)
- The overall length & effective width of this single span bridge are 4.1m & 7.7m respectively. The abutments are in good condition. The reinforcement in deck is badly exposed with weak concrete.

Deck reinforcement badly exposed

Deck reinforcement started to corrode

- Bridge No 53/1 on Jaffna - Ponnalai - Point Pedro Road (AB021)
- The overall length & effective width of this single span bridge are 4.1m & 7.7m respectively. The abutments are in good condition. The reinforcement in deck is badly exposed with weak concrete.

Reinforcement exposed

Reinforcement exposed

- Bridge No 242/1 on Colombo - Galle - Hambantota - Wellawaya (A002) (Hambantota City Road)

- The overall length & effective width of this single span bridge are 7.5m & 4.25m respectively. The RSJJ of the composite deck is badly corroded with considerable section loss.

Very badly corroded RSJ

Very badly corroded RSJ & weak abutment

- Bridge No 12/2 on Alawatugoda - Ankumbura - Keppetigala Road (B007)

- The overall length & effective width of this single span bridge are 8.54m and 5.25m respectively. The edge RSJJ of the composite deck is badly corroded with considerable section loss. The abutments are in good condition.

Very badly corroded RSJ

Reinforcement exposed in deck

- Bridge No 20/4 on Tudella - Pamunugama - Talahena – Negombo (B425) Road
- The overall length & effective width of this 18 span bridge are 139m & 10.6m respectively. The abutments & piers are in poor condition. Several piers are badly damaged with exposed reinforcement by fishing boat operations.

Collapsed wingwall, PSC beam reinforcement exposed

Badly damaged pier capping & pier columns with exposed reinforcement

Vulnerable Bridges Due to Illegal Mining Activities

- The foundations of the following bridges are severely exposed due to illegal mining activities taking place, close to the bridges. The river bed level has gone down to the considerable depth. These bridges will be in danger in near future.

- Bridge No 72/2 on Kandy - Mahiyangana – Padiyatalawa Road (A026)

General view of the bridge

Badly scoured foundation

- Bridge No 14/3 on Avissawella - Hatton - Nuwara Eliya Road (A007)

Badly scoured foundation

- Bridge No 1/5 on Avissawella - Hatton - Nuwara Eliya Road (A007)

Badly scoured foundation

- Bridge No 3/3 on Makandura Badalagama Road (B503)

Badly scoured foundation

- Bridge No 3/3 on Hanwella - Pugoda - Weke – Urapola Road (B503)

Badly scoured foundation

INVOLVEMENT OF MINISTRY OF HIGHWAYS, NATIONAL UNIVERSITIES & OTHER AGENCIES IN BRIDGE MANAGEMENT IN SRI LANAKA

The Ministry of Highways (MOH)

The MOH has the limited number of technical staff just to administor the issues related to the technical & financial matters.

As such, the involvement of MOH in the Bridge Management is very minimal & the RDA can't expect more from the MOH

The National Universities

The testing of materials are basically done in R&D Division of RDA. If those facilities are not available in R&D then those tests are conducted in the national universities & other relavant institutions.

The RDA received some public complaints regarding the excessive vibrations in a recently completed bridge. Then the national universities were requested to do the necessary instrumentation to measure the vibration & to check whether it is within the allowable limits.

Flyover at Rajagiriya

The Other Agencies

A steel bridge constructed 12 years ago across a lagoon in marine environment had corroded very severely even though the supplier of the bridge recommended the durability of it's protective coating system is minimum of 18 years.

Then RDA hired an expert in marine painting system, to inspect the steel components of the bridge and submit a detailed report with the recommendation.

- **Bridge No 17/3 on Navatkuli – Kerativu - Mannar (A032) Road**
- This bridge has 7 spans with an overall length of 223.8 m and overall width of 8.4m. The available clear carriageway is 7.8m. This bridge was fabricated & launched by Mabey, UK, in Year 2011.

Protective coatings peeled off & steel corrosion

BRIDGE INSPECTION VEHICLE GRANTED BY JICA

Bridge inspection Vehicle in Action

Thank You

FOR YOUR PATIENT HEARING

(1) Country Report by Training Participants

2) Country Report by [redacted]

COUNTRY REPORT

SRI LANKA

An Overview of Engineering Services Division and Human Resources Development

[redacted]

(B.Sc.Eng.(Hons), M.Sc.(Geotech), P.G.Dip.(Structural Eng.), C.Eng, MIE(SL))

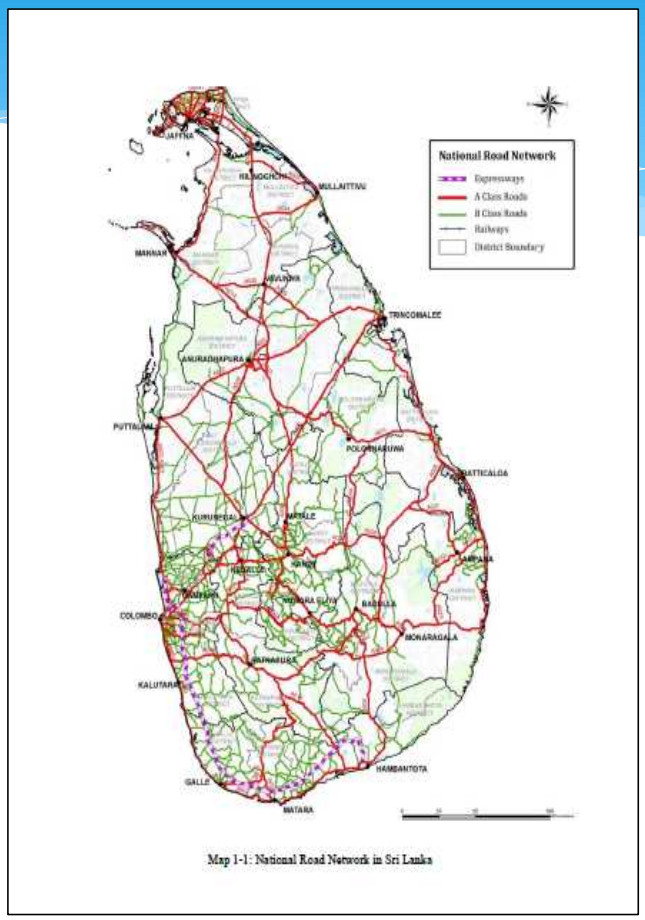
Senior Design Engineer

Bridge Designs Office - Engineering Services Division

Road Development Authority

SRI LANKA

National Road Network in Sri Lanka



Map 1-1: National Road Network in Sri Lanka

Road Network of Sri Lanka had been owned and maintained by …..

- Public Works Department (PWD) up to 1971
- Territorial Civil Engineering Organization (TECO) from 1971 to 1978
- Department of Highways (DH) from 1978 to 1985
- Road Development Authority (RDA) from 1986-

Presently..

- Road Development Authority
- Provincial Councils
- Municipal Councils

ROAD DEVELOPMENT AUTHORITY
MINISTRY OF TRANSPORT AND HIGHWAYS
SRI LANKA

- The Road Development Authority (RDA) is the Principal Highway Authority for the construction and maintenance of National Highways Network of Sri Lanka.

- National Highways Network consists of about 12,000 km A and B Class roads, about 312 km Expressways and about 4500 bridges.

ROAD DEVELOPMENT AUTHORITY

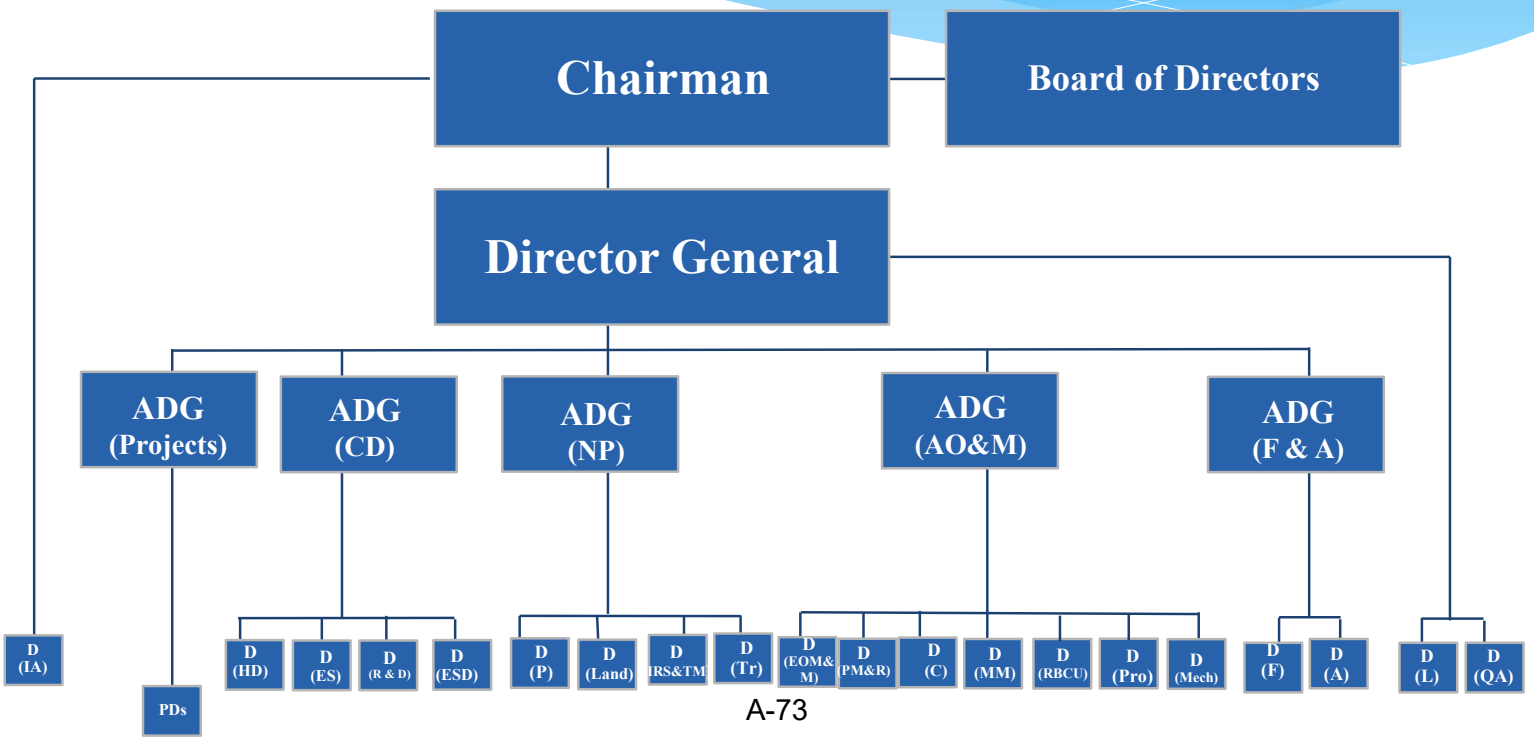
Sustainably developed Sri Lanka

As the premier national organization of the road sector, to provide an adequate and efficient network of national highways, to ensure mobility and accessibility at an acceptable level of safety and comfort, in an environment friendly manner, for the movement of people and goods paving way for the socio-economic development of the nation.

Strategies for Development of National Road Network

* Rehabilitation of the existing road network
* Major Improvements including realignment and deviation to existing trunk roads including enhancing capacity in terms of volume and load
* Construction of system of Ring Roads / Bypass to city , Fly – Overs, Major Towns and Urban Centres
* Bridge development
* Construction of Expressways / Highways as alternative to supplement the trunk roads

Organization Chart of RDA



Engineering Services Division

- Bridge Designs Office
- Bridge Management and Assessment unit

Bridge Designs Office

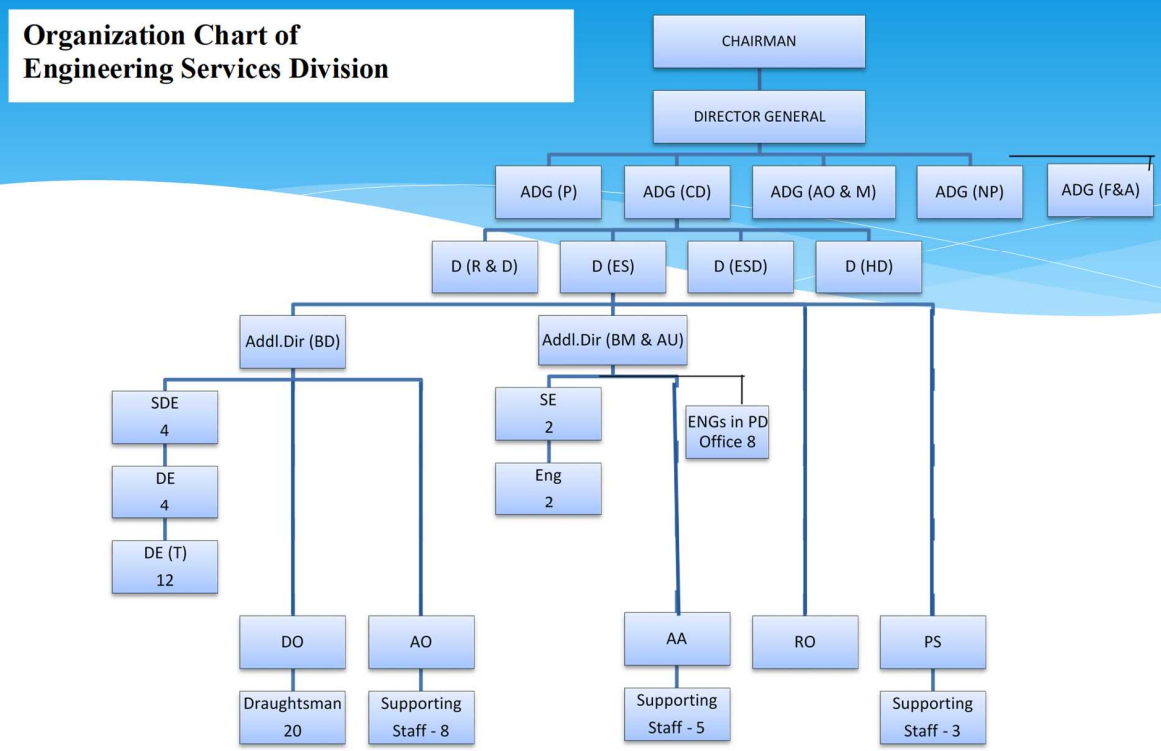
The Bridge Designs Office is responsible to provide designs for Bridges, elevated highways, viaducts, underpasses, overpasses & other road related structures and strengthening of weak and narrow bridges along with training of young engineers and it is managed by Additional Director/Bridge Designs which is one of the specialized divisions of the RDA.

There are Senior Design Engineers, Design Engineers, Trainee Design Engineers, Draft Personnel and other supporting staff under the Additional Director/ Bridge Designs.

Bridge Management and Assessment unit

The BM & AU was established with the Technical Assistance granted by **JICA** for the formulation of mechanism of bridge management and assessment based on scientific analysis of all factors concerned, such as structural capacity, importancy of the bridge location, availability of alternative route etc. in order to prepare schedule of prioritization of rectification of weak bridges.

The BM & AU is managed by Additional Director with Engineers and other staff provided by RDA.



Functions of the Bridge Design Office

- Preparation of conceptual designs of Bridges, elevated highways, viaducts, underpasses, overpasses & other road related structures and approach roads for bridge improvement and rehabilitation projects.
- Preparation of detailed designs, drawings, BOQ and Engineer's Estimates for bridge projects.
- Providing advisory and support services to the relevant divisions of RDA for implementation of bridge projects on request.
- Review of Designs requested by PMUU.

13

Functions of the Bridge Design Office cont.

- Diagnosing problems in implementation of bridge projects and amending designs as required to suit the site conditions during construction.
- Providing advisory services and guidance in repair/maintenance of bridges.
- Developing and updating of standard designs for bridge beams and other bridge components to satisfy current requirements, codes of practices and finalization of type plans for same.

Functions of the Bridge Design Office cont.

- Providing training for RDA Engineers in Bridge Designs to enable them to partially fulfill the requirements to obtain professional qualifications.
- Participation for progress review meetings and providing advisory and support services where required for projects implemented by the Project Management Units.
- Participation for discussions with Foreign Missions in connection with bridge rehabilitation projects to be implemented under foreign funded programs.

Functions of the Bridge Design Office cont.

- Providing counterpart services to Foreign Missions such as providing data/information, appraising of local conditions, reviewing of basic designs and detail engineering work, making observations and suggestions.
- Monitoring, review and acceptance of detail engineering work executed by Consultants for bridge projects on request of PMUU.
- Checking of alterative designs submitted by Contractors in the process of executing the bridge projects awarded to them to decide on adaptability of same.
- Execution of structural assessments of bridges and providing designs and specifying repairs/strengthening needed for bridges for transport of abnormally or extra heavy loads such as Electric Generators, Gas Turbines etc. and grant approval for the movement of those on specific trailer arrangements.

Functions of the BM&AU

- Inspection of bridges for inventory and condition assessment
- Feeding the inspection data to the web-based bridge data base.
- Prioritization of the weak bridges for necessary repair / reconstruction and preparing the tentative estimates.

Functions of the BM&AU

- Tentative estimates will be forwarded to the Planning Division for necessary funding arrangement and detailed design of those weak bridges will be attended by Bridge Designs Office
- Inspection and verification of about 4250 bridges

Human Resources Development

Introduction

* RDA considers training as a very important function of the organization and as an investment, which is an absolute necessity in a developing technical world.

* Training Division is entrusted with the responsibility of carrying out the training function in the organization in order to enhance the knowledge, upgrade the skills and develop appropriate attitudes to improve effectiveness and efficiency at work.

* Objectives are generally achieved by identification of training needs, preparation and implementation of training programmes.

Functions of Training Division in general

- Organizing and conducting regular in-house training programmes
  - Lectures and Seminars
  - Computer applications
  - Field visits and demonstrations
- Conducting induction courses
- Nominating Junior Engineers to various design offices in RDA to gain design experience for one year in order for them to obtain full professional qualifications.
- Nominating of employees for Foreign training programmes
- Nominating employees for long term courses such as Masters Degrees at local/foreign universities/institutes

Specific Training for carrier development of Bridge Designs Team

- Design guidelines for bridge structures using Euro codes – organized by Transport Connectivity and Asset Management Project , RDA
- Structural Design workshops on "Transition to Euro codes" in collaboration with University of Peradeniya
- Structural Design workshops on "Euro codes" in collaboration with Society of Structural Engineers, Sri Lanka
- Workshop on Euro code 7 for Geotechnical Design by Sri Lankan Geotechnical Society
- Annual Conference of Sri Lankan Geotechnical Society under the main theme of Pile Foundation design, Construction and Testing
- Knowledge sharing sessions – lessons learnt from Expressways – case study on Port Access elevated highway Project

Specific Training for carrier development of BM&AU Team and other provincial level technical staff

* With the technical assistance granted by **JICA,** Provincial Directors, Chief Engineers and Executive Engineers in each province were trained with some workshops and on-site training for bridge inspection and some repair methods.

* Same training sessions were extended to selected Engineers, Technical Officers and Work supervisors of each province in order to enhance their skills to meet the efficiency and effectiveness.

Constraints and Challenges on Human Resources Development

* Pandemic of COVID 19
* Political instability of the country
* Economic crisis

→ continuation of the carrier development of technical staff was not in order.

* Limited budget allocations

→ several restrictions on human resources development

* Deficiency of conducting sufficient no. of lectures, workshops and field training

Constraints and Challenges on Human Resources Development cont.

* Lack of funds ➡ Restrictions on implementation

* Limiting of professional resource personnel ➡ Restrictions on training

Expectations on HR Development from the Training

Identifying required training programmes for enhancing the knowledge on Bridge Management and Assessment

Thank You

(1) Country Report by Training Participants

3) Country Report by [redacted]

COUNTRY REPORT

CAPACITY DEVELOPMENT OF BRIDGE MANAGEMENT IN SRI LANKA

Presented by

[redacted]

BSc. Eng ; M Eng. (Structural); C Eng; MIE(SL)

SENIOR DESIGN ENGINEER

BRIDGE DESIGNS OFFICE

ROAD DEVELOPMENT AUTHORITY

SRI LANKA

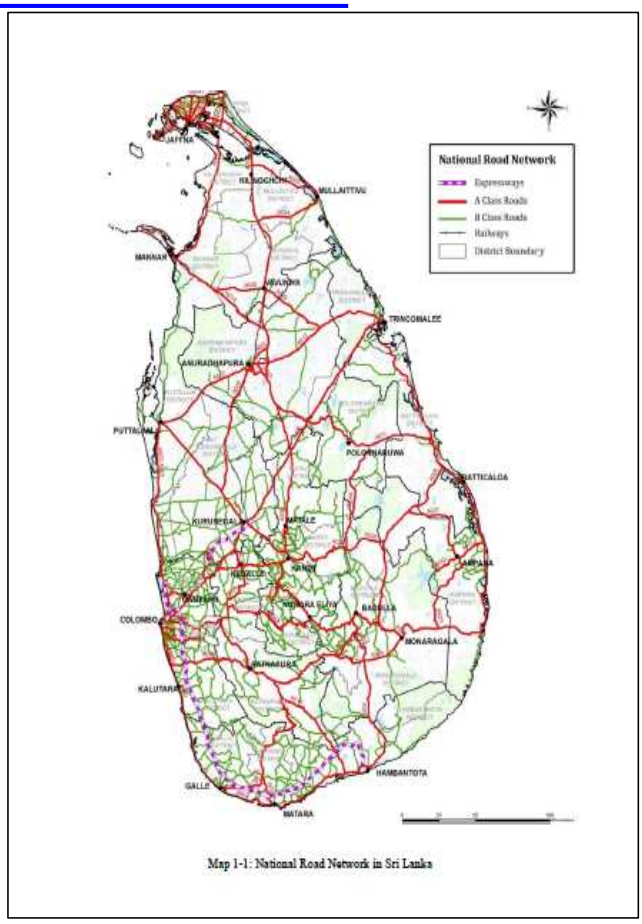
SRI LANKA

Brief Description on Sri Lanka

Sri Lanka is a tropical island surrounded by the Indian Ocean and its written history dates back to over 2500 years.

The central part of the Island is hill country about 1000-6000 ft above the mean sea level. Kandy, the last ancient capital of Sri Lanka is at 1500ft above mean sea level. Hilly terrain at center, hot plain beaches along the coast, ancient ruins and monuments and varying climate condition are attractive features of Sri Lanka.

National Road Network



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- Department of Highways (DH) from 1978 to 1985
- Road Development Authority (RDA) from 1986-

Presently..

- Road Development Authority
- Provincial Councils
- Municipal Councils and Sri Lanka Railways Department.

MINISTRY OF TRANSPORT AND HIGHWAYS
ROAD DEVELOPMENT AUTHORITY

- **The Road Development Authority (RDA) is the Principal Highway Authority for the construction and maintenance of National Highways Network of Sri Lanka.**

- **National Highways Network consists of 12,180 km roads and about 4500 bridges.**
- **Expressway Network consists of 312km**

ROAD DEVELOPMENT AUTHORITY

Vision & Mission

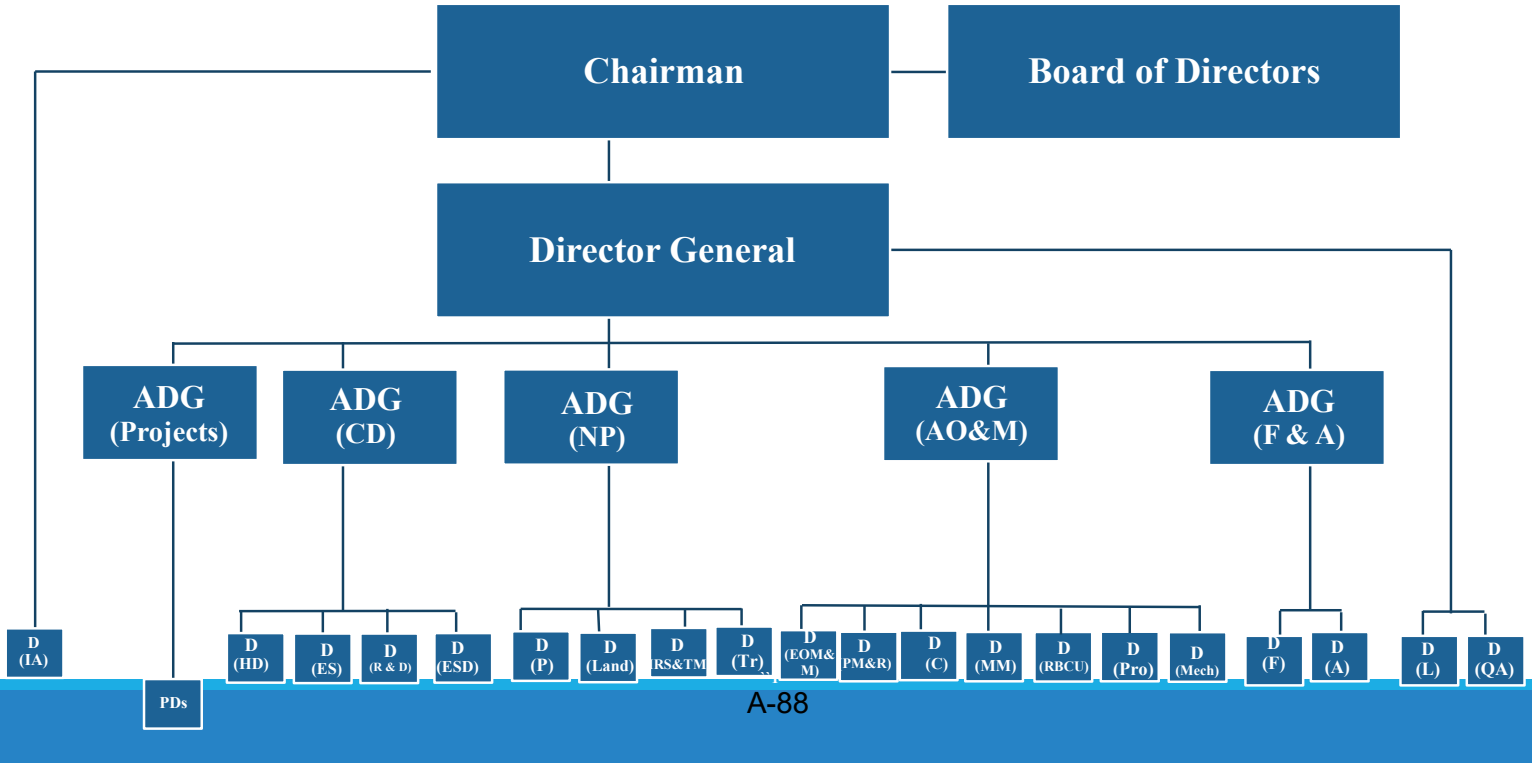
Vision

"Sustainably developed Sri Lanka"

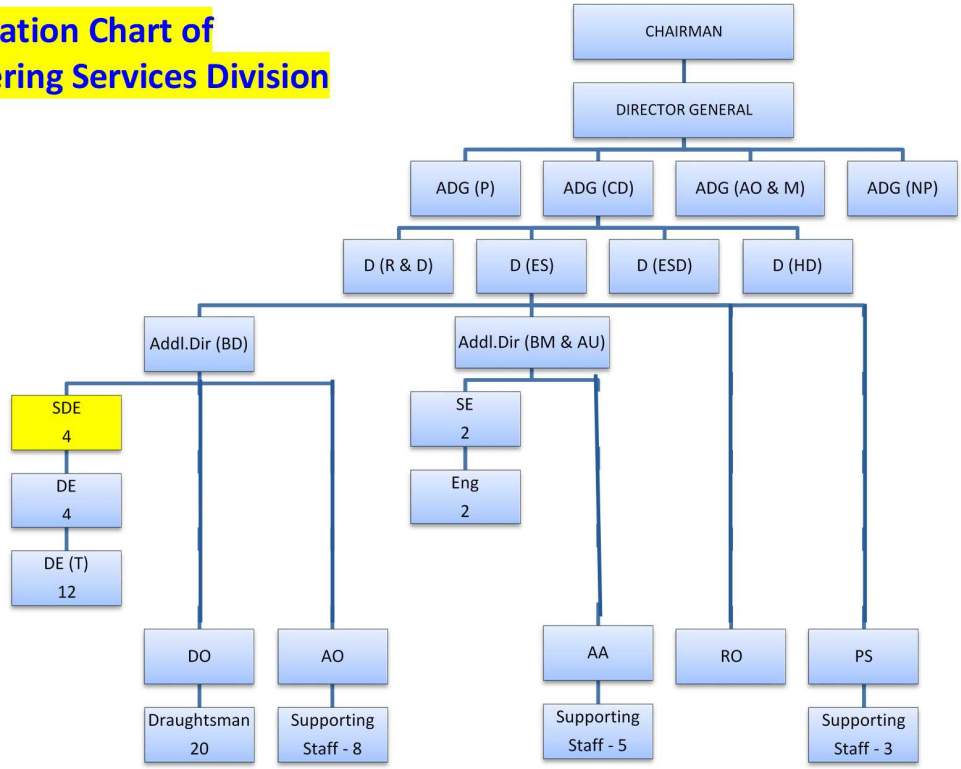
Mission

As the premier national organization of the road sector, to provide an adequate and efficient network of national highways, to ensure mobility and accessibility at an acceptable level of safety and comfort, in an environment friendly manner, for the movement of people and goods paving way for the socio-economic development of the nation.

Organization Chart of RDA



Organization Chart of Engineering Services Division



ADG (CD)	-	Additional Director General (Construction & Designs)
D (ES)	-	Director (Engineering Services)
Addl.Dir. (BD)	-	Additional Director (Bridge Designs)
Addl.Dir. (BM & AU)	-	Additional Director (Bridge Management & Assessment Unit)
SDE	-	Senior Design Engineer
SE	-	Senior Engineer
DE	-	Design Engineer
Eng.	-	Engineer
DE (T)	-	Design Engineer (Training)
DO	-	Drawing Officer
RO	-	Record Officer
AO	-	Administrative Officer
PS	-	Personal Secretary

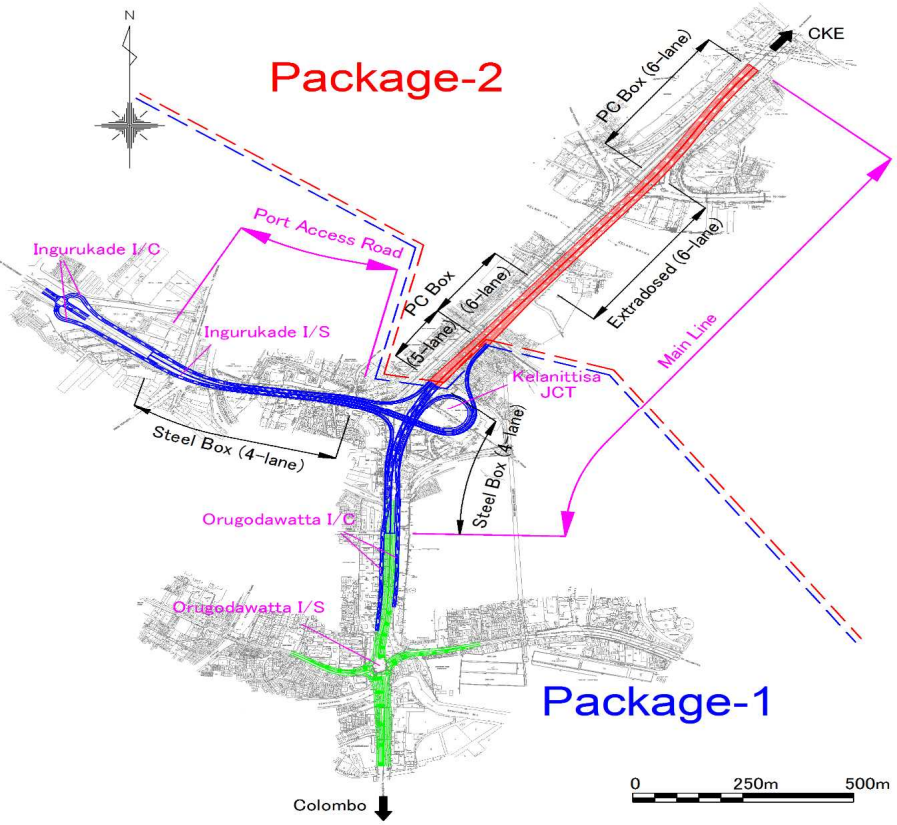
NEW KELANI BRIDGE PROJECT

LOCATION MAP

Before constructing the NKB

After completing the NKB

PROJECT DETAILS



Pkg 1: Steel Bridge Section

1) Construction of Main Line (4-lane)
2) Construction of Port Access Road (4-lane)
3) Construction of I/C and JCT
    1. Orugodawatta I/C
    2. Ingurukade I/C
    3. Kelanittisa Junction

4) Improvement of At-grade Road
    1. Orugodawatta I/C
    2. Ingurukade I/C

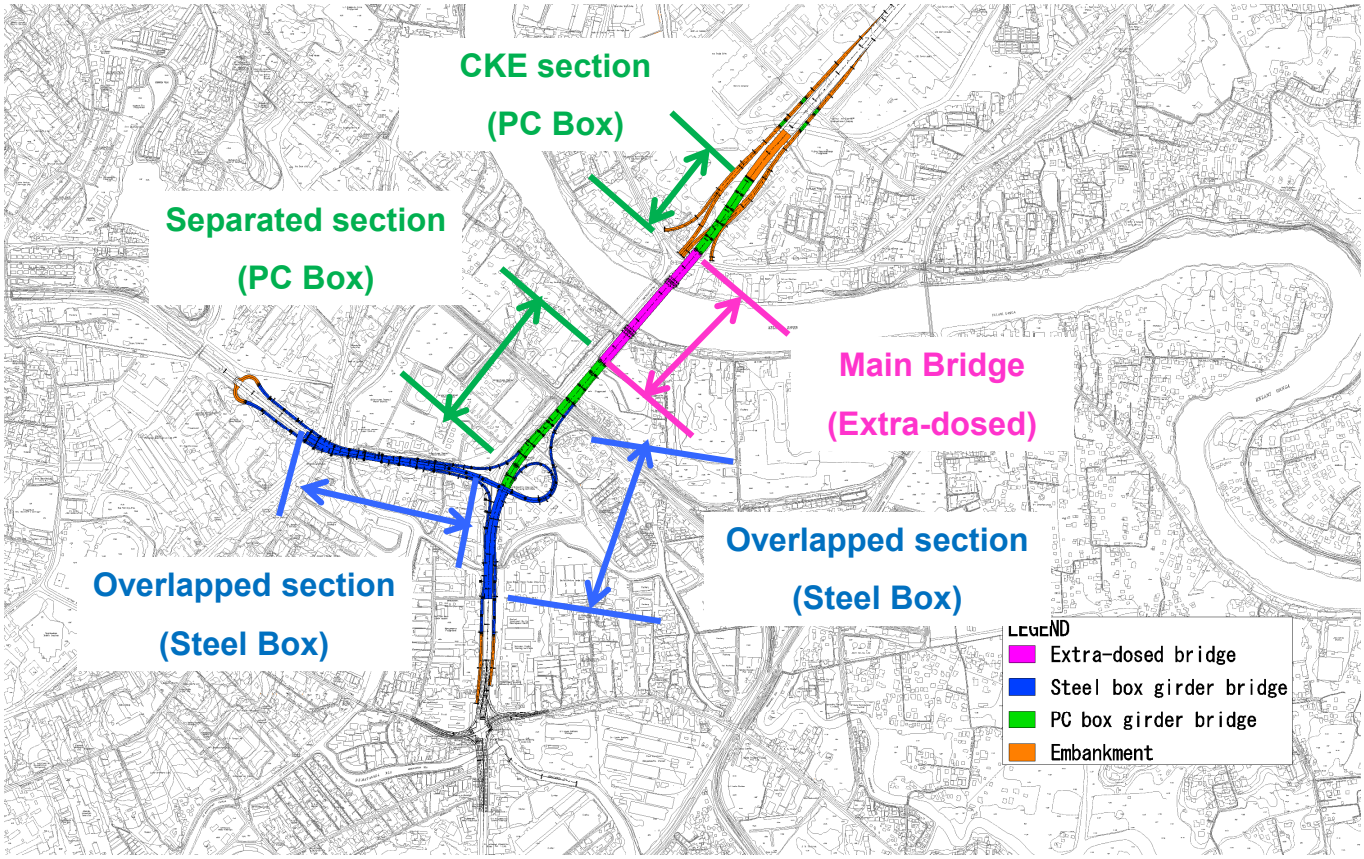
Pkg 2:Extradosed Bridge Section

Construction of Main Line
1. Main Bridge (6-lane)
2. Approach Bridge (6-lane)
3. Approach Bridge (5-lane)
4. Earthwork (6-lane)

PROJECT DETAILS

- **Project name:** New Bridge Construction Project Over The Kelani River
- **Project owner:** Road Development Authority (RDA)
- **Consultant:**
  - JV of Oriental Consultants Co. Ltd. & Katahira Engineers International Co. Ltd
  - In association with
    +Consulting Engineers and Architects Associated (Pvt) Ltd
    +Project Management Associate International (Pvt) Ltd
- **Contractor:**
  - Package 1: JFE Co. Ltd, Mitsui Ship Building Co. Ltd and Toda Construction Co. Ltd JV
  - Package 2: Sumitomo Mitsui Construction Co. Ltd & Sanken Construction (Pvt) Ltd JV

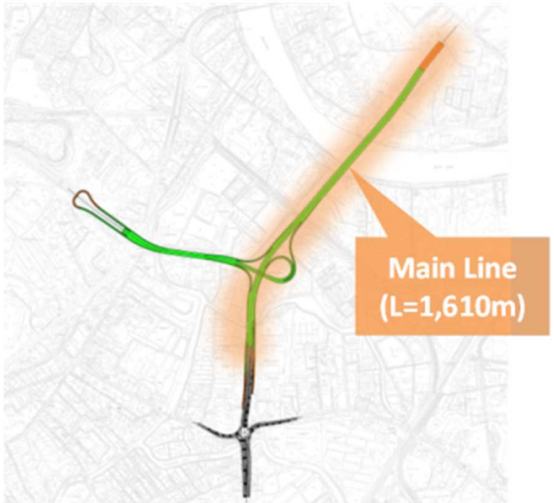
Bridge Type in Each Section

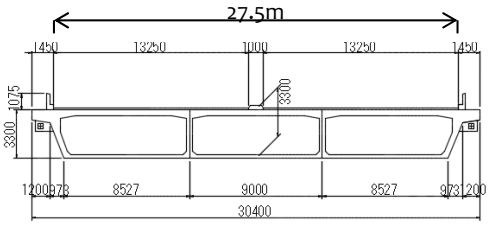


- Construction of Elevated Main Line (1/2) -

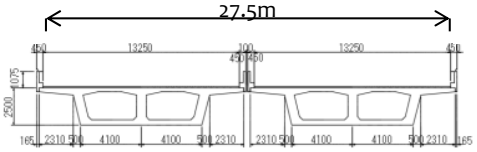
- Road Length: 1,610m
- Cross Section

✓ Main Bridge (6-lane): 27.5m
✓ Approach Bridge (6-lane): 27.5m
✓ Approach Bridge (4-lane): 20.5m

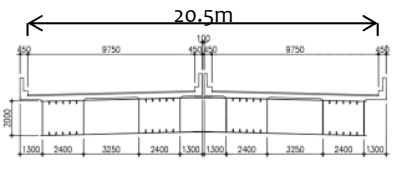




Main Bridge (6-lane)



Approach Bridge (6-lane)



Approach Bridge (4-lane)

- Construction of Elevated Main Line (2/2) -

➢ Bridge Type

✓ Main Bridge (6-lane): Extradosed Bridge (L=380m)
✓ Approach Bridge (6-lane): PC Box Girder Bridge (L=625m)
✓ Approach Bridge (4-lane): Steel Box Girder Bridge (L=425m)

Main Bridge (Extradosed)

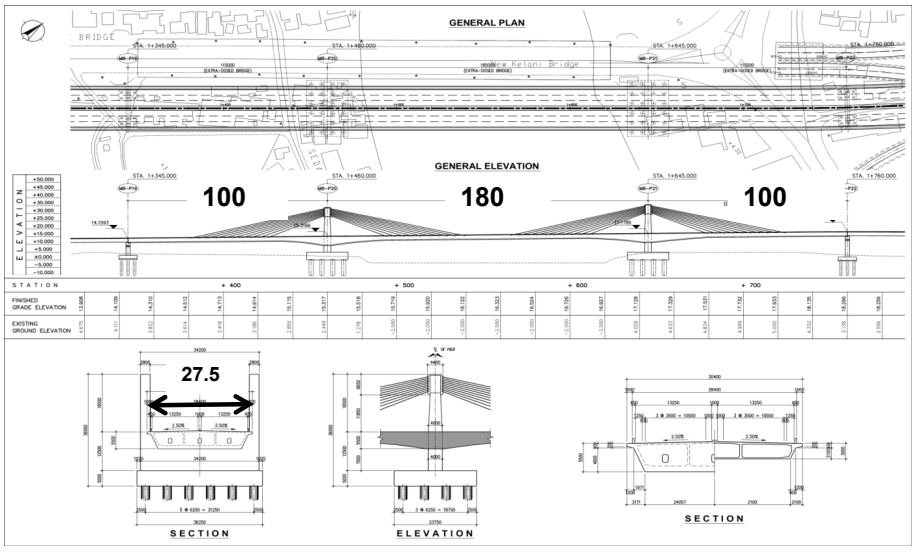
Approach Bridge (PC Box Girder)

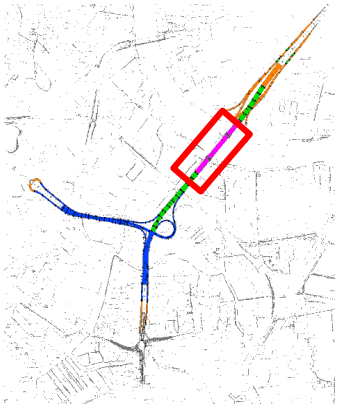
➢ Others

✓ Soft Soil Treatment in Earth Work Section

Details of Main Bridge

- Extra-dozed PC Box Girder Bridge
- Total Width= 30.4 m (6-lanes)
- Total Length= 380 m
- Method of construction is Cantilever Erection





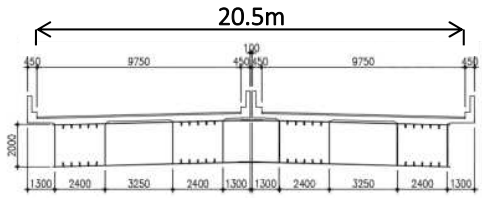
- Construction of Elevated Port Access Road -

- Road Length: 497m
- Cross Section

✓ Bridge (4-lane): 20.5m

- Bridge Type

✓ Bridge (4-lane): Steel Box Girder (L=497m)



Elevated Port Access Road (4-lane)

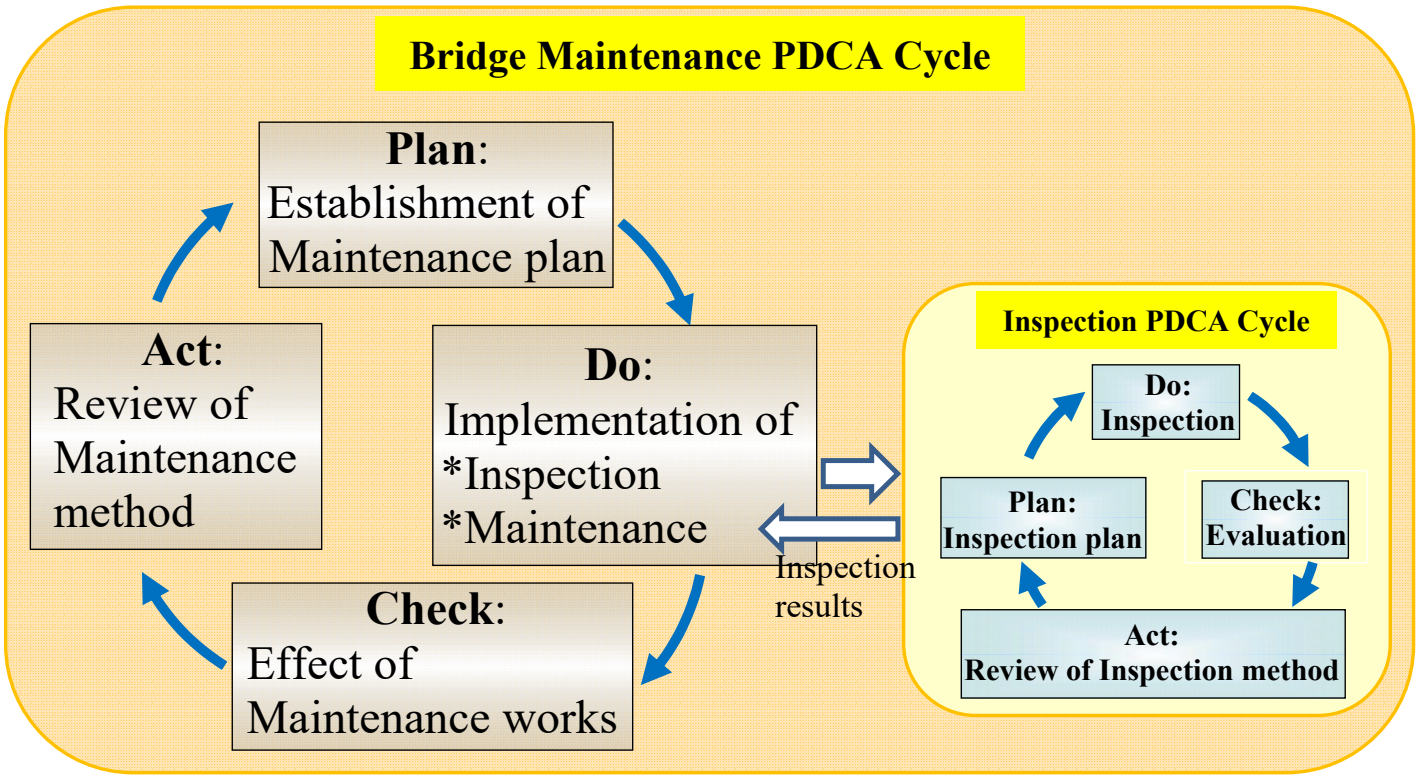
Bridge Inspection & Maintenance of New Kelani Bridge

Purpose of Maintenance

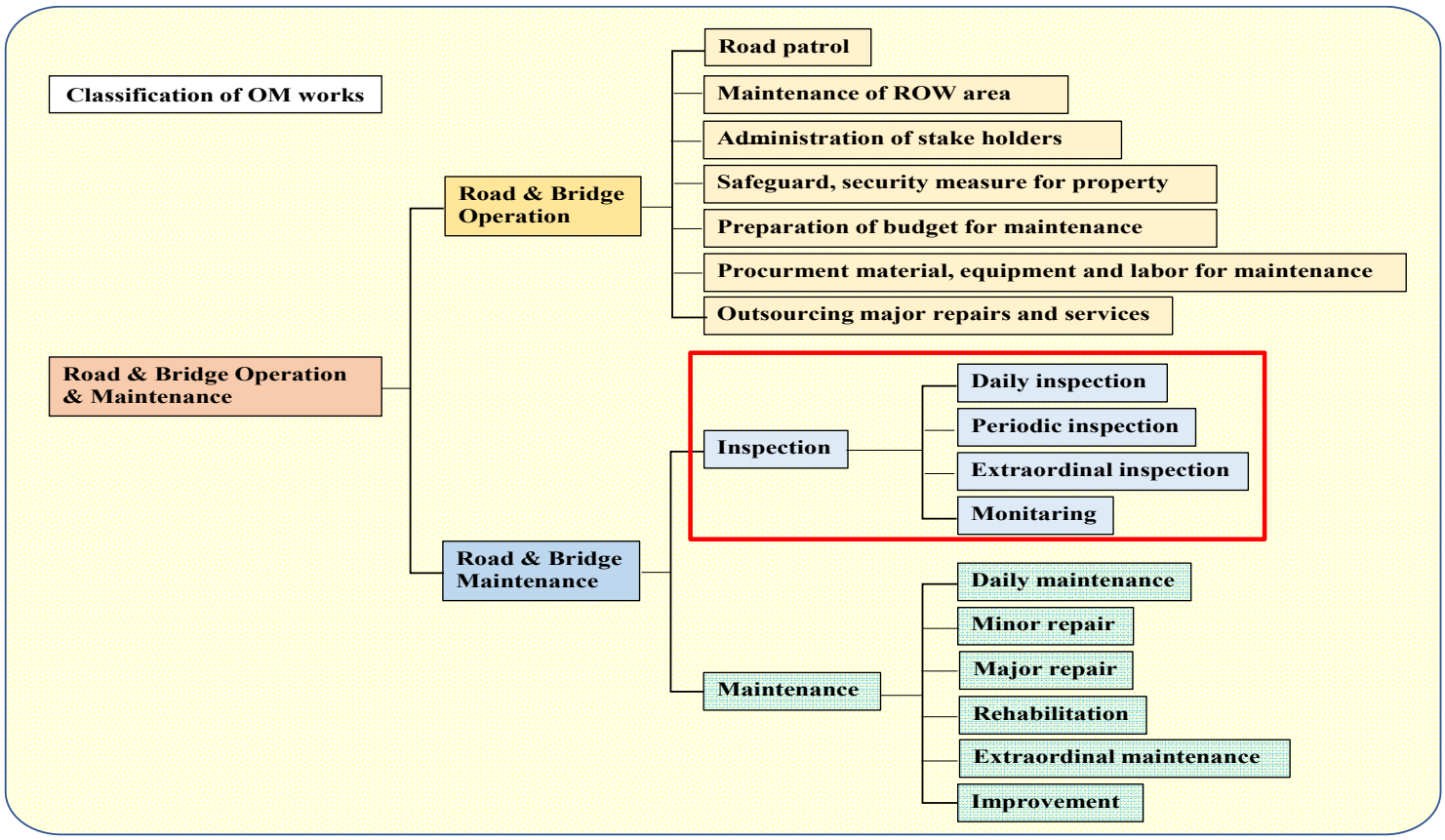
The bridges shall be maintained with special attention for following purposes;

- To ensure traffic safety
- To ensure smooth traffic flow with adequate condition
- To fulfill an expected service life
- To minimize a life cycle cost
- To take necessary countermeasures immediately to protect road users and the Bridge

Bridge Inspection & Maintenance with PDCA Cycle



Classification of operation & Maintenance Works



Kinds of Inspections

	Kind of Inspection	Main purpose	Method	Frequency
Daily Inspection				
1	i. Daily Inspection (on foot)	For grasping structures condition	Distance visual inspection from under bridges along the road on foot, using such as binocular, if necessary.	Every working day
	ii. (on the car)		Checking road condition through driving sense, and inspecting structures condition above the road by visual inspection from the	
Periodic Inspection				
	i. Detailed Inspection	Inspecting condition of all structures detailly for establishing	Closed visual inspection, touching structures and using some device, if necessary	Each 5 years
Extraordinal Inspection				
3	i. Extraordinal Inspection	For decision traffic restriction and implementation of urgent repair work after or during serious abnormal weather condition and traffic accident.	Distance/Closed visual inspection from the patrol car or on foot depending on situation.	At necessary situation.
Monitoring				
4	i. Monitoring	Monitor a defect to grasp whether the defect is progressing or not, and to grasp progressing speed	Monitor defect by using such as some devise or closed visual inspection periodically and continuously until obtain conclusion.	At necessary situation.

Daily Inspection Routs

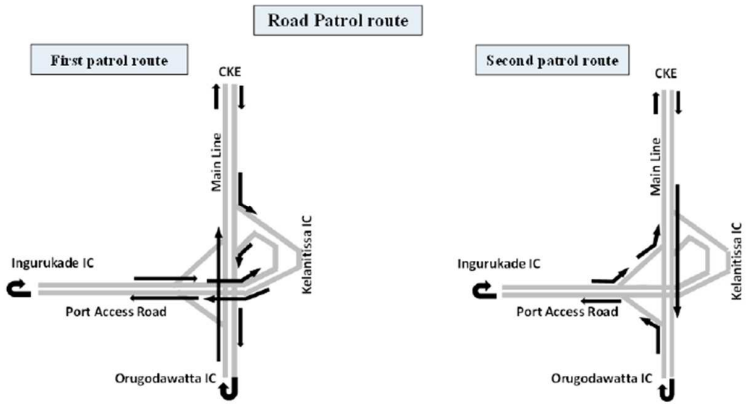


Figure 2-2 Example of Road Patrol Route

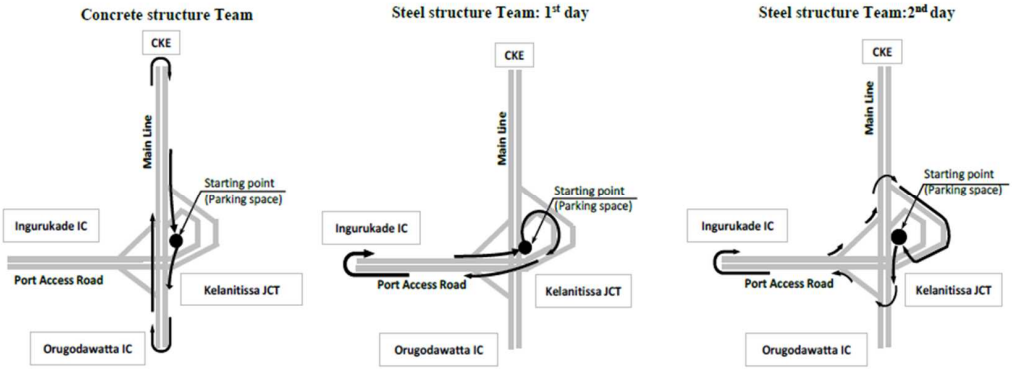
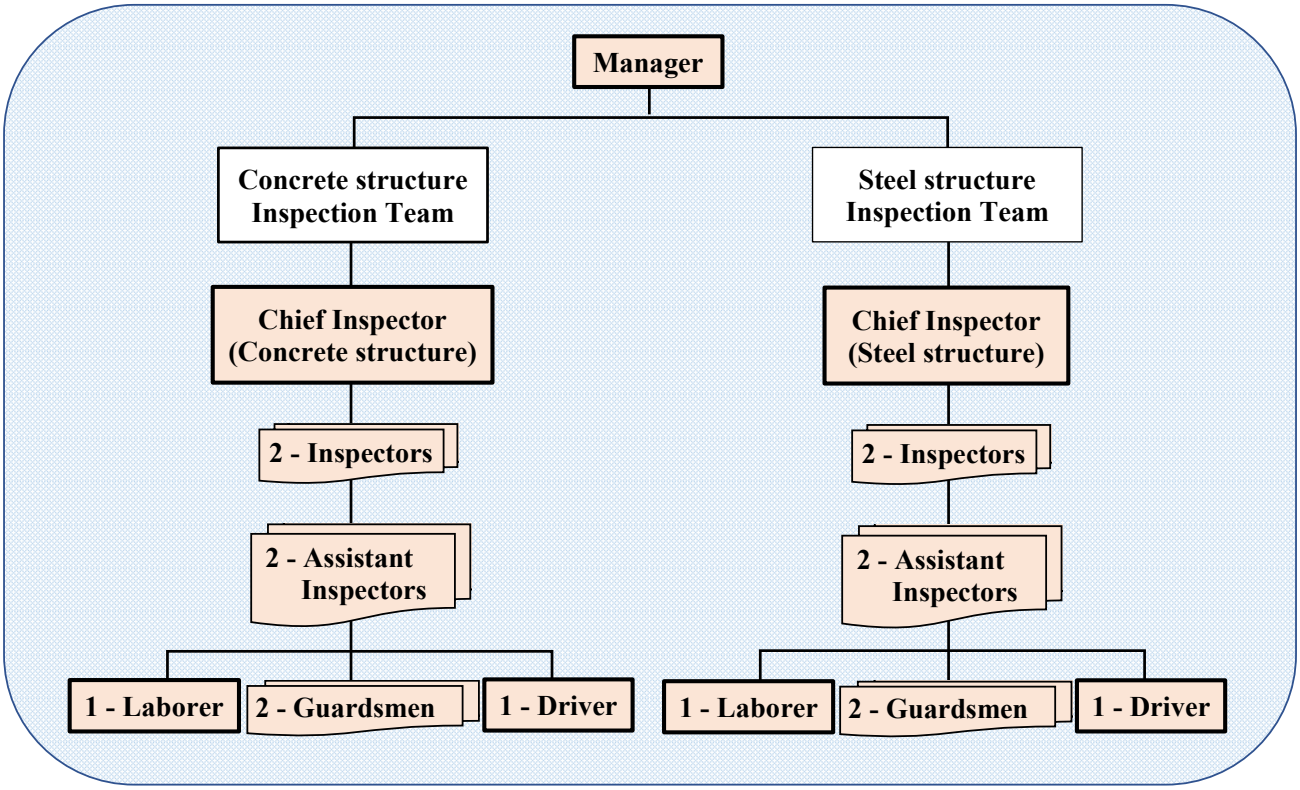


Figure 3-6 On-Foot Inspection Route

Proposed Arrangement of the Inspection Teams



Issues During Design Phase

Design Phase

1. Is it a home base design or field base design?

   RDA required to carryout the work as a field base design considering the necessity of knowledge transferring.

2. Does it actually a field base design ?

   Steel Bridge Section is carried out by Mr. Nohmi and his team. (In the project Mr. Nohmi is appointed as Bridge Engineer for Extradosed bridge. But he is a steel design specialist)

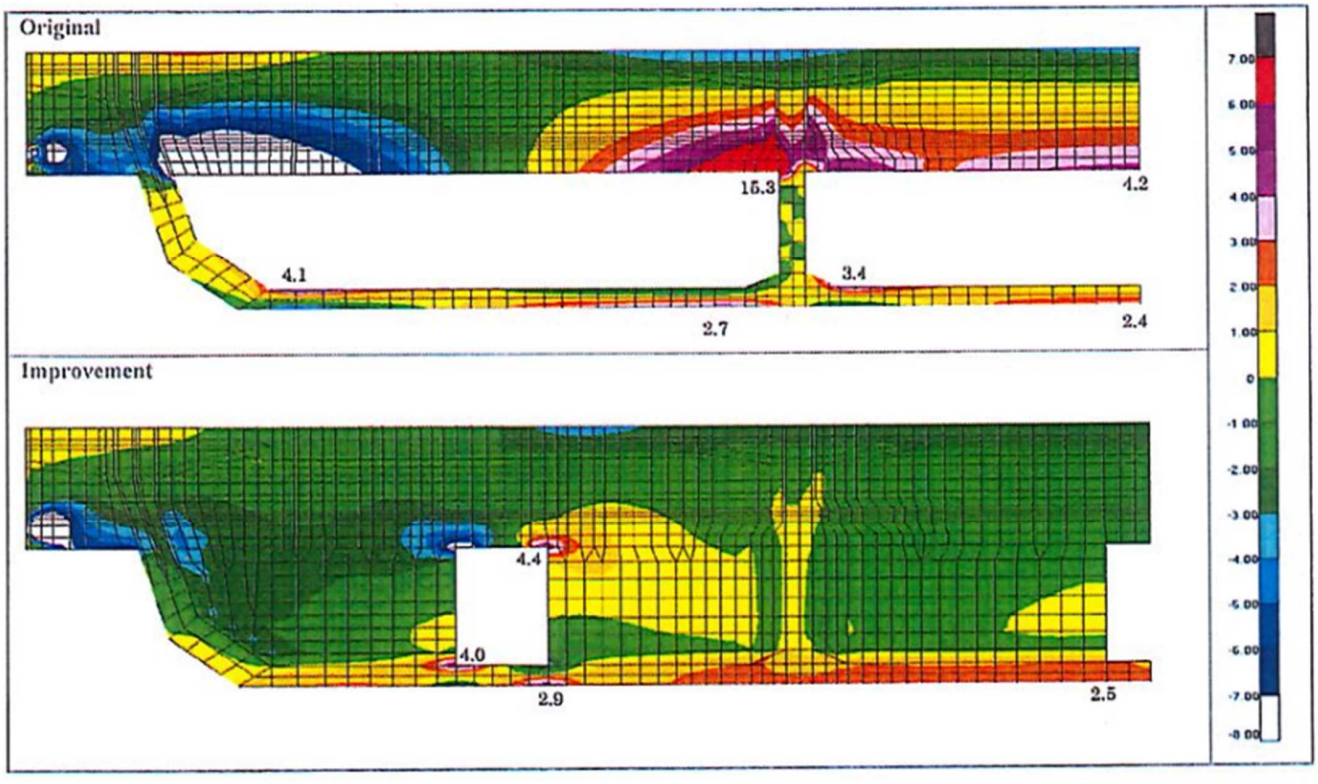
   Extradosed Bridge ??????????

Design Phase

3. Did they submit a detailed design report with a supporting calculations?
   - Summary Report was submitted.
   - Only after requesting, Calculations are provided only for the steel bridge section and Bridge design Division of RDA accepted the design of steel bridge section after reviewing the submitted documents.

Design Phase

- Many comments were issued for the Extradosed bridge design.
- Specially requested the stage construction analysis.
- Saddle and cable anchoring system analysis.
- Consultant replied that stage construction analysis will be done during construction stage.
- Effect of this cost RDA about RS. 73.4 million, 48 days of EOT and Prolongation cost.



Future Challenges

Inspection and Maintenance of NKB

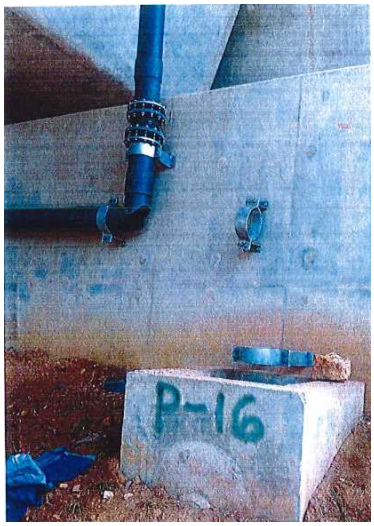
1. Inspection team has not been appointed up to now.

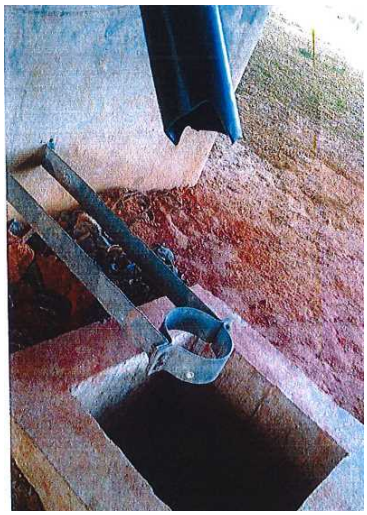
2. Tools and Equipment mentioned in Operation and Maintenance Manual are not acquired up to now.

3. Since, we don't have proper design calculations of the Extradosed bridge we will face many difficulties to analyze the structure when it required to plan major repair works.

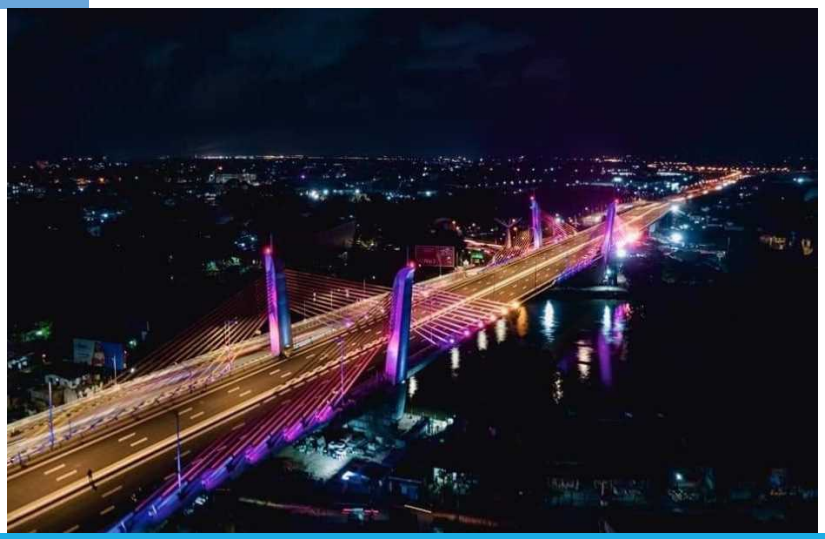
Inspection and Maintenance of NKB

4. Protect the steel bridge components from Drug addicted persons.





Aerial view of MB-P21



JFE Factory Inspection 2018 (Tsu, Japan)

Thank You

(1) Country Report by Training Participants

4) Country Report by [redacted]

COUNTRY REPORT

CAPACITY DEVELOPMENT OF BRIDGE MANAGEMENT

[redacted]

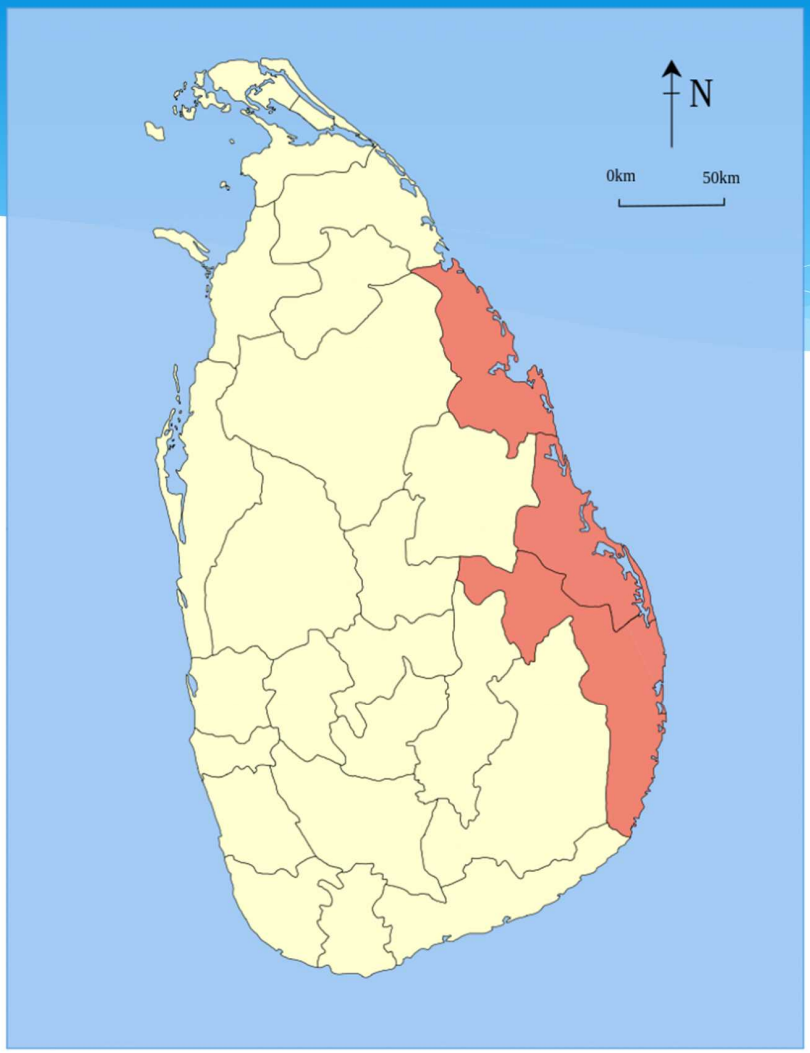
ROAD DEVELOPMENT AUTHORITY

SRI LANKA

Contents

1. Inspections, diagnosis, repair, record keeping.
2. Budget.
3. Machinery, tools, and equipment.
4. Technical skills of the engineers.
5. BMS operation
6. Present issues and Future challenge
7. Our expectation

related to Eastern Province



Summary of Bridges – E.P.

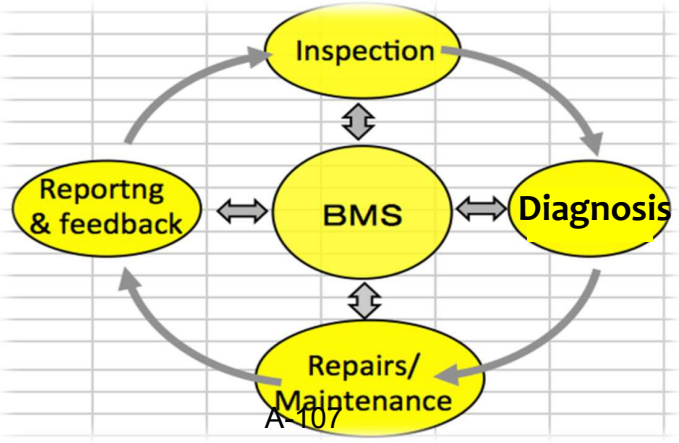
District	Concrete bridges	Box bridges	Steel bridges	Other bridges	Total	
Batticaloa	55 Nos/ 1.44 km	23 Nos/ 0.24 km	04 Nos/ 0.37 km	-	82 Nos	2.05 km
Trincomalee	59 Nos/ 1.46 km	80 Nos/ 0.95 km	14 Nos/ 1.35 km	1 Nos/ 0.10 km	154 Nos	3.86 km
Ampara	118 Nos/ 2.59 km	14 Nos/ 0.21 km	21 Nos/ 0.74 km	1 Nos/ 0.16 km	154 Nos	3.70 km
Total	232Nos/ 5.49 km	117 Nos/ 1.40 km	39 Nos/ 1.46 km	2 Nos/ 0.26 km	390 Nos	9.61 km

Bridge Management Strategy and Plan

* There were No bridge management plan including inspection planning, repair planning and reconstruction planning (ad-hoc basis).

Bridge Management Cycle

* JICA has implemented the Project for Capacity Development on Bridge Management for about 3 years from February 2015 to February 2018 for Sri Lanka



1.A. Inspection

Inspection

Inspection are conducted by close visual inspection.

or with inspection hammer and measuring devices.

In case close inspection cannot be conducted bridge inspection vehicles and inspection pole cameras are utilized.

Inspection

* Current methods are

1. Close visual inspection – preferred
2. Distant visual inspection
3. Indirect method
4. ~~Desktop inspection~~

* Bridge surface - ok
* Super structure – distance , clarity
* Sub structure -- scour

Close visual inspection

* Most preferred and suitable method for EP. 80% bridges covered.

* Limitations are-

  Dirt, garbage

  Crocodile (even with boat ride)

  Wild elephant (hide under bridges)


KOMARI CAUSEWAY
JAPAN

Distant visual inspection

* Limitations
* Binoculars
* No content feel

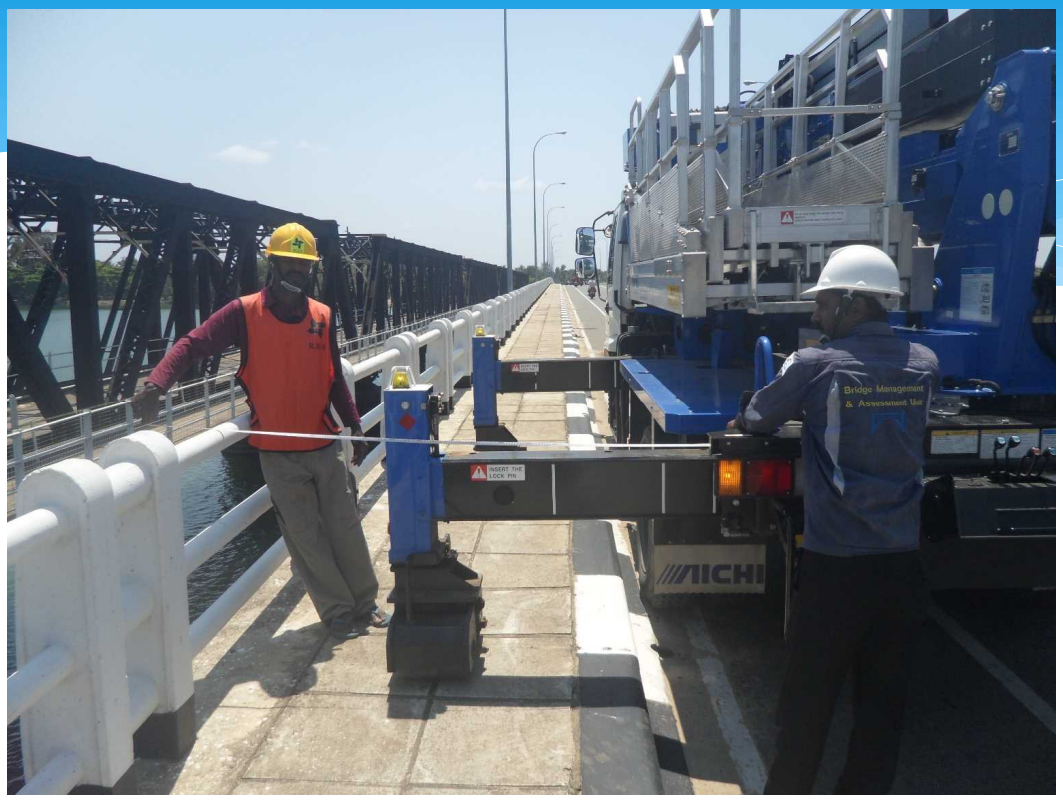
Indirect

* Working range of pole camera
* Lighting issues
* Type of bridges

* SMD road bridges

Issues In BIV

* Truss bridges (Oddamavady, Irrakkandy,……)
* Post tension beam bridges (Kallady bridge)
* Service line/ High voltage line (Periya kallar, VNN road)
* Clear height (Kalmunai bridge)


Bridge Management
& Assessment Unit
INSERT THE
LOCK PIN
AICHI


PERIYAKALLAR CAUSEWAY
GRANT AID FROM
THE PEOPLE AND
THE GOVERNMENT OF JAPAN
AS A TOKEN OF FRIENDSHIP AND
COOPERATION BETWEEN
JAPAN AND SRI LANKA
2007
RECONSTRUCTED AFTER ITS DESTRUCTION
BY THE INDIAN OCEAN TSUNAMI DISASTER OF
26 DECEMBER 2004.
JAPAN

1.B. Diagnosis

Diagnosis, Record keeping

* Diagnosis by Bridge Inspection Support System Ver 1.3.4 (HI and Soundness classification)
* If we don't feel this is ok, we ll go back check again
* Record keeping in Bridge Database System (BDS)

* Record keeping of As built drawings

1.C. Repair

Repair – Bridge surface

* Bridge surface - by dedicated team, Pilot programme in Batticaloa

If it is painting, surface irregularities, hand rail damages –
we repair(Provincial Offices)

1. Pavement
   potholes, cracks of pavement, rutting, waving
2. Expansion joint
   damage on expansion joint, difference in levels,
1. Accessories
   damage on drainage, damage on service duct, damages on railing or parapet
4. Approaches
   settlement of surface, approach bank/ river bank

Repair – Bridge sub structure

* Scour
* Spall/ Dela/ Ex-Rebar
* Crack
* Mud deposition/ Vegetation

If it is above water level is ok

Platform/ Maintenance way

Recently repaired due to BM&AU

* A025 – 39/4 – Steel bridge
* A005 – 241/1
* A025 – 56/2

1.D. Record keeping

Record keeping

* Diagnosis by Bridge Inspection Support System Ver 1.3.4 (HI and Soundness classification)
* Record keeping in Bridge Database System (BDS)

* Record keeping of As built drawings

2.Budget

Budget

* No considerable allocation
* During fuel crisis and economic crisis – fully stopped

* Damages on steel bridges close to costal line propagating (Kinniya, Arugambay)

3.Machinery, Tools and equipment

Safety Measures – own safety

Safety Helmet

Safety Jacket

Safety shoes

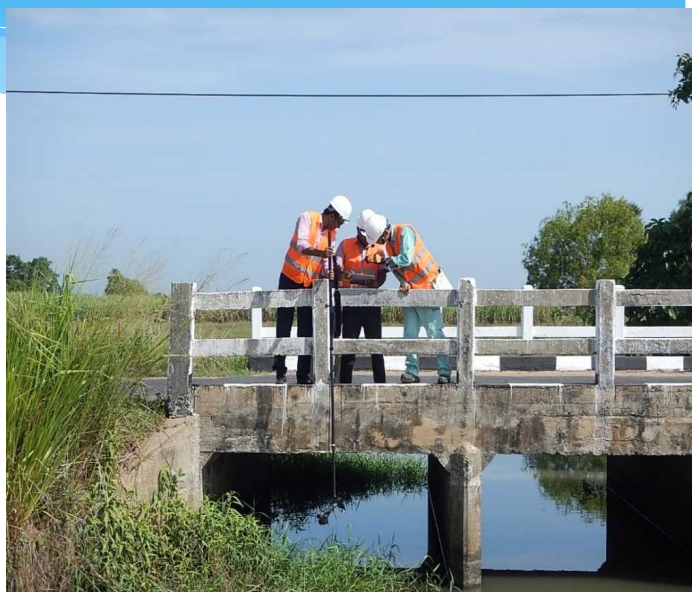
Hammers

Measuring devices

Camera

Binoculars

Using Pole camera



B001-5/3

Using BIV

4.Technical skills of the engineers

Skills

* Engineers have the capability
* Technical Officers are aware of minor repair works and they can be trained for major repair works
* Concept of bridge management and its importance are emphasized in work force in Road Development Authority.
* Hence dedicated resource allocation should be received and inspection and maintenance of bridges shall be conducted more efficiently and effectively.

5. BMS Operation

* (kept the records properly?, diagnosis properly done?, prepared the bridge repair plan every year?, etc.).

6.Future challenge

* Existing bridge inspection methods cannot cover all type of bridges.
* Under water inspection/ scour confirmation
* Proper repair methods to be proposed – Feasible for SL context
* Steel bridges on coastal line
* Competent contractors/ work force for bridge repairing/ specialized expert contractors
* Maintenance way/ Platform to be provided for long span bridges

7.Our expectations

* We have been practicing close visual inspection and indirect visual inspection. Several practical issues were identified when carrying out above inspection methods. Hence inspection methods other than visual inspection will be focused to apply in Sri Lankan context.
* Repairing of bridges were merely neglected and reconstruction was preferred in the past. However after the implementation of Bridge Management & Assessment Unit in R.D.A. This has slightly changed. However repairing is mostly limited to concrete bridges specially Reinforced Concrete Slab. This has to be extended to other type of bridges as well.
* Further application of repair methods for other bridge components should also be focused. Confident in Bridge repair methods in regional levels will be build up.

* Due to several reasons maintenance and repairs of steel bridges are not effectively attended in regional offices in R.D.A. 5 provinces out of 9 are located in coastal area of the country. Therefore steel structures are exposed to corrosive environment. Few provinces are located in industrial zones.
* Therefore effective, efficient and easy method will be introduced

What we want to learn in Japan

* How did Japan sustain a Bridge Management Cycle? How Japan engage specially designated staff through out
* Repair methods?
* Repairs suitable for Sri Lanka?
* Types of tools & equipment used in Bridge Management
* Technologies used?
* Modern techniques used in Japan for major and minor repairs
* Defects and repair methods

THANK YOU

ありがとうございました。

(1) Country Report by Training Participants

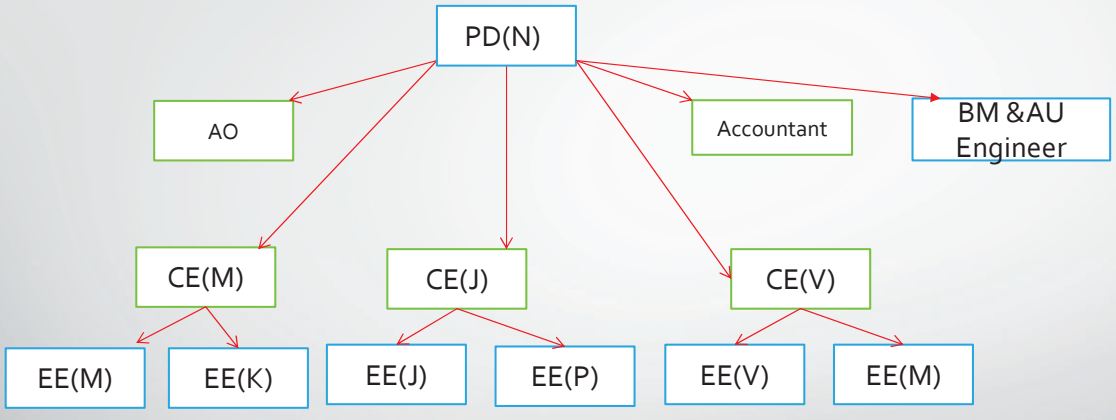
5) Country Report by [redacted]

Country Report
Sri Lanka

[redacted]
Bridge Management and Asses t
Road development Authority

Joined in RDA 2012

- Provincial Director office Northern Province2012-2015(Construction related works)
- BM& AU unit 2015-2018



- Ultimate objective for me from project is to complete all bridges inspection in Northern Province and sustains for the long term period.

1. On job training to 1-2 Technical officers and 2-3 Work supervisors in each EE division
2. Awareness about bridge inspection and maintenance to each EE
3. Distribution of the manuals to all CE,PD and EE office Engineers.
4. Trained one PD office Engineer to BM &AU (N)

Total Bridges in Sri Lanka

Summary of Bridges by Province

No.	Province	Concrete		Box		Steel		Others		Total		Action
		Nos.	Len. (km)	Nos.	Len. (km)	Nos.	Len. (km)	Nos.	Len. (km)	Nos.	Len. (km)	
1	Western	524	9.80	105	0.68	130	4.36	9	0.16	768	15.00	List Dict.
2	Central	266	3.94	10	0.05	91	1.13	93	0.96	460	6.07	List Dict.
3	Southern	351	5.59	46	0.29	76	1.27	17	0.23	490	7.39	List Dict.
4	Northern	199	2.96	139	0.95	38	1.44	8	0.03	384	5.38	List Dict.
5	Eastern	232	5.49	117	1.39	39	2.47	2	0.25	390	9.60	List Dict.
6	North Western	313	3.93	62	0.49	40	1.31	8	0.04	423	5.77	List Dict.
7	North Central	269	4.05	107	0.89	10	0.37	6	0.07	392	5.37	List Dict.
8	Sabaragamuwa	391	5.13	26	0.18	91	1.30	23	0.26	531	6.87	List Dict.
9	Uva	269	3.87	22	0.16	107	1.50	19	0.23	417	5.76	List Dict.

Inspection Carried out different methods

- Direct visual inspection

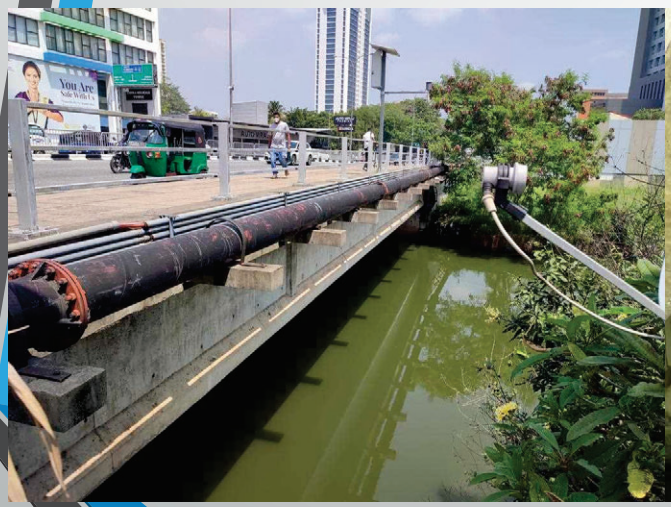
Indirect Visual inspection (Pole Camara)

Bridge inspection vehicle

Current issues related to bridge inspection

Problems encounter at the site during Inspection

1. Can't access to the bridge and using pole camera

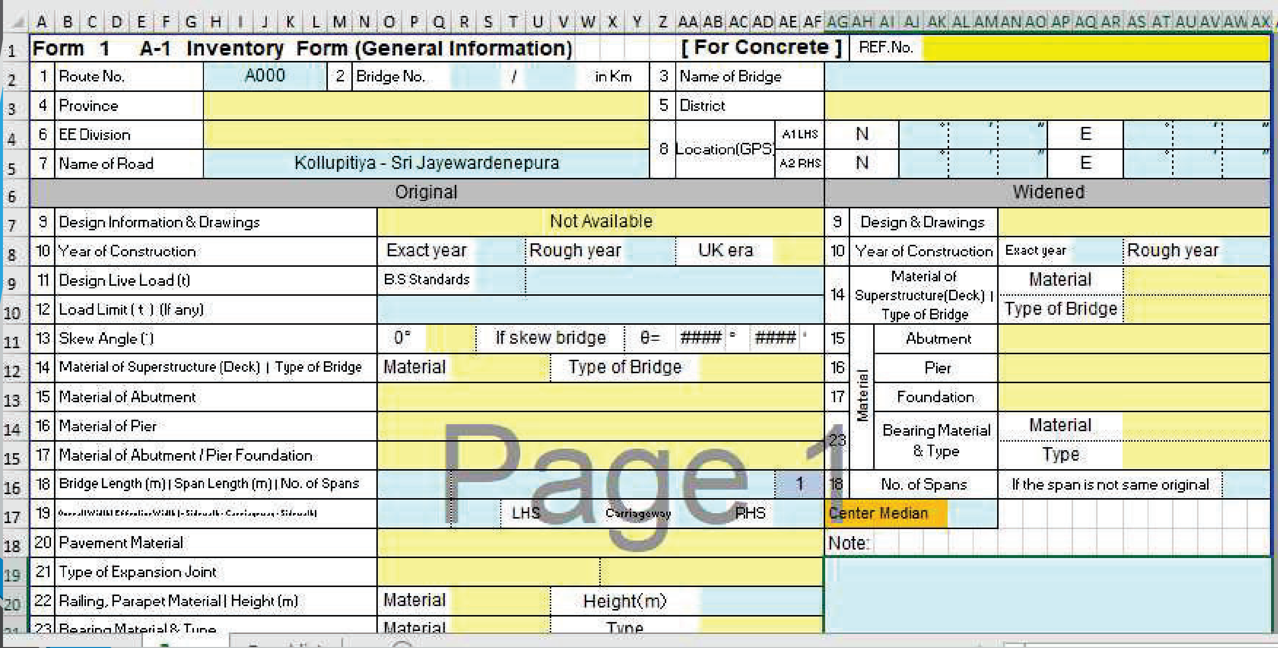


2.Pole camera connection freeze and disconnect

(distance between pole and ipad > 1.5-2.0 m)

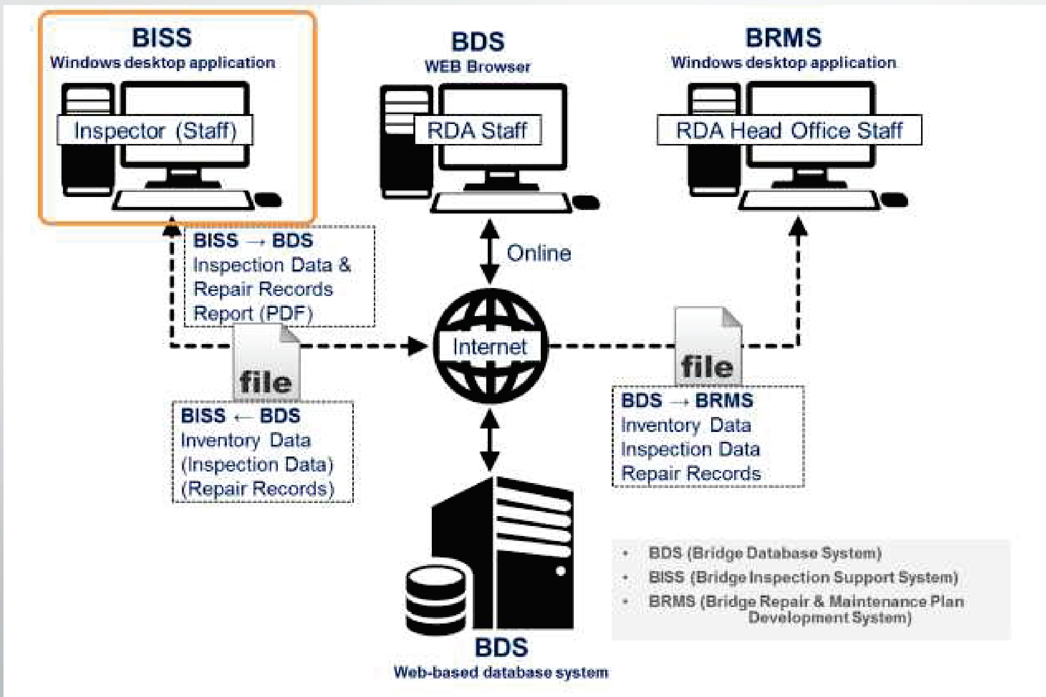
BMS application related issues

BMS work sheet developed from 2015 march-2017 July (Version1-10.4)

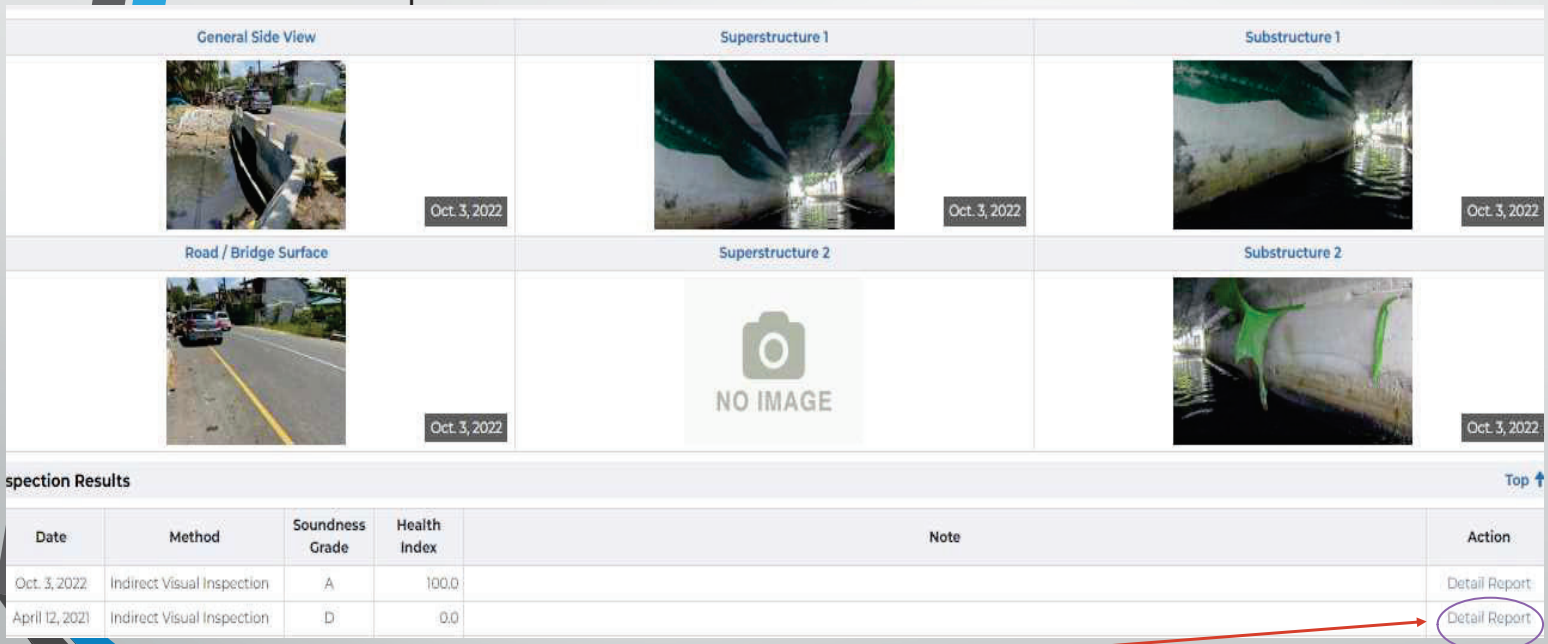


Form 1 A-1 Inventory Form (General Information)		[For Concrete]	REF.No.	
1 Route No.	A000	2 Bridge No. / in Km	3 Name of Bridge	
4 Province			5 District	
6 EE Division		8 Location(GPS)	A1 LHS	N E
7 Name of Road	Kollupitiya - Sri Jayewardenepura		A2 RHS	N E
Original			Widened	
9 Design Information & Drawings	Not Available		9 Design & Drawings	
10 Year of Construction	Exact year / Rough year / UK era		10 Year of Construction	Exact year / Rough year
11 Design Live Load (t)	B.S Standards		14 Material of Superstructure(Deck) / Type of Bridge	Material
12 Load Limit (t) (If any)				Type of Bridge
13 Skew Angle (°)	0° / If skew bridge / θ= #### ° #### °		15 Material: Abutment	
14 Material of Superstructure (Deck) / Type of Bridge	Material / Type of Bridge		16 Pier	
15 Material of Abutment			17 Foundation	
16 Material of Pier			23 Bearing Material & Type	Material
17 Material of Abutment / Pier Foundation				Type
18 Bridge Length (m) / Span Length (m) / No. of Spans	1		18 No. of Spans	If the span is not same original
19	LHS / Carriageway / RHS		Center Median	
20 Pavement Material			Note:	
21 Type of Expansion Joint				
22 Railing, Parapet Material / Height (m)	Material / Height(m)			
23 Bearing Material & Type	Material / Type			

- BMS application developed July/August 2017,Demo/trial version for bridge inspection. Lack of time for feedbacks .



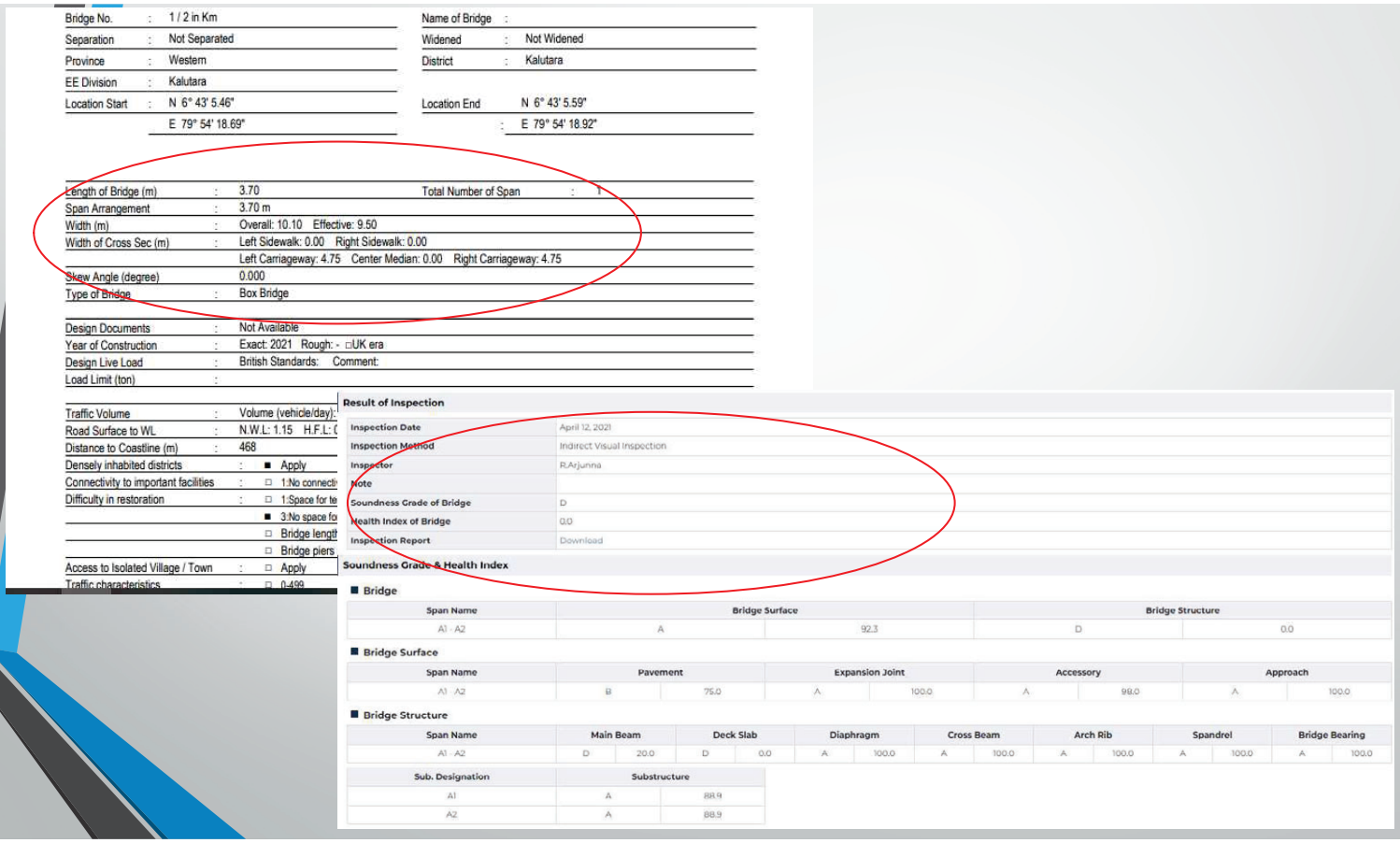
- Existing bridge inventory data and past inspection photos are not available after 2nd inspection



spection Results

Top

Date	Method	Soundness Grade	Health Index	Note	Action
Oct. 3, 2022	Indirect Visual Inspection	A	100.0		Detail Report
April 12, 2021	Indirect Visual Inspection	D	0.0		Detail Report



Bridge No.	: 1 / 2 in Km	Name of Bridge	:
Separation	: Not Separated	Widened	: Not Widened
Province	: Western	District	: Kalutara
EE Division	: Kalutara		
Location Start	: N 6° 43' 5.46" E 79° 54' 18.69"	Location End	: N 6° 43' 5.59" E 79° 54' 18.92"
Length of Bridge (m)	: 3.70	Total Number of Span	: 1
Span Arrangement	: 3.70 m		
Width (m)	: Overall: 10.10 Effective: 9.50		
Width of Cross Sec (m)	: Left Sidewalk: 0.00 Right Sidewalk: 0.00 Left Carriageway: 4.75 Center Median: 0.00 Right Carriageway: 4.75		
Skew Angle (degree)	0.000		
Type of Bridge	: Box Bridge		
Design Documents	: Not Available		
Year of Construction	: Exact: 2021 Rough: - □UK era		
Design Live Load	: British Standards: Comment:		
Load Limit (ton)	:		
Traffic Volume	: Volume (vehicle/day):		
Road Surface to WL	: N.W.L: 1.15 H.F.L: (		
Distance to Coastline (m)	: 468		
Densely inhabited districts	: ■ Apply		
Connectivity to important facilities	: □ 1:No connecti		
Difficulty in restoration	: □ 1:Space for te		
	■ 3:No space fo		
	□ Bridge length		
	□ Bridge piers		
Access to Isolated Village / Town	: □ Apply		
Traffic characteristics	: □ 0-499		

Result of Inspection

Inspection Date	April 12, 2021
Inspection Method	Indirect Visual Inspection
Inspector	R.Arjunna
Note	
Soundness Grade of Bridge	D
Health Index of Bridge	0.0
Inspection Report	Download

Soundness Grade & Health Index

■ Bridge

Span Name	Bridge Surface		Bridge Structure	
A1 - A2	A	92.3	D	0.0

■ Bridge Surface

Span Name	Pavement		Expansion Joint		Accessory		Approach	
A1 - A2	B	75.0	A	100.0	A	98.0	A	100.0

■ Bridge Structure

Span Name	Main Beam		Deck Slab		Diaphragm		Cross Beam		Arch Rib		Spandrel		Bridge Bearing	
A1 - A2	D	20.0	D	0.0	A	100.0	A	100.0	A	100.0	A	100.0	A	100.0

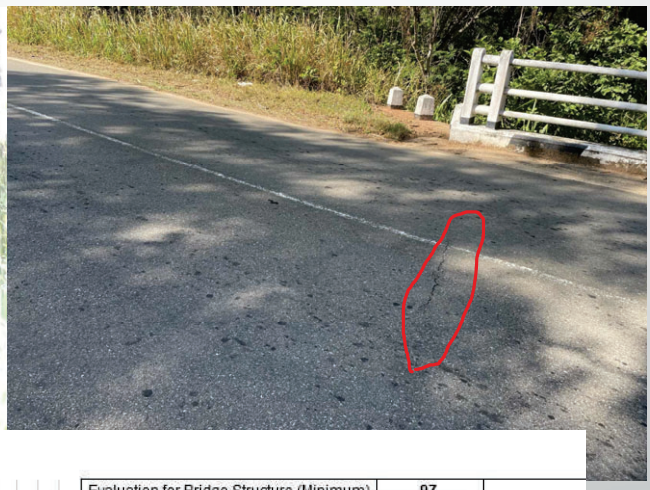
Sub. Designation	Substructure	
A1	A	88.9
A2	A	88.9

Widened bridges

- BMS not allow to record the widened bridge damage.

Require additional improvements for BMS & BRMS

- Weightage may require to modify eg. Scour, Expansion joint damage, crack in abutment



Evaluation for Bridge Structure			
	Evaluation value	Decision	
Evaluation for Bridge Surface	100	98	A
Evaluation for Bridge Structure	97		
Needs of Emergency Measures			
Needs of Detailed Investigation			

Evaluation for Bridge Structure (Minimum)	97	
Unusual Deterioration & Malfunction		
Evaluation for Bridge Structure	97	A

If there is the unusual deterioration, report to EE for his judgemer

Note

	1	2	3
Class of Road	A	A	AB
Length	8.2 m	22.3 m	75 m
HI	D=0	D=0	D=0

Future requirements for BM&AU

- Need continue software update (only support up to x64 bit but future????,fully web based system easy for data extraction
- Only routine maintenance on bridge is not enough
- No separate budget for bridge maintanance/repair
- Long term/medium term knowledge transfer require for repair work
- (fund source for bridge maintanance/repair expenditure)?????

What I want to learn

1. Correlation between bridge age vs damge extent+damage severity impact HI?
2. If Carbonation/salt attack exceed the cover depth ,bridge damge progressive speed?
3. If Carbonation/salt attack exceed the cover depth and spall observed – bridge repair or reconstruction optimum ?
4. Any mathematical model for above issues?

Thank You

(1) Country Report by Training Participants

6) Country Report by [redacted]

COUNTRY REPORT

[redacted]

BM & AU

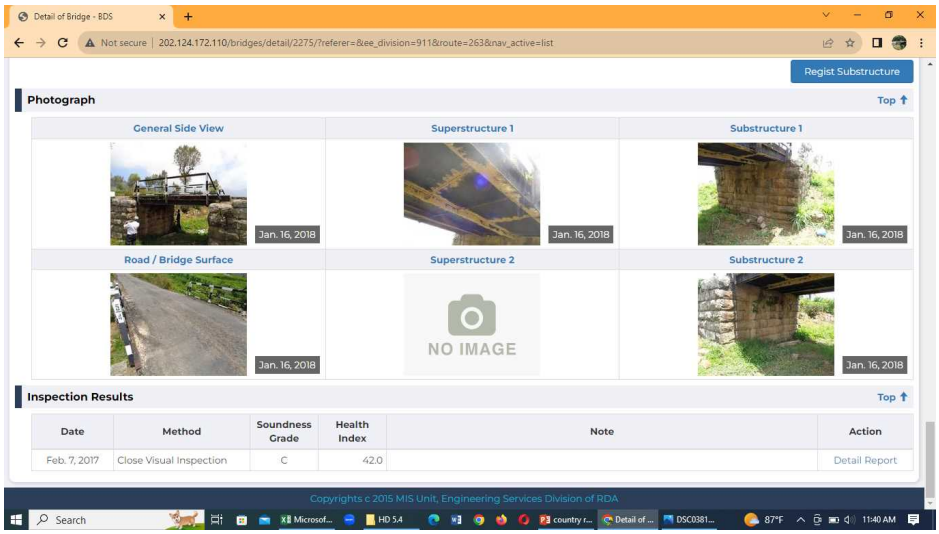
RDA

Summary of Bridges by Province

No.	Province	Concrete		Box		Steel		Others		Total	
		Nos.	Len. (km)	Nos.	Len. (km)	Nos.	Len. (km)	Nos.	Len. (km)	Nos.	Len. (km)
1	Western	524	9.8	105	0.68	130	4.36	9	0.16	768	15
2	Central	266	3.94	10	0.05	91	1.13	93	0.96	460	6.07
3	Southern	352	5.6	45	0.29	76	1.27	17	0.23	490	7.39
4	Northern	199	2.96	139	0.95	38	1.44	8	0.03	384	5.38
5	Eastern	232	5.49	117	1.39	39	2.47	2	0.25	390	9.6
6	North Western	313	3.93	62	0.49	40	1.31	8	0.04	423	5.77
7	North Central	269	4.05	107	0.89	10	0.37	6	0.07	392	5.37
8	Sabaragamuwa	391	5.13	26	0.18	91	1.3	23	0.26	531	6.87
9	**Uva**	**269**	**3.87**	**22**	**0.16**	**107**	**1.5**	**19**	**0.23**	**417**	**5.76**

BMS operation
Inspection & the records keeping properly

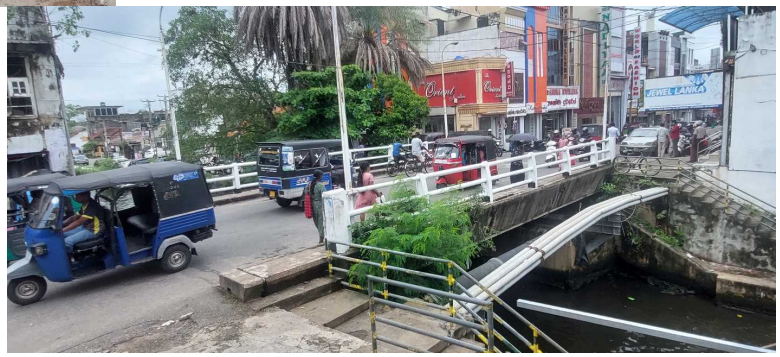
BMS operation
Diagnosis



When doing the inspection

Accident

Parking



Traffic

Congestion

Odor

(1) Country Report by Training Participants

7) Country Report by [redacted]

COUNTRY REPORT

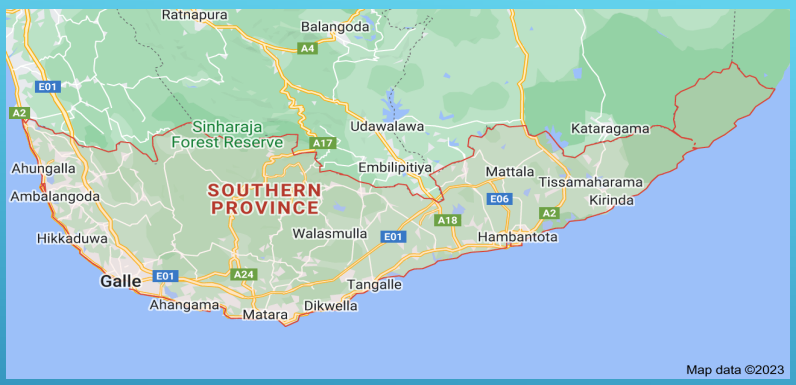
BRIGE MANAGEMENT AND ASSESMENT UNIT SOUTHERN PROVINCE,

ROAD DEVELOPMENT AUTHORITY

SRI LANKA

Presented by :- [redacted]

MAP OF SRI LANKA



Total length of roads in southern province – 1562 km
Total number of Bridges - 490
No of Districts - 3
Galle -224 nos
Matara - 142Nos
Hambantota – 124Nos

SUMMARY OF BRIDGES

District	No of Bridges	Type			
		Concrete	Box	Steel	Others
Galle	224	155	25	40	4
Matara	142	97	15	22	8
Hambantota	124	100	5	4	5
Total	490	352	45	76	17

Chief Engineer's Divisions	Executive Engineers Divisions	No of Bridges	Type			
			Concrete	Box	Steel	Others
Galle						
	Galle	95	71	6	14	4
	Hiniduma	129	84	19	26	0
Matara						
	Matara	67	46	11	9	1
	Deniyaya	75	51	4	13	7
Hambantota						
	Hambantota	40	35	2	3	0
	Tangalle	84	65	3	11	5

VISUAL INSPECTIONS

- Hand rail damages
- Surface damages
- Rain water outlets
- Expansion Joints
- Bridge Bearings
- Underside of the Super Structure
- Abutments
- Piers
- Scouring
- Wing walls

MACHINERY, TOOLS & EQUIPMENTS

- Bridge inspection vehicle
- Pole Camera
- Mallet
- Crack Gauges
- GPS Instruments
- Tapes
- Tab

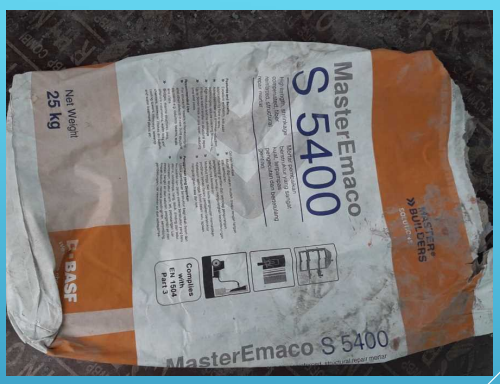
SAMPLE FOR THE TECHNICAL SKILL OF THE ENGINEERS

- Diagnosis of defects
  - Damages of underside of deck slab
  - Corrosion and exposed of reinforcement
  - Loss of section and damages of reinforcement
- Method of Rectification
  - Chipped off loose concrete sections
  - Clean the reinforcement by sand blasting
  - Providing of additional reinforcement for the weak sections
  - Application of corrosion resistant chemicals
  - Application of Priming
  - Concreting bottom side with admixtures
  - Proper Curing

Thank you


GARMIN


SONY
ZEISS
8x
20.1


MasterEmaco
S 5400
Net Weight
25 kg
BASF
MasterEmaco S 5400

(1) Country Report by Training Participants

8) Country Report by [redacted]

Country Report:
Retrofitting of Defective Bored Cast In-Situ Pile During the Construction of Bridge No. 27/5 on A001 Road.

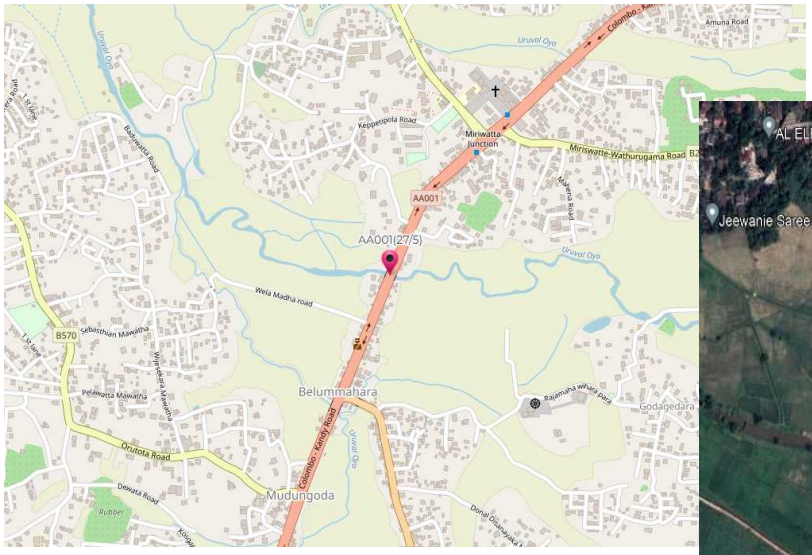
Training in Japan on Capacity Strengthening on Bridge Management for Democratic Socialist Republic of Sri Lanka

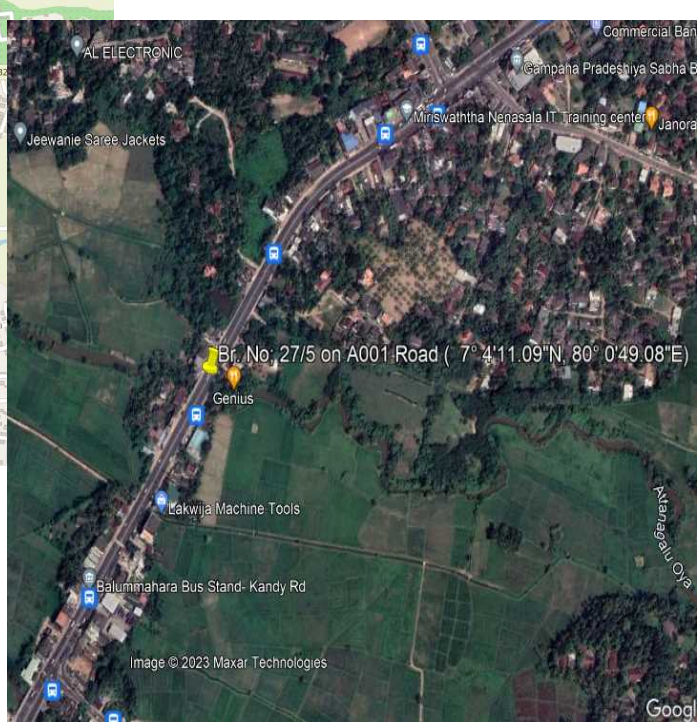
[redacted]
Bridge Designs Office,
RDA

Contents

1. General Details of Project

❖ Location of Bridge No; 27/5 on Colombo – Kandy RoadA001 Road (7° 4‘11.09"N, 81°0‘49.08"E)





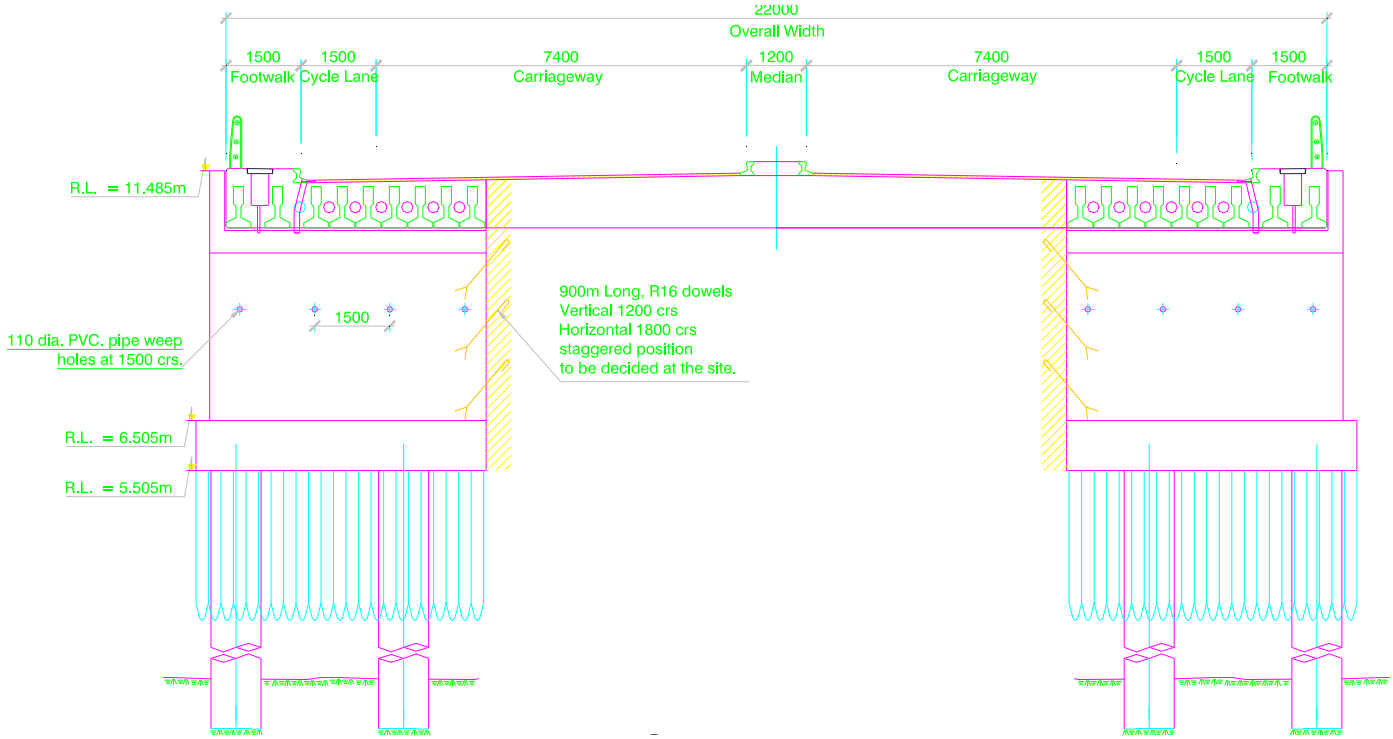
1. General Details of Project

❖ General Details of Existing Bridge.

- Overall length of the original bridge was 19.00 m, consisting 2 span 9.5m PSC beam bridge deck.
- Overall width of the bridge deck was 11.60m
- Both Abutments and Pier are sitting on driven piles and the existing bridge was overall in good condition.
- The bridge capacity has to be enhanced to satisfy the future traffic demand, and it was proposed to widened by 5.20m on both side to full fill 4 lanes with cycle lanes.
- The deck is designed using 19.00m PSC beam as single span.
- The abutments for widening section was designed as RC abutments and wing walls sitting on 4 Nos. of 1.0m Dia. Bored Cast in-situ Piles for all sides in both ends.
- The piles are end bearing and socketed into 1.0 m bed rock.

1. General Details of Project

❖ General Details of Bridge.



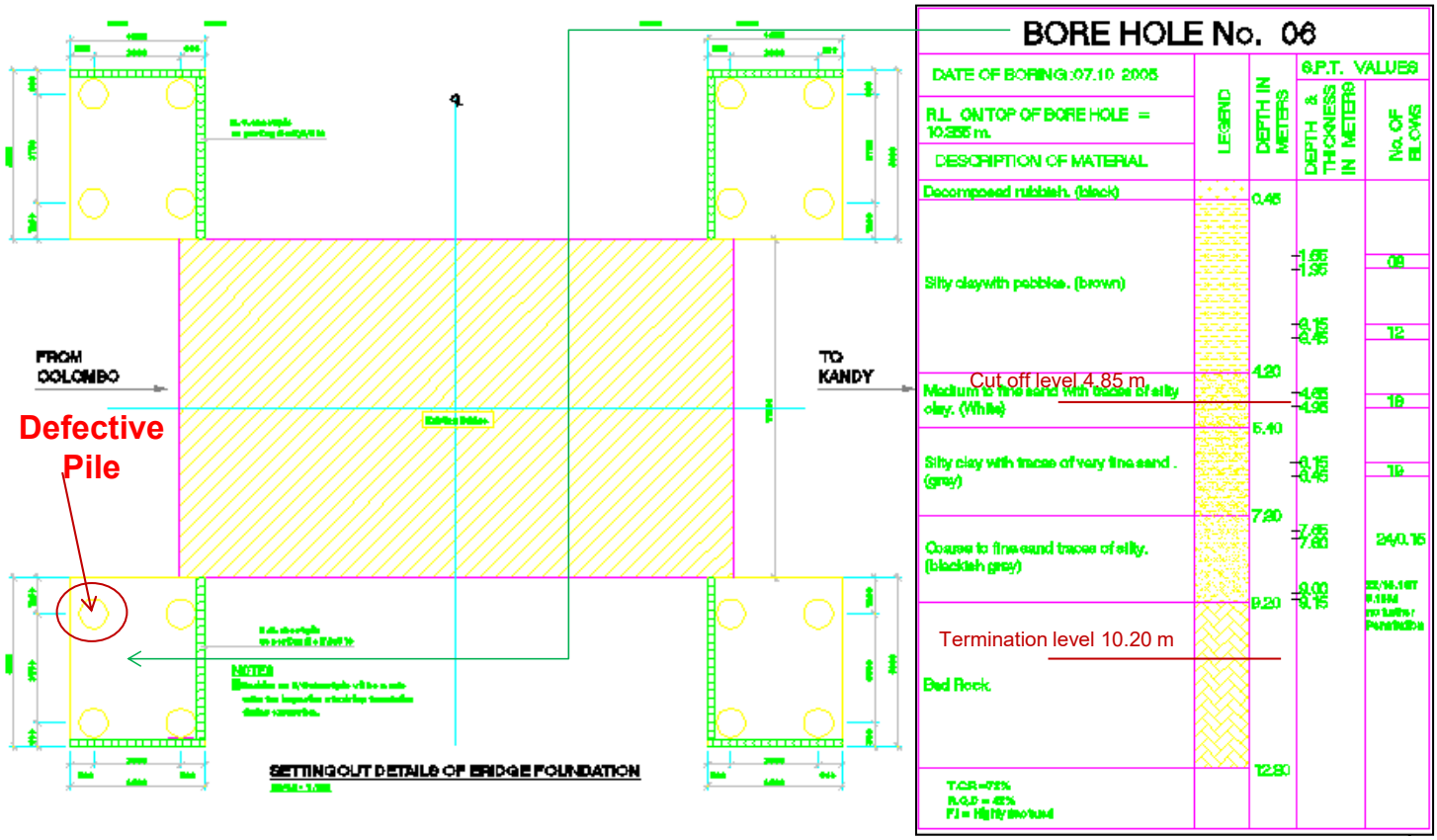
1. General Details of Project

❖ Defect in a Bored Pile during the Casting

- Pile no. 14 was found as a severe defective pile during the CSL tests.
- The defect was located at the pile toe region where within rock socketed area.
- It is necessary to rectify the pile for both integrity and load carrying capacity.
- Sub Structure
  - ✓ Both side widening by each 5.80m
  - ✓ 1.0 m Dia. Bored Cast In-Situ piles are used for foundations.
  - ✓ Service load on the Pile = 1500 kN
  - ✓ Pile is designed to carry both vertical loads and lateral loads
  - ✓ Socket length of each pile in to the bed rock is 1.0m.

1. General Details of Project

❖ Location of Defective Pile & Borehole log



2. Cross Hole Sonic Logging Test

❖ Cross Sonic Logging Profile

- Four nos. of access tubes were installed during the casting of pile.
- 6 nos. of profiles were performed during the scanning.
- All 6 profiles are shown a severe defect which is within the rock socketed region ((at the bottom level) of the pile.
- Defect was suspected due to unclean debris/mud deposit at the toe or the side wall might collapsed during the concreting operations.

The classification criteria for piles based on CSL results

Category Number	Category	FAT increase	And/ Or	Signal Reduction (Energy Reduction)	Comment
1	G	Up to 10%	And	<6db	Good
2	Q	11 to 20%	And	<9db	Doubtful
3	P/F	21 to 30%	Or	9 to 12db	Poor/Flaw
4	P/D	>30%	Or	>12db	Poor/ Defect

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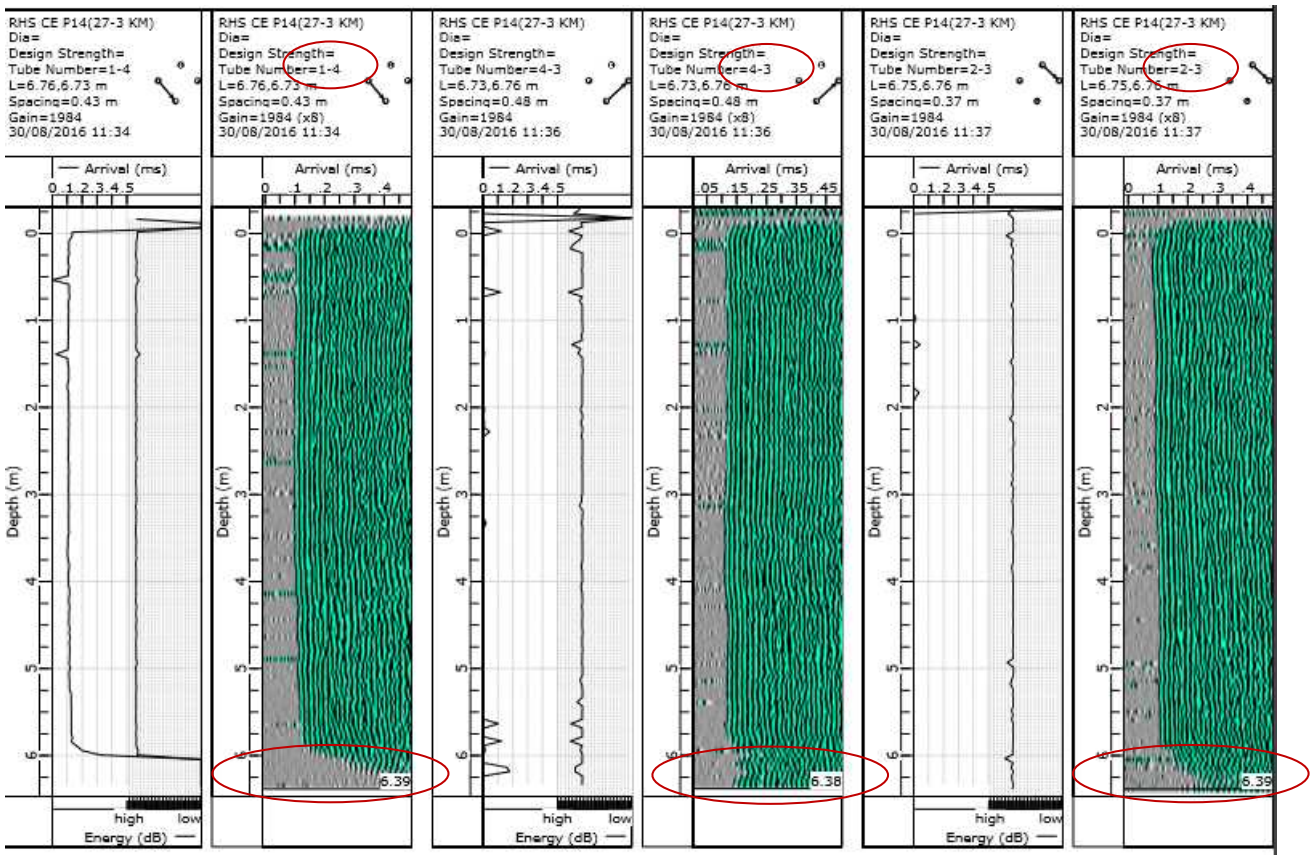
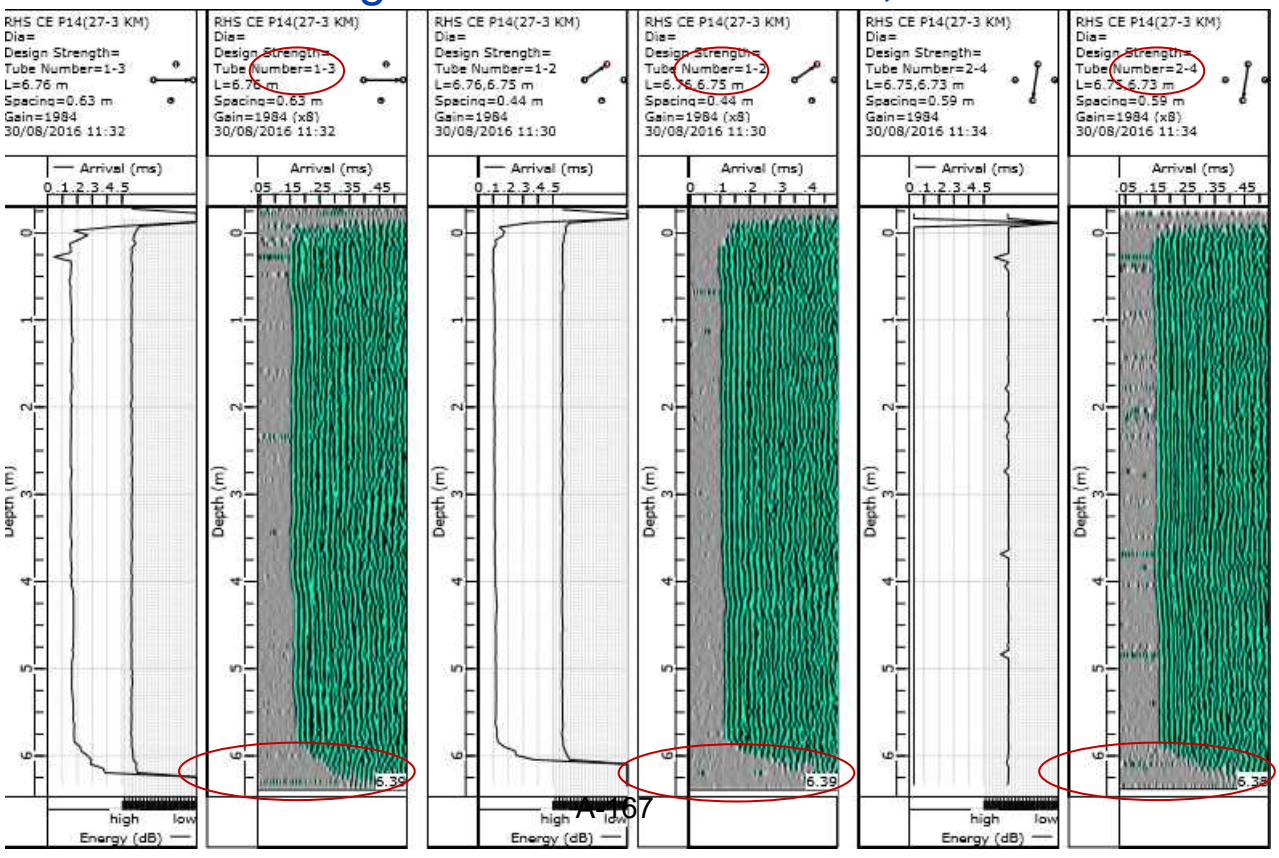
2. Cross Hole Sonic Logging Test

❖ Water Fall Diagram for the CSL test



2. Cross Hole Sonic Logging Test

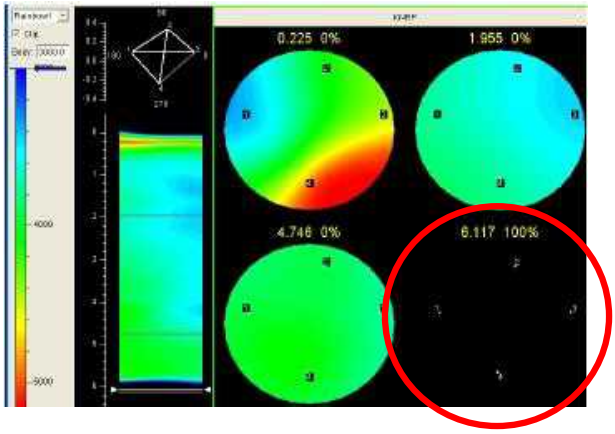
❖ Water Fall Diagram for the CSL test…,



2. Cross Hole Sonic Logging Test

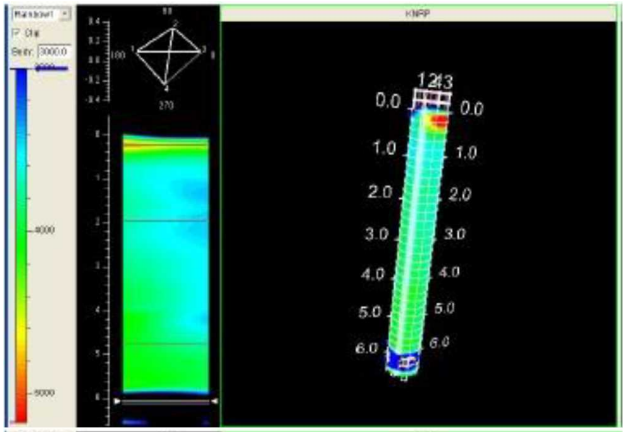
❖ Tomosonic Analysis

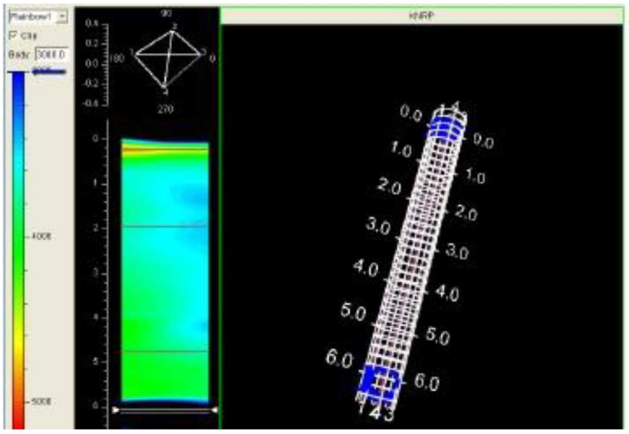
- Tomosonic was conducted on Pile No P14 (RHS-CE) which was identified as a defective pile by cross-hole sonic logging test.
- 2D/3D visualization of the defected pile was developed using tomosonic software and the longitudinal and transverse sectional or slices details were produced.
- 2D and 3D tomography images show the presence of non-homogeneous or contaminated materials from 5.80m below from the cut off level.

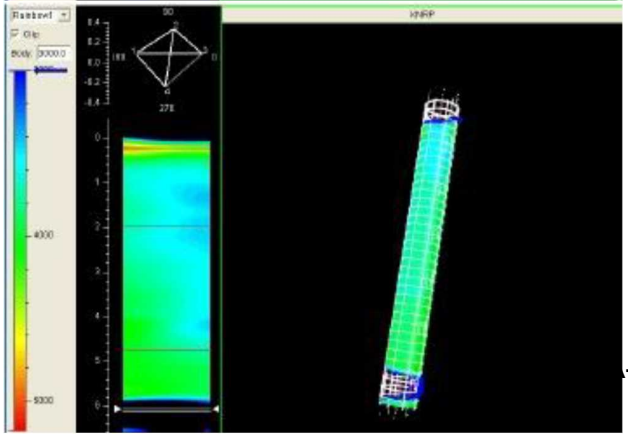


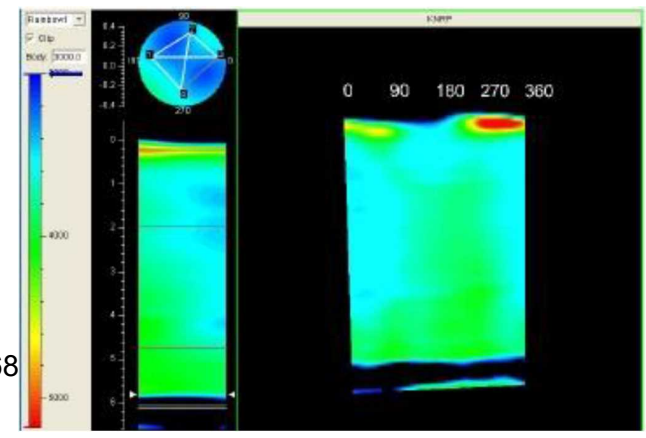
2. Cross Hole Sonic Logging Test

❖ Tomosonic Analysis





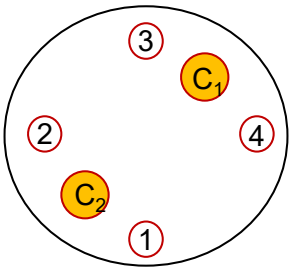


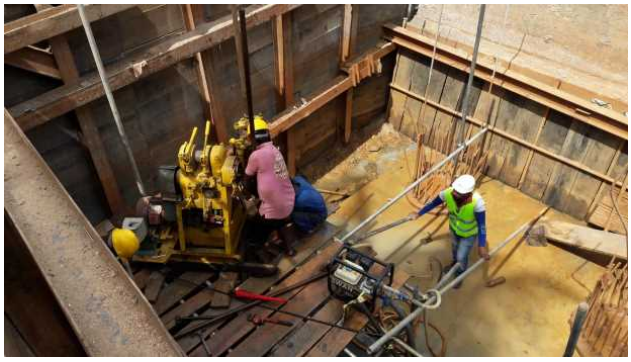


3. Extraction of Core Samples

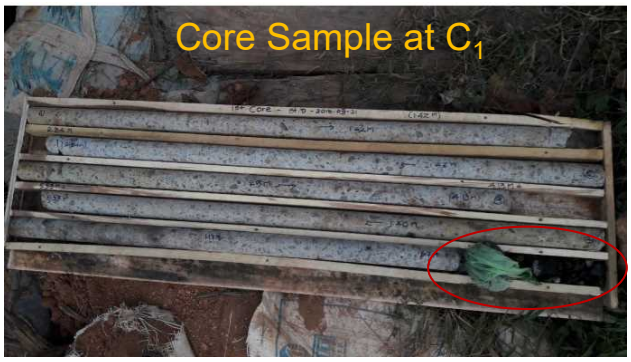
❖ Core Samples for verify the defect with Non Destructive test Results.

➢ From the core sample, the severe defect is confirmed at the toe (within rock socketed region) of the pile.





- ✓ 1, 2, 3 & 4 are cross hole sonic logging access tubes
- ✓ C_1 & C_2 are location of Core Cuts
- ✓ 72mm Core diameter & 54 mm Sample diameter.



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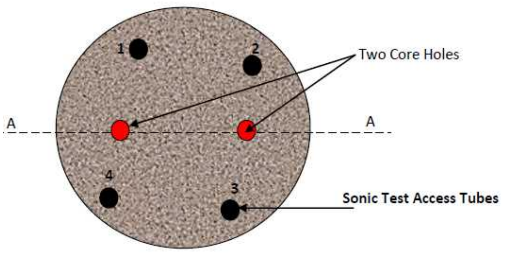
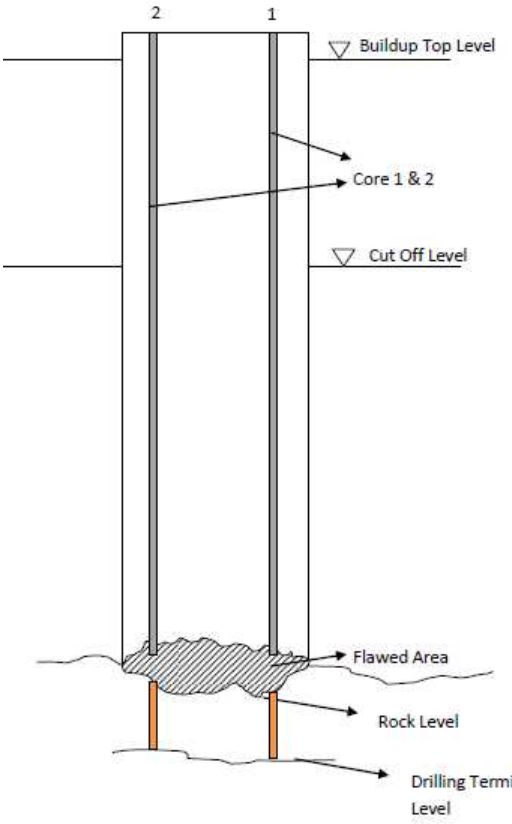
4. Retrofitting Proposal, by Pressure Grouting

❖ Method of Statement for Rectification,

- ➢ Advancing 72 mm Dia. Cores in two locations through the pile up to the bottom of pile.
- ➢ Flush the pile with high pressure water.
- ➢ Fill the voids in defect region with pressured cement grout.
- ➢ Integrity & Load Testing Tastings.
- ➢ Approvals



Plan View of the Pile



Section A-A

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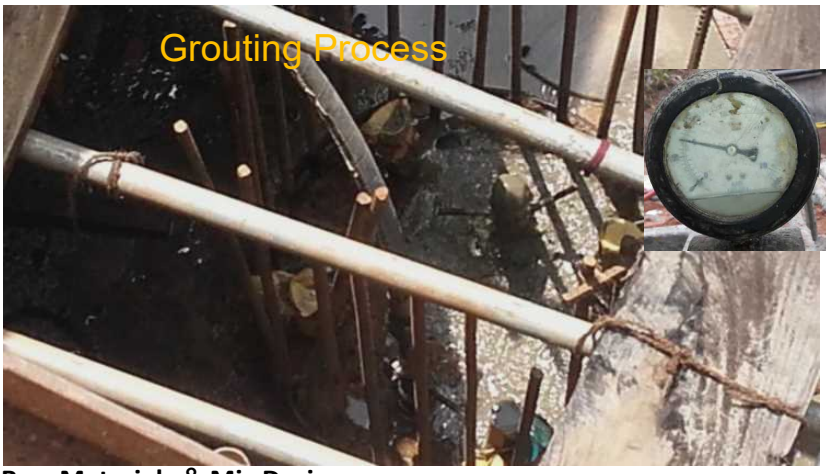
4. Retrofitting by Pressure Grouting

❖ Grouting operations

- Initially pressurized water is used to clean the mud and debris deposited at the toe.
- Approved mix design of cement grout is used to rectify the defects (10 Bars pressure is maintained for 5 minutes).



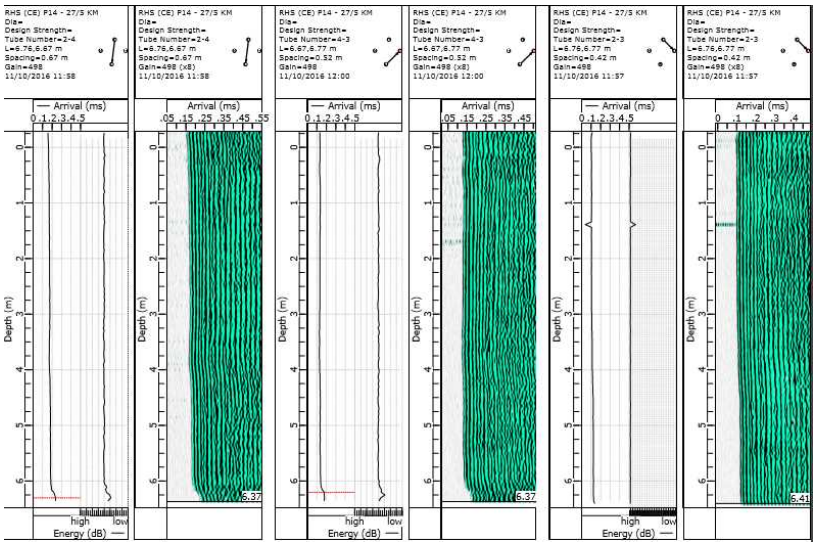
Raw Materials & Mix Design

Cement (kg)	100 (OPC (42.5))	Admixture 01 (Flow Cable 50) / (kg)	0.500
Water (kg)	40	Admixture 02 (Rheobuld 1000) (Ltr)	0.750
Water Cement ratio = 0.4			

5. CSLTest after Rectification

❖ Water fall Diagram

- Access tube No. 01 was blocked.
- Only three profiles were scanned out of six.
- From the CSL test, the pile's integrity cannot be verified.



Pile NO	Profile	Depth (m)	FAT Delay (%)	Energy Reduction (E.R.) (dB)	Profile Category	Conclusion
P14	1-2	Profiles involved with the tube no 01, were not tested due to a blockage in the tube no 01.				Pile integrity cannot be verified through the CSL test.
	1-3					
	1-4					
	2-3	Full Depth	<10	<6	G	
	2-4	6.20-6.35	18%	<6	Q	
		Other region	<10	<6	G	
	3-4	6.15-6.35	17%	<6	Q	
		Other region	<10	<6	G	

6. Dynamic Load Test (PDA Test)

❖ Test Results

- Working load of the pile is1500 kN.
- Applied Hammer load is 8 Tons with 750mm stroke.
- Mobilized Static load capacity is 3040 kN.
- Pile Integrity (Minimum beta value) is 0.96 (>0.9 OK).

Pile Details	
Pile Number	P14
Date of Installation	
Date of Testing	24th Nov 2016
Pile Type	Bored Cast Insitu Pile
Pile Diameter (mm)	1000
Cross Sectional Area at sensor location (cm^2)	7,854
Wave Speed (m/s)	3,800
Material Specific Weight (kN/m3)	24
Pile length (m) from ground level (from excavated level)	6.80
Length Below Gauges (m)	6.90
Working Load, WL (KN)	1,500
Test Load (KN)	2,250
Hammer Details	
Hammer Model	Drop
Ram Weight (KN)	80 KN
Observed Stroke (mm)	750
PDA Results	
RMX (KN)	3,752
FMX (KN)	2,871
CSX (Mpa)	3.70
EMX (KN-m)	6.40
ETR (%)	15%
Pile Integrity (Min %)	(96)
Blow Number	2

Description	Pile No. P14
1. Mobilized Static pile Capacity (kN)	3040
2. Mobilized Skin Resistance (kN)	927
3. Mobilized Toe Resistance (kN)	2113
4. Pile Integrity(Min. β value)	96% OK
5. Gross Settlement at working load (mm)	0.61
6. Gross Settlement at test load (mm)	1.29
7. Gross Settlement at mobilized load (mm)	2.10

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7. Conclusions

- The defect is well confined location, therefore the grouting technique is very successful.
- The mobilized load capacity of the pile is 3040 kN, it is greater than working load of the pile 1500kN.
- Minimum integrity ratio (β) along the pile shaft was found 0.96, it is acceptable limit.
- The pile is accepted as a working pile after rectification.

8. Future Challenges

- Substructure and all type of foundations can be repaired / retrofitted after conducting sophisticated testing **During the construction easily**.
- **During the service** it would be very challenging and very high cost involving process.
- **Cost** is playing major role in such situation when the bridges are in operation.
- The **repair / retrofitting cost** should be analyzed and compare with **fully replacement cost**.
- The **durability is highly questionable** of the repaired / retrofitted structures.
- How could be do **investigations, tastings and retrofitting** for specially **substructures & foundations where invisible and inaccessible**.
- In Sri Lanka numerus number of bridges which are very poor in conditions, have to be repaired/ retrofitted as our country is currently facing financial issues.

8. Future Challenges

❖ Successfully repaired the substructures of Br. No; 326/1 on CRWB Road (6° 55‘9.8"N, 81°50‘16"E)

8. Future Challenges

❖ Condition of Br.No;1/1 on P-V (B344) Road (7° 30’58.36"N, 81°46’51.1"E)

- No of Span — 21
- Clear opening — 7x20+13.5 m (153.5 m)
- Overall Length — 158.0 m
- Clear carriageway — 6.1 m
- Overall width — 7.1 m
- Foot Walk — Not available
- Super Structure — PC beam with Reinforced concrete deck
- Sub Structure — Pile foundation
- Deck thickness — 0.5 m

8. Future Challenges

❖ Condition of Br.No;1/1 on P-V (B344) Road (7° 30’58.36"N, 81°46’51.1"E)

8. Future Challenges

❖ Condition of Br.No;1/1 on P-V (B344) Road (7° 30’58.36"N, 81°46’51.1"E)

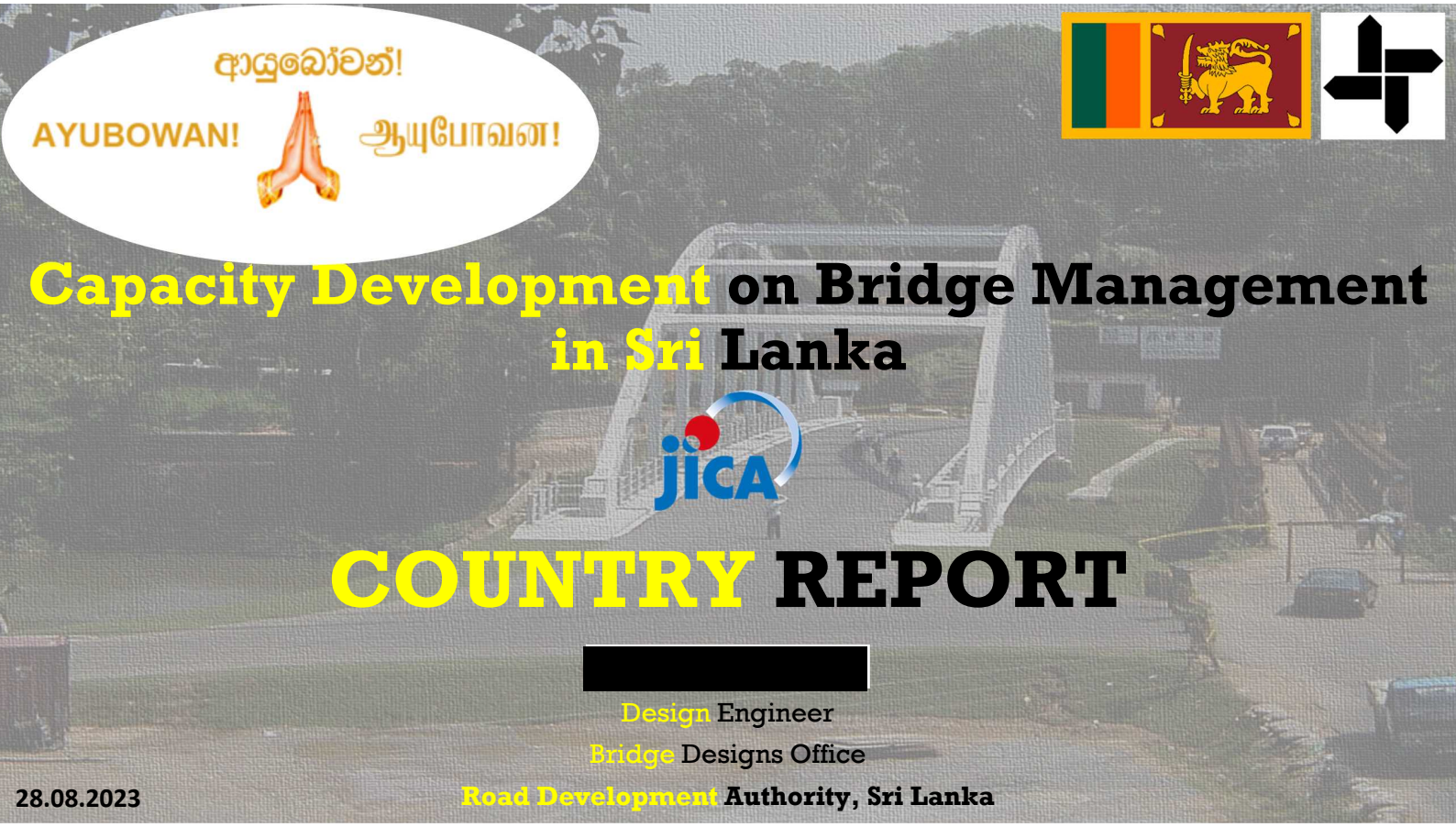
7. Future Challenges

- How to rectify this Bridge…?
- Is it cost effective than replacement…?
- If Rectified, What would be the durability of the bridge & lifecycle cost..?


Thank
you

(1) Country Report by Training Participants

9) Country Report by [redacted]



Capacity Development on Bridge Management in Sri Lanka

COUNTRY REPORT

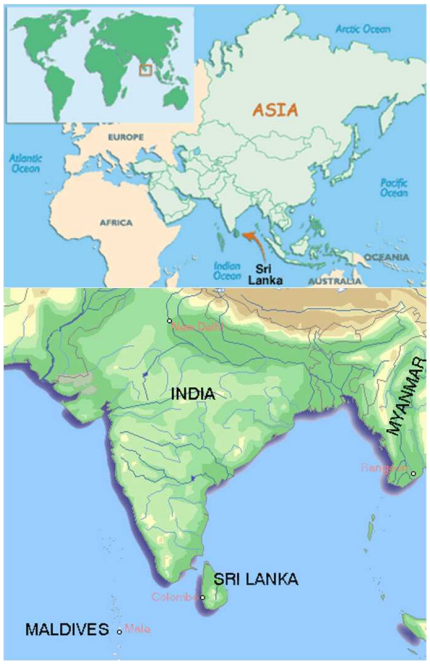
[redacted]
Design Engineer
Bridge Designs Office
Road Development Authority, Sri Lanka

28.08.2023

Content

- About Sri Lanka
- Self Introduction
- About Organization
- Bridge Management & Assessment Unit
- Bridge Management Workflow
- Bridge Inspection
- Underwater Inspection
- Expected Learning Outcomes

About Sri Lanka



- Total Area = 65,610 km² (25,332 Sq. mi)
- Population = 21.6 million
- Capital = Sri Jayewardenepura Kotte

- Currency = Sri Lankan Rupees (LKR)
- Literacy = 92.5%
- Main Export Item = Cinnamon, Rubber, Tea
- Climate = Tropical and Warm
- Official Language = Sinhala and Tamil
- Economy = Upper middle income country

3

Self Introduction

- Name : Pahalage **Sampath** Perera
- Educational background
  - ➢ Bachelor of Science of Engineering (Civil) (2006 – 2010)
    University of Moratuwa, Sri Lanka
  - ➢ Master of Philosophy (Infrastructure Management) (2018 – 2020)
    Yokohama National University, Japan
- Professional career
  - ➢ Work in Road Development Authority (RDA), Sri Lanka (2010 – up to present)
    - Engineer's Representative – CE's Office (Projects) Colombo (2010 - 2013)
    - Design Engineer – Bridge Designs Office (2013 – up to now)

4

About Organization

for bridge engineering activities

- Director Planning

- **Investigation**
  - **R&D Division**
  - Director R&D

- **Design**
  - **Bridge Designs Office**
  - Director ES

- **Construction**
  - **Construction Division**
  - Director Construction

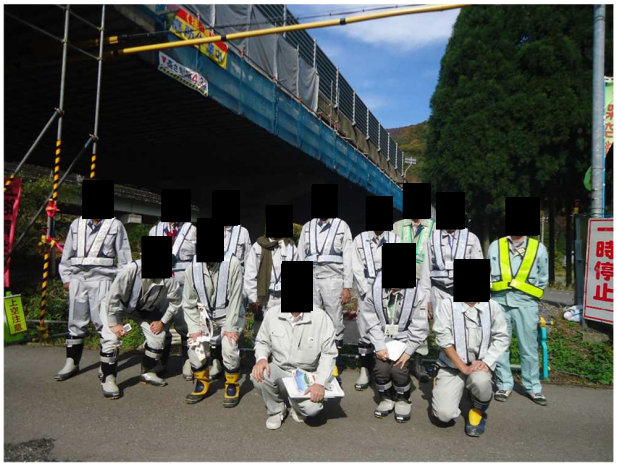
- **Maintenance and Repair**
  - **Maintenance Management Division**
  - Director MM

- **Management & Assessment**
  - **Bridge Management & Assessment unit**
  - Director ES

Bridge Management & Assessment Unit

The Project for Capacity Development on Bridge Management in Sri Lanka

❑ **Counterpart Training Program in Japan**

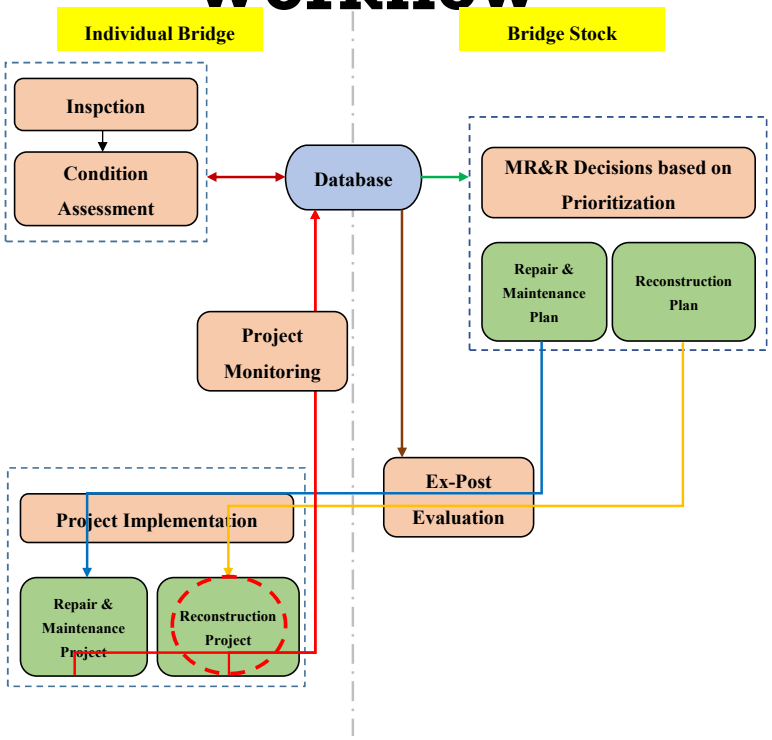


Bridge Management & Assessment Unit

The Project for Capacity Development on Bridge Management in Sri Lanka

❑ **Project Activities in Sri Lanka**

Bridge Management Workflow



Bridge Inspection

Current Inspection Types

- Periodic Inspection
- Bridge Condition Inspection
- Damage Inspection

Current Inspection Techniques

- Visual Inspections
- Acoustic Inspections (with a hammer)

Current Challenges

- Traffic
- Access
- Modern Techniques
- Quality of Bridge Inspections
- Cost

9

Underwater Inspection

Scour at foundations of some bridges are visible during the dry season.

Underwater Inspection

Conditions of the foundations are unknown as no underwater inspection are done.

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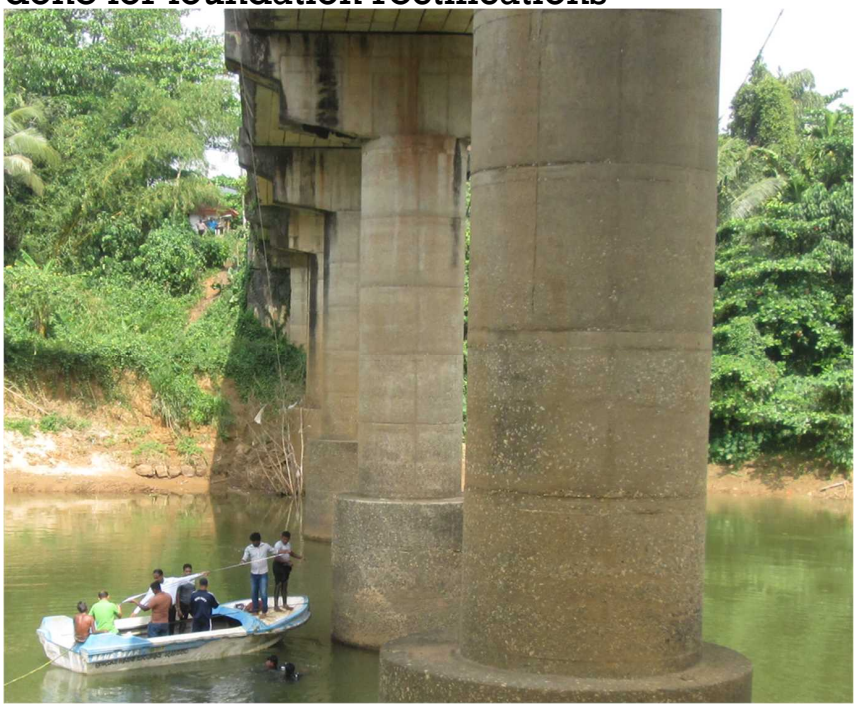
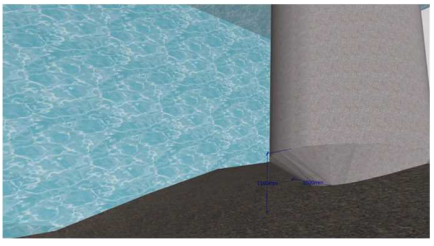
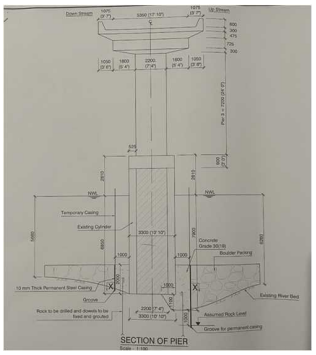
Underwater Inspection

done for foundation rectifications







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Underwater Inspection

Current Challenges

- Diving Equipment
- Specially-trained Personnel

Expected Learning Outcomes

- Modern Techniques for Bridge Inspections
  - Remote Visual Inspections (RVI)
  - Thermal Inspections
  - Ground-Penetrating Radar (GPR)
- Ways to Improve the Quality of Bridge Inspections
  - Characteristic of Inspectors
  - Skills, training, and experience on Inspection
  - Environmental, technical, institutional, and Practical Constraints
- Underwater Inspection Methods


Thank You
ありがとうございました。
15

(1) Country Report by Training Participants

10) Country Report by [redacted]

COUNTRY REPORT

by

[redacted]

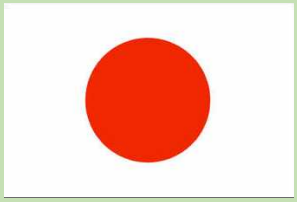
(BM&AU – Central Province)

Road Development Authority

Sri Lanka

PERSONAL INFORMATIONS

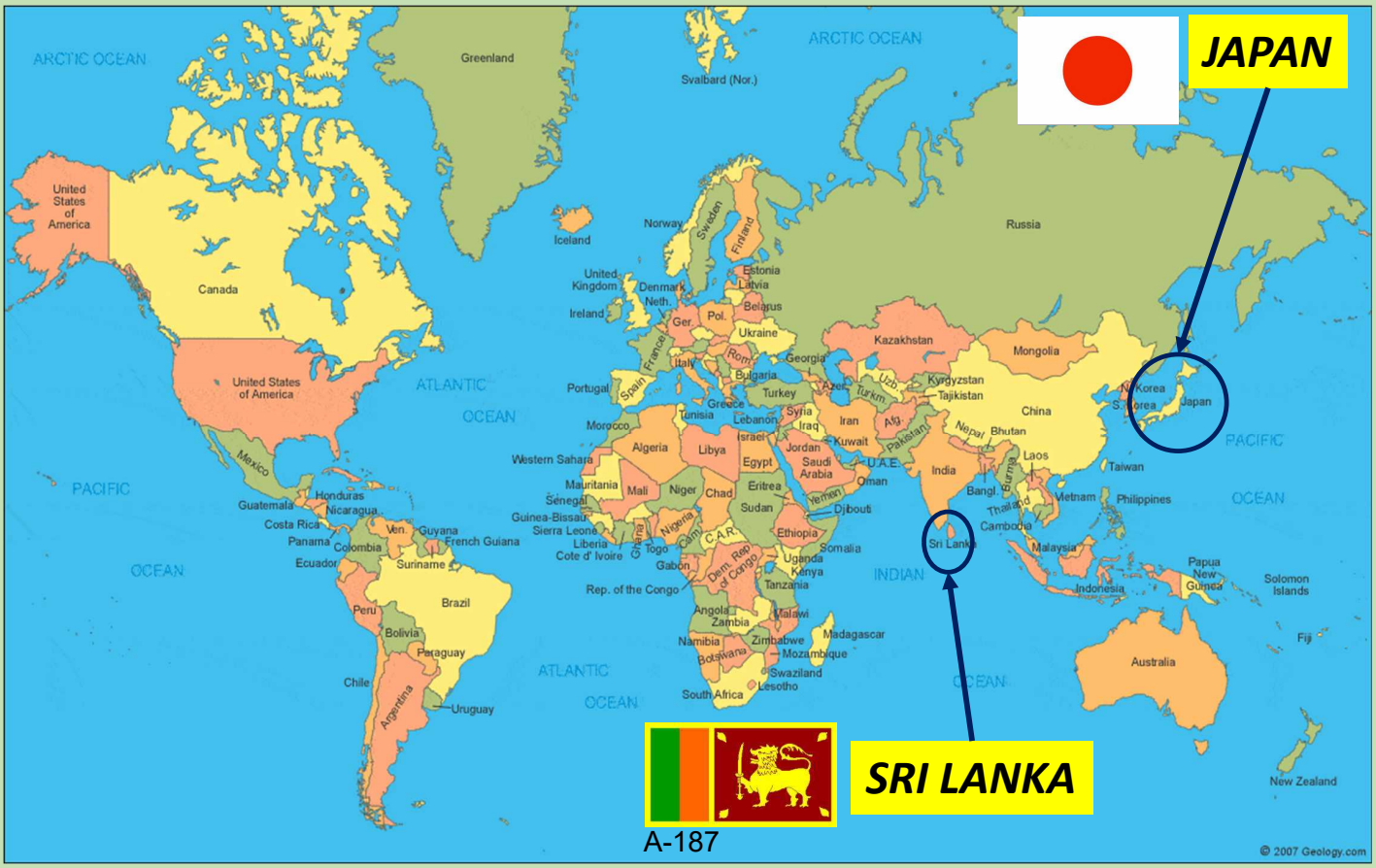
- Graduated in University of Peradeniya, Sri Lanka
- Obtained Engineering degree, Specialized in Civil Engineering
- 25 years experiences in road and bridge maintenance in Road Development Authority



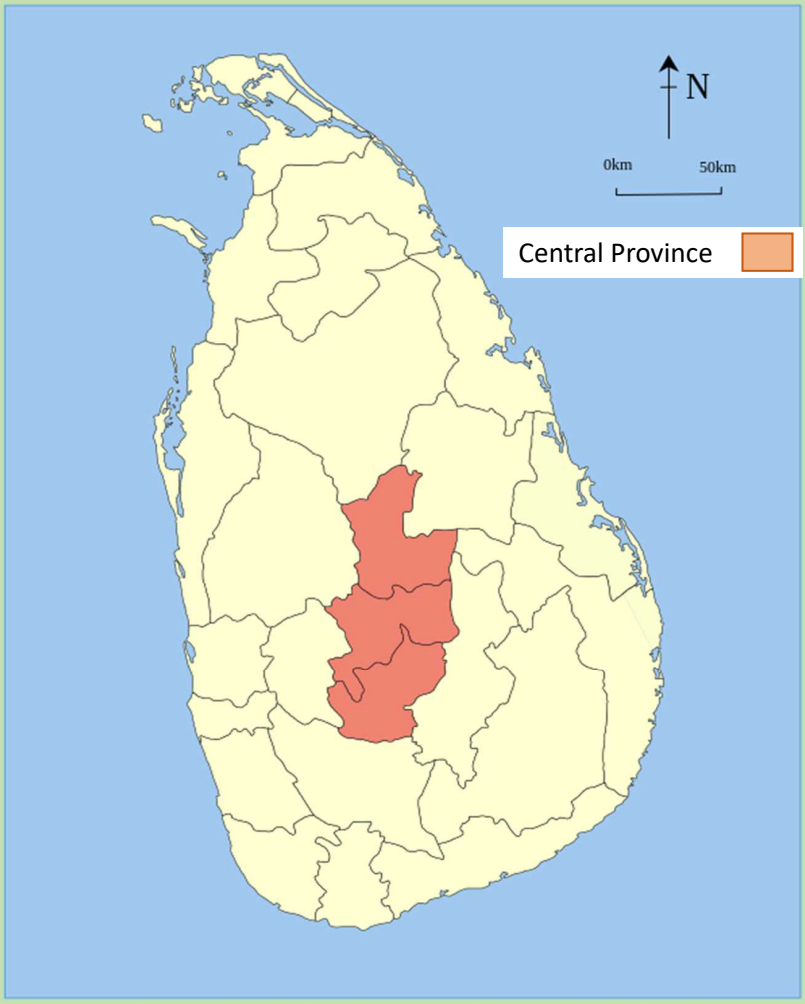
Japan International Corporation Agency

My special thanks to ***JICA*** for organizing this type of programs and giving knowledge to Sri Lanka for strengthen the relationship between Sri Lanka and Japan.

SRI LANKA IN THE WORLD



CENTRAL PROVINCE IN SRI LANKA



IMPORTANT CULTURAL EVENTS IN SRI LANKA




Kandy Perahera




Vesak Festival




Kataragama Festival

HISTORICAL LOCATIONS IN SRI LANKA

TEMPLE OF Tooth Relic - Kandy

Sigiriya

Dambulla Cave Temple

Anuradapura

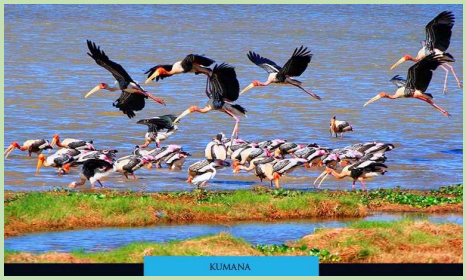
Polonnaruwaa

Hikaduwa

ATTRACTIVE TOURIST LOCATIONS IN SRILANKA

Hikaduwa

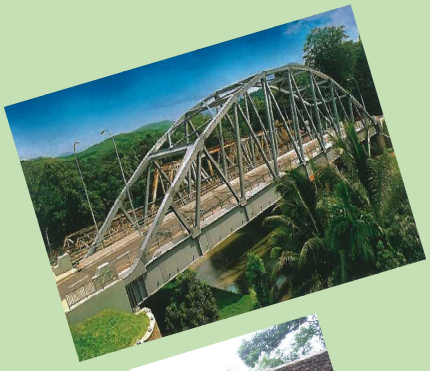
Arugambay

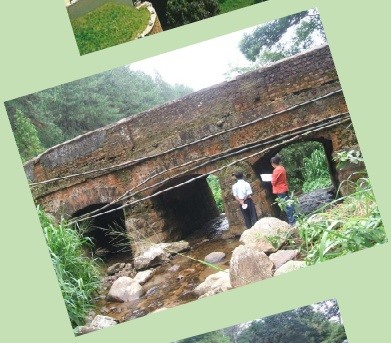


Kumana

Minneriya

BRIDGE TYPES IN SRI LANKA







DEMODARA NINE ARCH RAILWAY BRIDGE

INSPECTION EQUIPMENTS

GPS Machine

Measuring Weel

Distance Meter

Camera

Inspection Hammer

Measuring Tapes

Bridge Inspection Vehicle

Pole Camera

INSPECTION

RECORDING

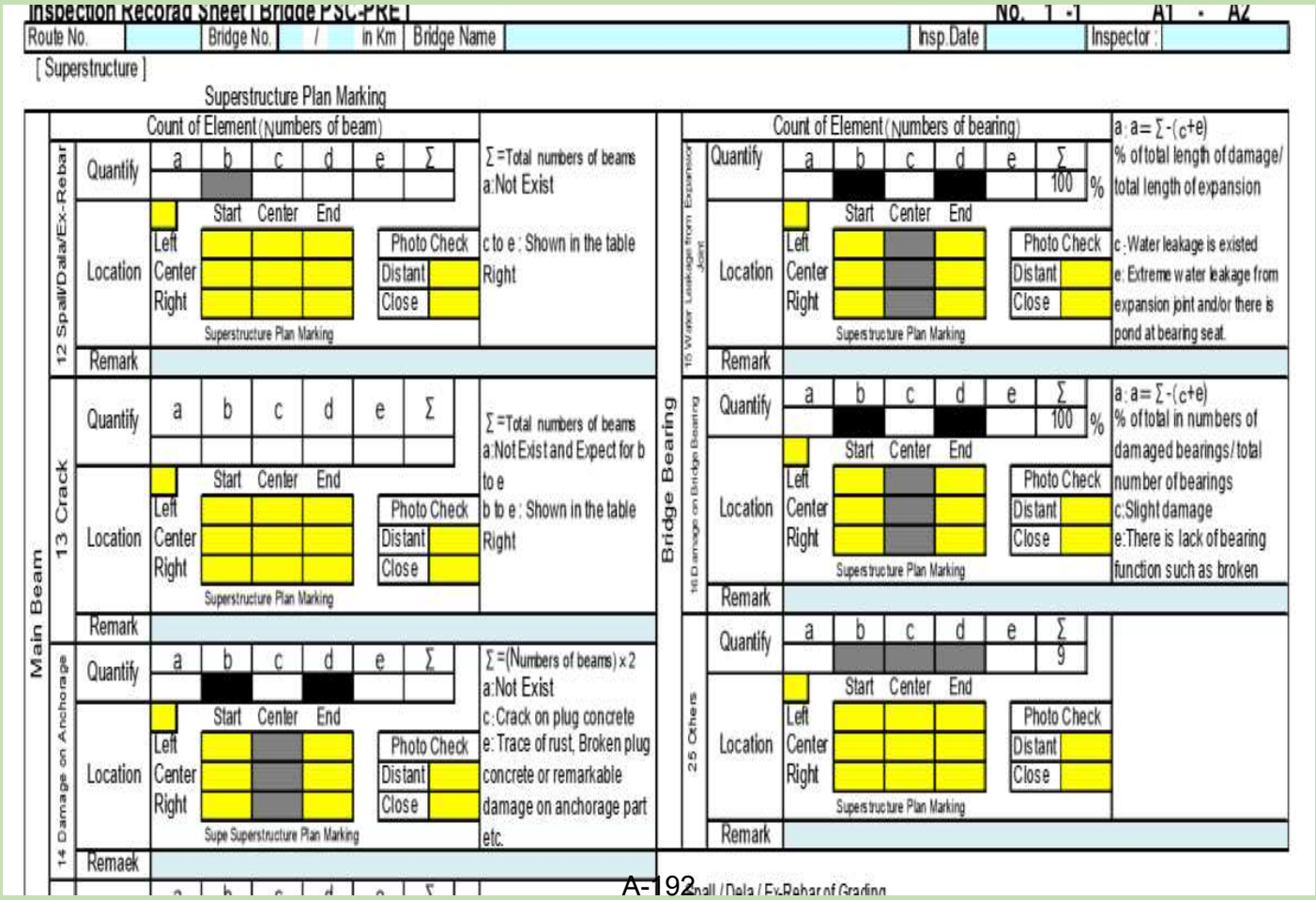
Bridge Information

Route No.	AA009	Name of Road	Kandy - Jaffna
Bridge No.	5 / 2 in Km		
Name of Bridge	Katugastota Bridge		
Separation	Not Separated	Widened	☐ Widened Bridge
Province	Central	District	Kandy
EE Division	Kandy		
Location Start	N 7° 19' 17.76", E 80° 37' 34.78"	Location End	N 7° 19' 20.16", E 80° 37' 30.48"

Superstructure

	Specification

RECORDING



TRAINING FOR INSPECTION

BUDGET

- No dedicated budget for bridge maintenance
- Maintenance done within small budget under "**Routine Maintenance"**
- "**Weak Bridges Programme"** for reconstruction and widening of bridges identified by this programme
- Surveying and designs has to be done to get funds
- Priorities change time to time

DIFFICULTIES

- No proper equipment to inspect under water
- No separate budget allocation for bridges

THANK YOU