

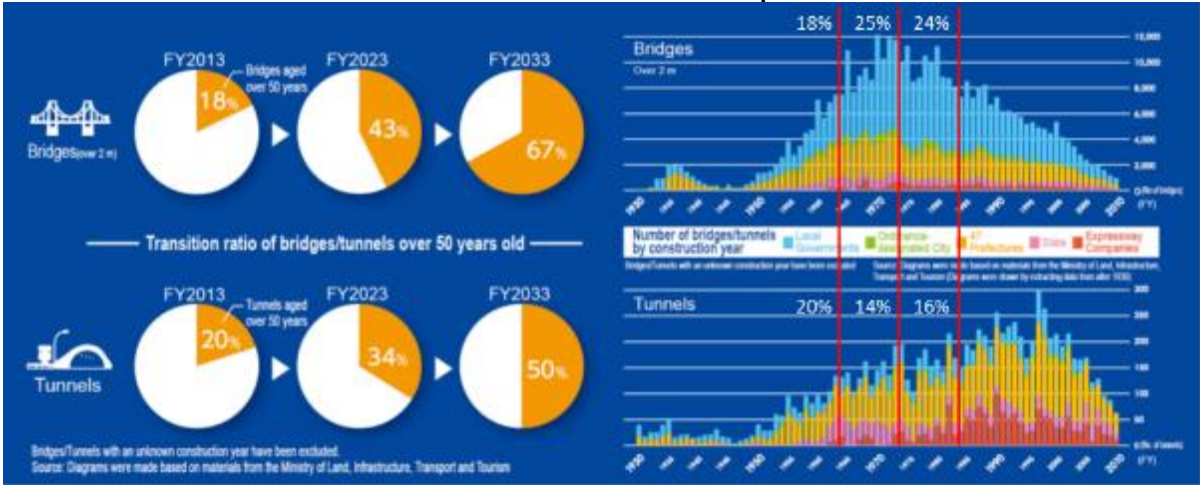
**JICA's Development Initiative for
Road Asset Management**

September, 2019

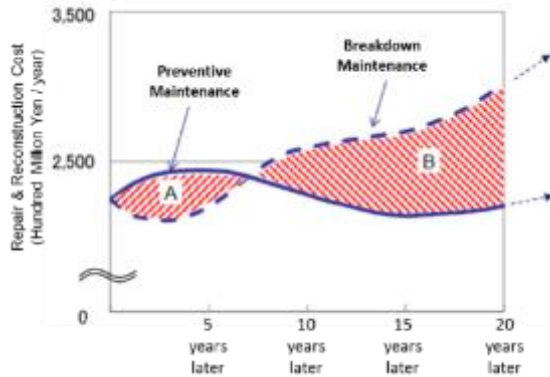
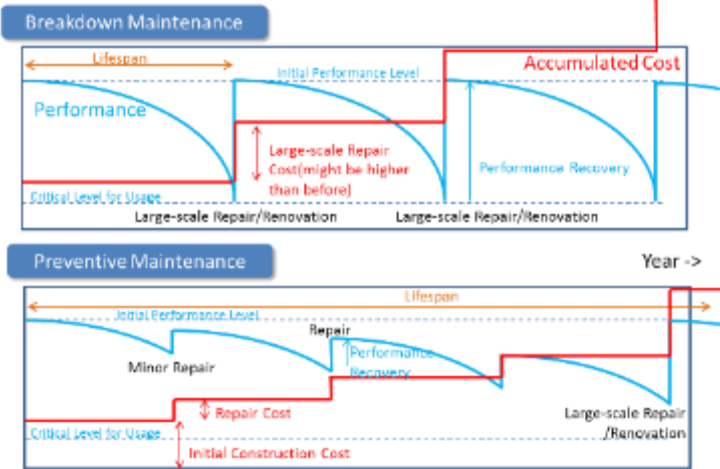
Transportation and ICT Group
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

Condition of Road Infrastructure in Japan

Current condition of Road Infrastructure in Japan



Action for Road Infrastructure in Japan Reduction of Life Cycle Cost through Preventive Maintenance



Amount of Reduction Cost:
5,000 Hundred Million Yen in the next 20 Years
 Estimated by Ministry of Land, Infrastructure and Transport

Asia's Infrastructure needs estimated by ADB

Estimated Infrastructure Investment Needs by Sector, 45 DMCs, 2016–2030
(\$ billion in 2015 prices)

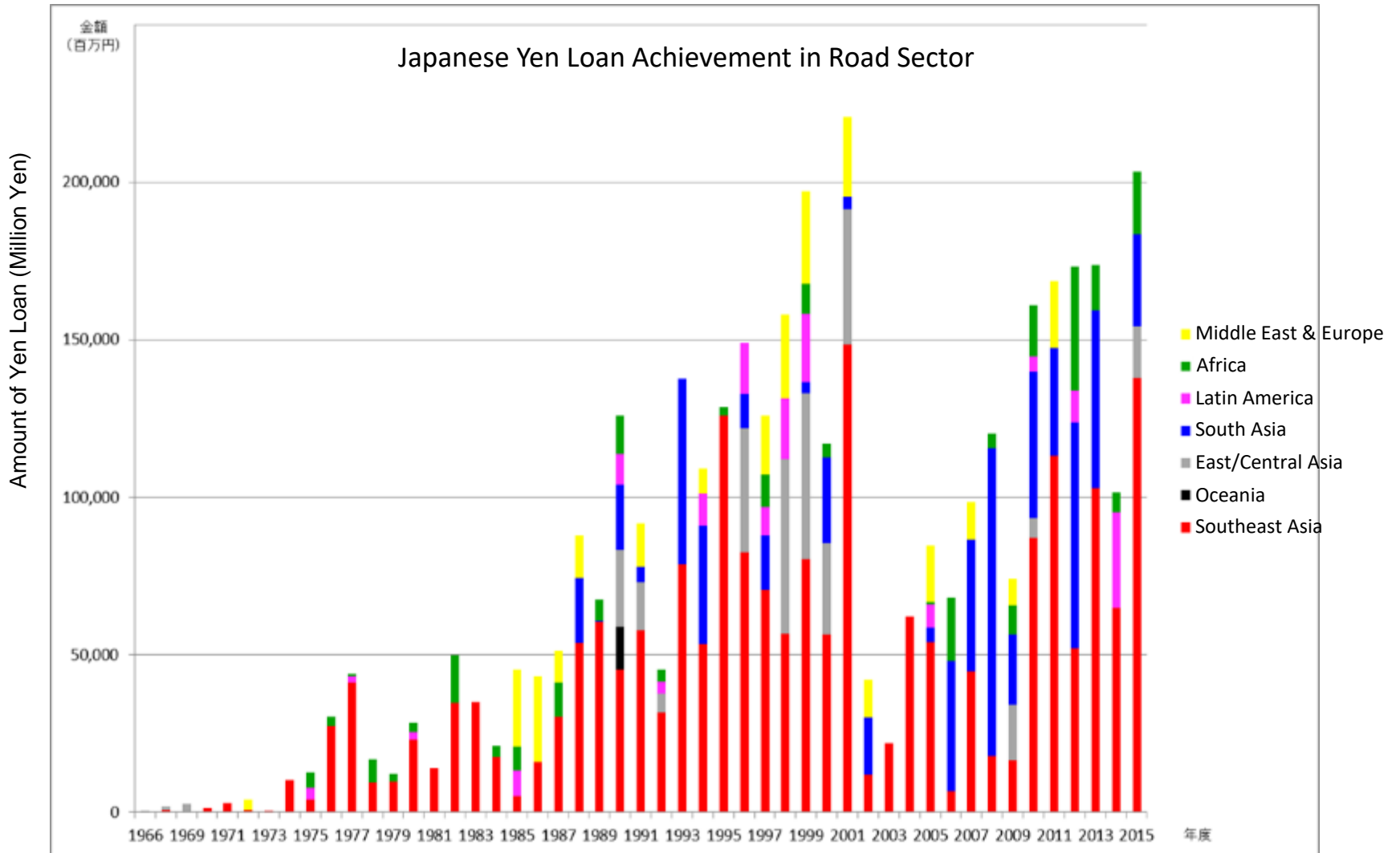
	Power	Transport	Telecommunications	Water and Sanitation	Total
Investment Needs	14,731	8,353	2,279	802	26,166
Annual Average	982	557	152	53	1,744
Share of Total	56.3%	31.9%	8.7%	3.1%	100%

Estimated Infrastructure Investment Needs by Region, 45 DMCs, 2016–2030
(\$ billion in 2015 prices)

	Central Asia	East Asia	South Asia	Southeast Asia	The Pacific	Total
Investment Needs	565	16,062	6,347	3,147	46	26,166
Annual Average	38	1,071	423	210	3.1	1,744
Investment Needs as % of GDP	7.8%	5.2%	8.8%	5.7%	9.1%	5.9%

Source : Meeting Asia's Infrastructure Needs), ADB 2017

Issue in the Developing Country



Issue in the Developing Country

Issues for Road Maintenance and Management

Budget

Technology

Human Resources

Basic Knowledge and Technology for Road Asset Management acquired by JICA's Technical Cooperation

1. Grasp and Minimization of Maintenance Cost by PDCA cycle for Road Maintenance and Preventive Maintenance
2. Road Administration based on the Road Asset Management

1. Technology and Guidance for Maintenance work and Repair work depending on the damage situation
2. Research and Development for Road Asset Management Technology and Infrastructures Lifetime-Extending Maintenance Technology depending on the Natural and Weather Condition
3. Introduction of Latest Technology

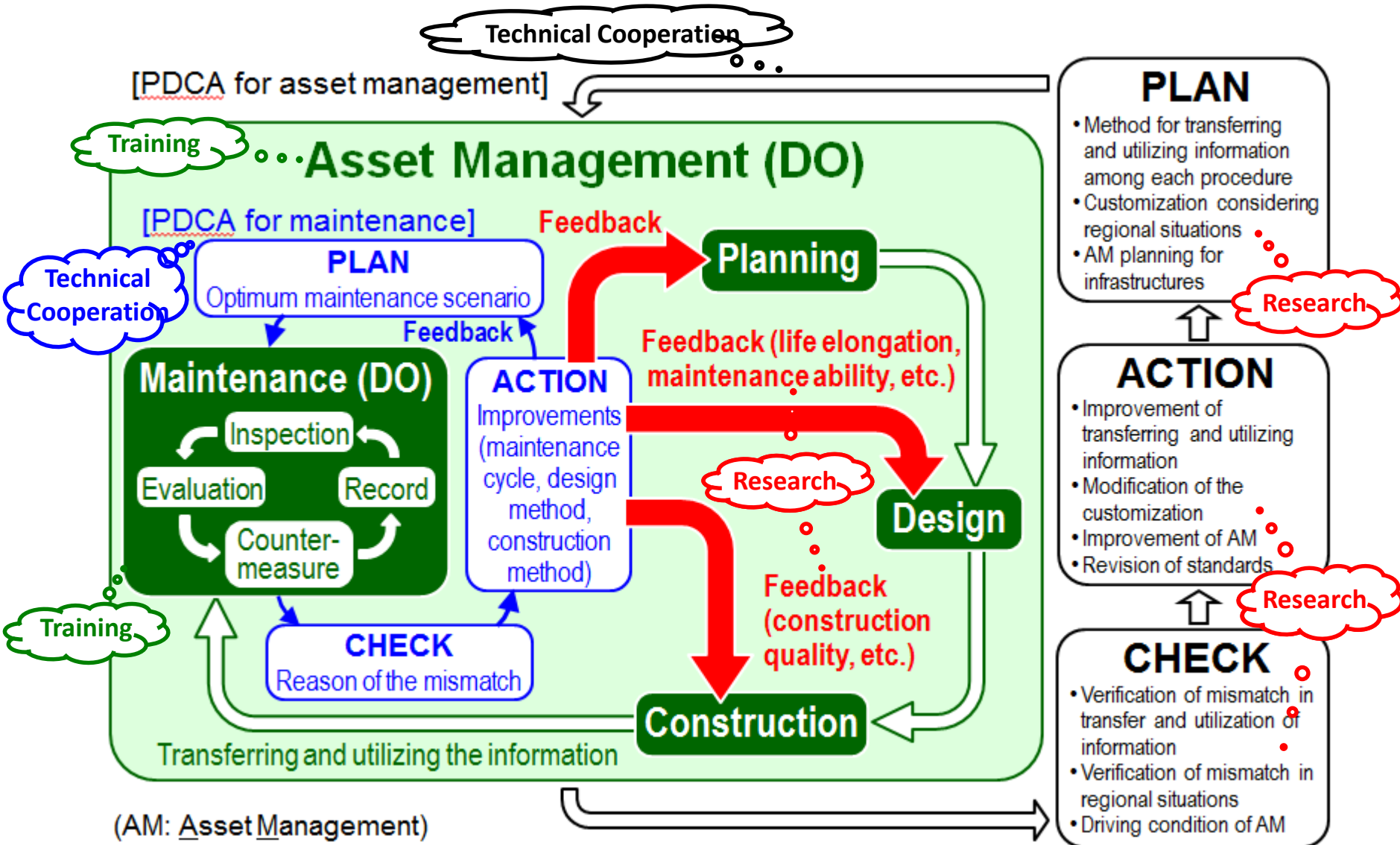
1. On the job training of Inspection and repair work for Road Maintenance in pilot site
1. Expansion of PDCA cycle for Road Maintenance to all of the country

Further Cooperation will be necessary in future

Number of Technical Cooperation Project for Road/Bridge Maintenance

Status	Southeast Asia	South Asia	East & Central Asia Pacific	Africa	Central and South America	Total
Ongoing	3	4	3	5	1	16
Preparation	5					5

Conceptual Diagram of Road Asset Management



Source: Introduction of SIP project / Current situation of infrastructure management in Japan and Asia, Kohei NAGAI, Associate Professor, International Center for Urban Safety Engineering (ICUS), Institute of Industrial Science, The University of Tokyo

Activities on Road Asset Management in Japan

Cross-ministerial **S**trategic **I**nnovation Promotion **P**rogram: **SIP** (2014.4-2019.3)

- National project under the Council for Science, Technology and Innovation to promote advancements of science, technology and innovation in Japan
- Promotion of end-to-end research and development, based on collaboration between government, industry and academia, from basic research to practical application and commercialization
- 11 issues that answer critical social needs and offer competitive advantage to Japanese industry and the economy

(1) Innovative Combustion Technology

(2) Next-Generation Power Electronics

(3) Structural Materials for Innovation

(4) Energy Carriers

(5) Next-Generation Technology for Ocean Resources Exploration

(6) Automated Driving System

(7) Infrastructure Maintenance, Renovation and Management

(8) Enhancement of Societal Resiliency against Natural Disasters

(9) Technologies for Creating Next-Generation Agriculture, Forestry and Fisheries

(10) Innovative Design/Manufacturing Technologies

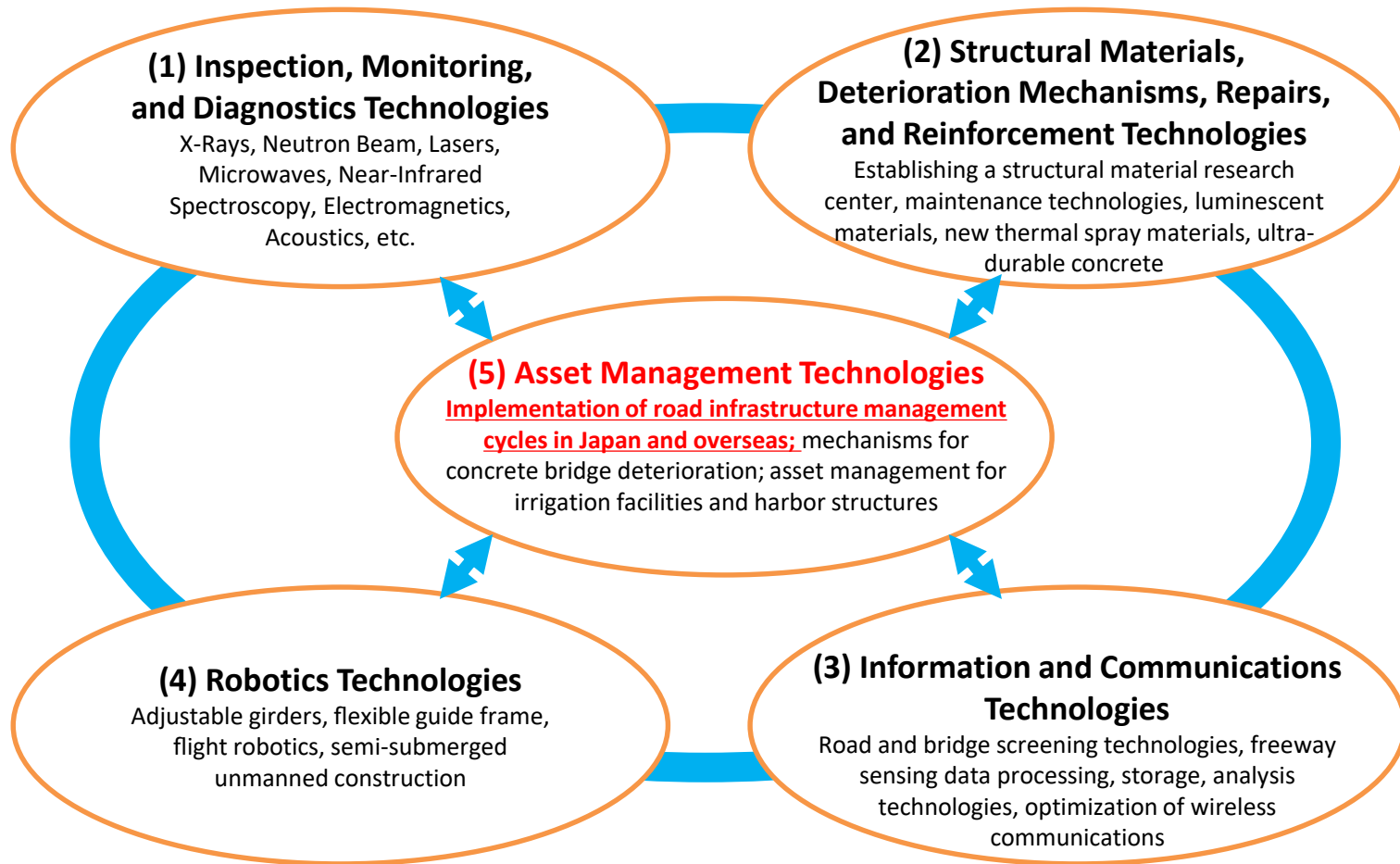
(11) Cyber-Security for Critical Infrastructure

How to Deal with an Aging Infrastructure and the heavy burden of infrastructure maintenance and repairs serious needs in our society?
How to do for Safe, Secure and Sustainable Infrastructure Systems?

Source: Cabinet Office HP, Brouchure about SIP
http://www8.cao.go.jp/cstp/panhu/sip_english/sip_en.html

SIP: Infrastructure Maintenance, Renovation and Management

5 Research and Development Topics, and 71 themes (as of Jan. 2017)



Source: Cabinet Office HP, Brouchure about SIP
http://www8.cao.go.jp/cstp/panhu/sip_english/sip_en.html

Cooperation with SIP

JICA cooperates with SIP researchers, who research and develop the most advanced technology for road asset management in Japan, to develop Road Asset Management System (including human resource development) in developing countries. JICA will provide not only technical instruction and advice but also introduction of advanced technology and systems to developing countries through research and development under SIP researchers in Japan.



JICA and SIP concluded the Memorandums of Cooperation for Road Asset Management on 23rd October, 2017.

Advanced Technologies for Maintenance & Management developed by SIP

Efficiency of Inspection and Monitoring Works & Sustainability in Developing Countries

Multicopter-based Inspection Robotic System with Visual Observation and Hammering Test Devices

R&D Objectives and Subjects

Background

Problems in infrastructure inspections

- Costs of the special vehicle
- Safety management
- Dependency on human efforts
- Lack of experts

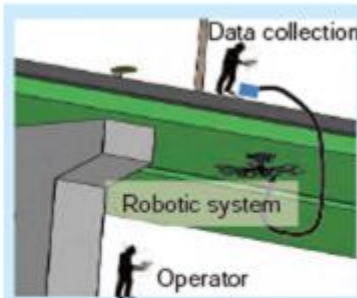


Special vehicle inspection has limitations

Purpose

Less cost and high efficacy by using drones and automatic data analysis

- Less costs for special materials
- Reduction of road regulations
- High availability of recorded inspection data
- Automatic abnormal detections
- Support for inspection reports



Schematic illustration of the inspection process

Key points

- **Mobility mechanism** with **drones** and **wheels**
- **Inspection** by **visual observation** and **hammering tests**
- **Image** and **sound**-based **abnormal detections**



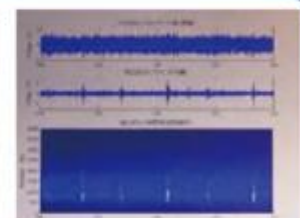
Flying close to the target



Running on the target



Hammering test



Sound analysis

Advanced Technologies for Maintenance & Management

Efficiency of Inspection and Monitoring Works & Sustainability in Developing Countries

Flying Robot (UAV: Unmanned Aerial Vehicle) for Bridge/Tunnel Inspection

R&D Objectives and Subjects

Objectives

Develop alternative system for infrastructure inspection utilizing a flying robot with hammering test equipment

Problems with the conventional inspection method

- ① Road closure during inspections
- ② Difficulties with inspecting high areas
- ③ High risks for human inspectors



Utilization of flying robot

- ① Reduction of road closure time
- ② Easier access to remote areas
- ③ Less risk during the inspection



Bridge and tunnel environment



Flying robot under development

Hammering test equipment

Research Topics

- ① Development of flight control technology to cope with **GPS-denied** and **highly windy** environments
- ② Research of **inspection technology** for concrete structures using hammering test equipment
- ③ Research of effective ways of inspection in terms of **safety** and **time**

Advanced Technologies for Maintenance & Management

Efficiency of Inspection and Monitoring Works & Sustainability in Developing Countries

Quantitative Evaluation System of Cracks on Distant Slabs by Digital Image Analysis

R&D Objectives and Subjects

Objectives

- Development of a system that can quantitatively evaluate the deterioration stage of road bridge slabs by image analysis

Conventional Inspection of slabs



Conventional visual inspection

- Creating crack drawings by freehand
- Difficulty in quantitative evaluation of cracks
- Difficulty in inspecting distant and narrow spaces

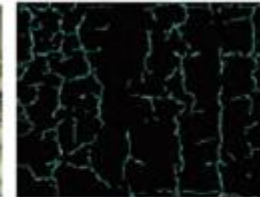


Inspection of slabs by Image analysis

- Automatic creation of accurate crack drawings
- Quantify the length for each crack width
- More efficient inspection of distant and narrow spaces



Photographing by UAV



Result of crack image analysis

Subjects (2014-2018)

- Development of digital imaging technology by UAV and pole
 - Realization of high-definition image shooting eliminating the influence of vibration
- Development of image analysis technology capable of extracting and quantitatively evaluating planar damage
 - Estimation of area of free lime and hidden crack width
- Image technology that can obtain analysis results quickly on site
 - Realization of faster processing using tablet PC



Image analysis by tablet PC



Image processing on site

Advanced Technologies for Maintenance & Management

Efficiency of Inspection and Monitoring Works & Sustainability in Developing Countries

Early Warning Monitoring System of Slope Failure using Multi-point Tilt Change and Volumetric Water Content

R&D Objectives and Subjects

Objectives

Research and develop a highly accurate, multi-point early-warning system for slope failure using low-cost tilt sensors.

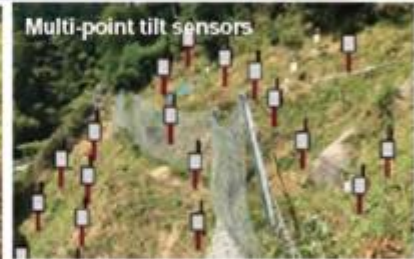
Extensometer



- Difficult to install.
- Expensive to set up numerous units on a single slope.
- Sensitive only to regional movement.

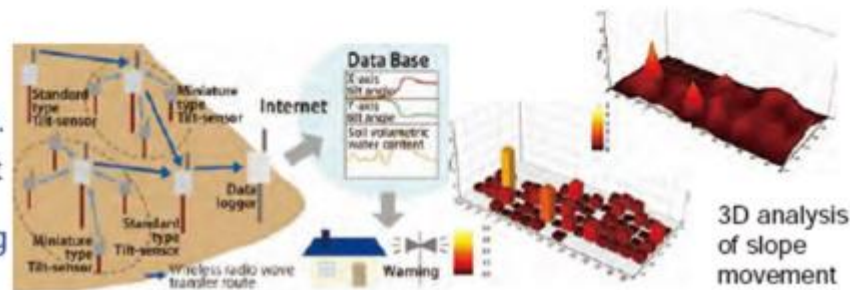
Multi-point Monitoring System using Tilt Sensor

- Easy to install.
- Low cost of equipment and installation.
- Sensitive to movement of whole area.



Subjects (2014-2016)

- Low-cost, easily-installed tilt sensors.
⇒ Realized low cost multi-point measurement.
- Prediction of slope deformation by multi-point measurements.
⇒ Realized high-precision, stable, early warning slope failure system.



Activities in Japanese Local Government

Human Resource Development “ME (Maintenance Expert)” Program in Gifu Prefecture

- **Gifu Prefecture**, located in **a mountainous area**, has many road infrastructures, **road length is approximately 4,200 km, 1,648 bridges (more than 15m) and many concrete structures.**
- Gifu Pref. faces **problems such as lack of construction / maintenance budget, lack of engineer, lack of technology.**
- **Gifu Pref. is working on switch from breakdown maintenance to preventive maintenance** of infrastructures **to keep them in good condition.**
- Gifu University established “**Center for Infrastructure Asset Management Technology and Research**” in July, 2008 to promote the **research and development on the strategic and effective maintenance for the aging social infrastructure.**
- **Gifu Univ. conducts a training program of ME(Maintenance Expert), designs the Infrastructure Management System in cooperation with industry, government, university, and the local community, and conducts the research and development on advanced technologies for effective maintenance or reduction of disaster, under the cooperation with Gifu Pref..**
- Gifu Univ. conducts two research and development projects under SIP Program, Development of Automatic Technology on Pavement and Embankment Survey and Evaluation, and Implementation Effective SIP Maintenance Technologies by the ME Network.

Collaboration with Local University is a Good Practice for Sustainable Human Resource Development

Source: Center for Infrastructure Asset Management Technology and Research, Gifu University, <http://ciam.xsrv.jp/overview01/> (Japanese Only)
Gifu Prefecture, http://www.pref.gifu.lg.jp/shakai-kiban/doro/doro-iji/11657/maintenance-expert.data/ME_290517.pdf (Japanese Only)

Advanced Technologies for Maintenance & Management

Efficiency of Repair Works & Sustainability in Developing Countries

Asphalt Pavement Repair Work using a pavement repair material “Excel Patch”

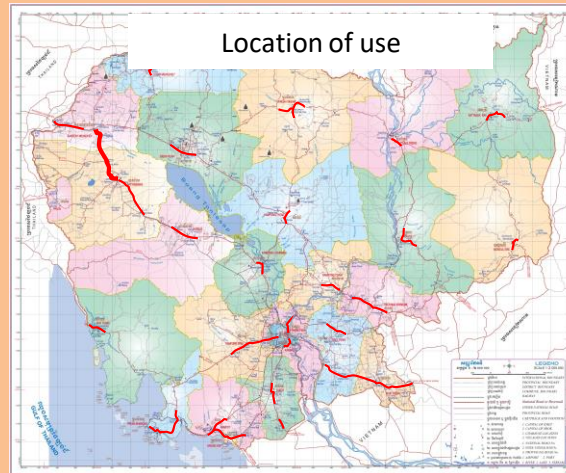
Improvement of work efficiency and quality control by using an asphalt pavement repair material “Excel Patch”



Repair of potholes using Excel Patch



Production Plant of Excel Patch in Laboratory of RID



Ministry of Public Works and Transport
Job Code: 1164
Activity: Pothole repair – Cold Mix AC (m²)

Approved Application by public-private partner: 10/16, 10/18, 10/19, 10/21

Approved Scope:

- Pothole repair on asphalt
- Pothole repair on concrete
- Pothole repair on gravel
- Pothole repair on sand

Approved Method:

- Cold Mix AC (m²)

Approved Material:

- Cold Mix AC (m²)

Approved Quantity:

- 100 m² per lot

Approved Price:

- 100,000 Baht per lot

Prescribe utilization of Excel Patch as a standard method in road repair guideline

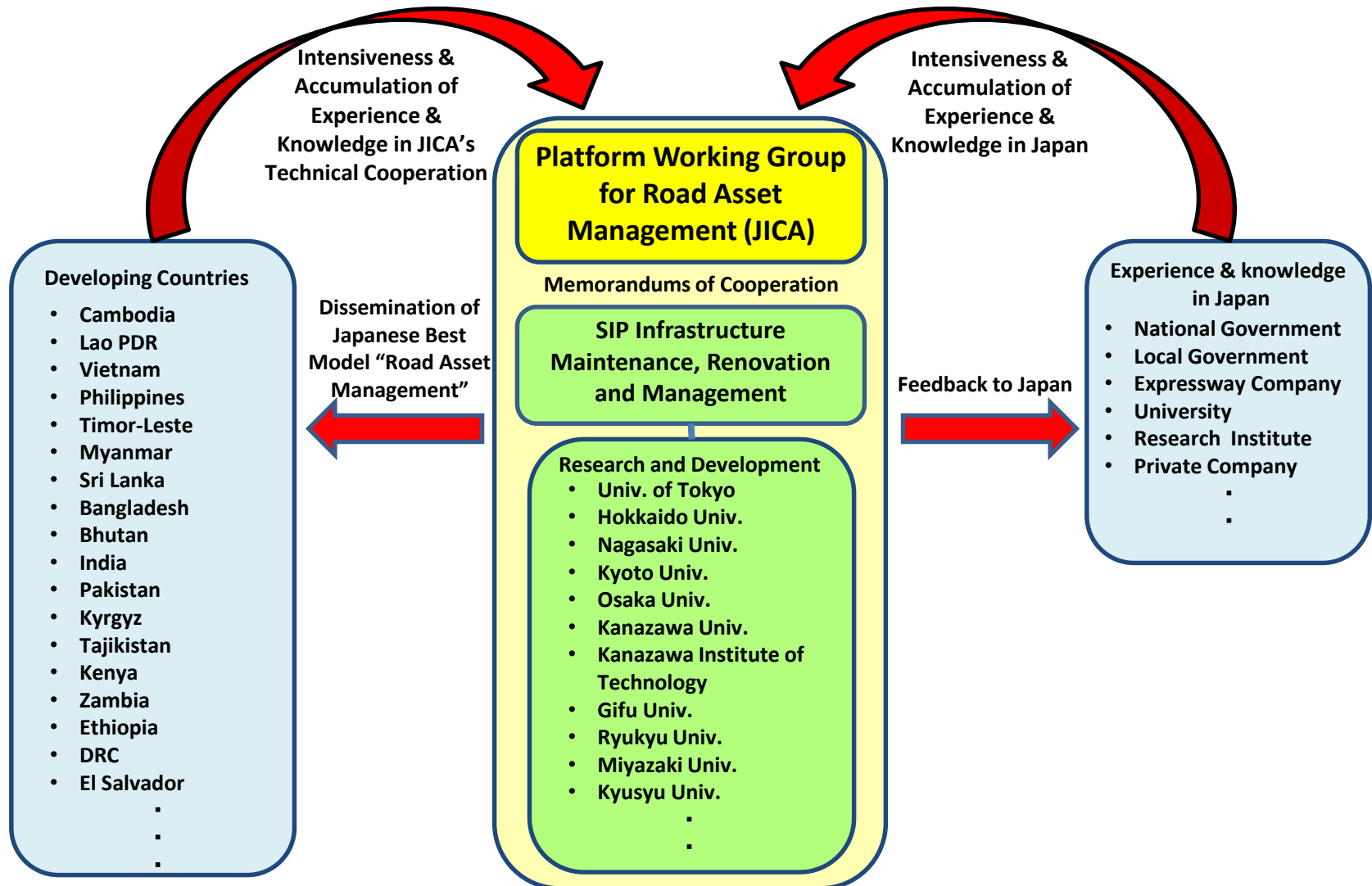
- Achieve the early repair of potholes and improvement of durability after repairs by EXCEL PATCH method
- Prescribe EXCEL PATCH method as a standard method of pothole repairs in a road repair guideline.
- EXCEL PATCH method can be applied in all weather conditions (rain, frost, snow etc.)
- Ship 140 tons (6,300 bags) and EXCEL PATCH method applied in case of repair of national road

IKEE Co., Ltd.

<http://www.ikee.jp/>



Platform for Road Asset Management



Results of Cooperation with SIP

Consultation with 21 themes' investigators after October, 2017 (as of end of March, 2019)

Topic	Research and Development Theme	Investigator	JICA Seminar for Counsultans	Implementation by JICA project
Inspection, Monitoring and Diagnostics Technologies	Development of Automatic Technology on Pavement & Embankment Survey and Evaluation	Gifu University	completed	
Inspection, Monitoring and Diagnostics Technologies	R&D of Vibration Imaging Radar	Alouette Technology Inc.	completed	
Inspection, Monitoring and Diagnostics Technologies	Inner Defects Inspection for Tunnel Lining using Rapidly Scannable Non-contact Radar and Synthetic Soundness Diagnosis System	Pacific Consultants Co., Ltd.	completed	
Inspection, Monitoring and Diagnostics Technologies	R&D of a Simplified System for Monitoring the Airport Pavement Surfaces Using Maintenance Vehicles	The University of Tokyo	completed	
Inspection, Monitoring and Diagnostics Technologies	Creation of Monitoring System using Equipment with Robotic Camera and etc. for Bridge Inspection	Sumitomo Mitsui Construction Co., Ltd.	completed	Bangladesh
Inspection, Monitoring and Diagnostics Technologies	Field Validation of the Continuous Remote Monitoring System with Power saving Wireless Sensor	Omron Social Solutions Co., Ltd.	completed	
Inspection, Monitoring and Diagnostics Technologies	R&D of Monitoring System for Detecting Surface Failure by Pore Pressure Sensor with Inclinator	OYO Corp.	completed	
Inspection, Monitoring and Diagnostics Technologies	R&D of Early Warning Monitoring System of Slope Failure using Multi-point Tilt Change and Volumetric Water Content	Chuo Kaihatsu Corp.	completed	Bhutan
Inspection, Monitoring and Diagnostics Technologies	Improvement for More Advanced and Efficient Road Structure Maintenance using Monitoring Technology	Research Association for Infrastructure Monitoring System	completed	
Structural Materials, Deterioration Mechanisms, Repairs, and Reinforcement Technologies	Deterioration Mechanism of Infrastructures and Materials Technology for Efficient Maintenance	NIMS		
Information and Communications Technologies	Research, Development and Social Implementation of Screening Technologies on Pavement and Bridges based on Large-scale Sensor Information Fusion toward Preventive Maintenance of Infrastructure	JIP Techno Science Co., Inc.	completed	Kenya
Information and Communications Technologies	R&D of Integrated Data Management Platform for Civil Infrastructure Sensing	National Institute of Informatics		
Robotics Technologies	Development of Bridge Inspection Robot System Supported by the Provisional and Flexible Scaffolding Structure	HiBot Corp.	completed	
Robotics Technologies	Development of a Bridge Inspection Support Robot System that uses Proximity-images with Geotag and a Two-wheeled Flying Robot	Fujitsu Ltd.		
Asset Management Technologies	Global R&D on the Management Cycle of Road Infrastructures	The University of Tokyo		
Asset Management Technologies	Resolution of Early-aged Deterioration Mechanism & Development of Total Management System Based on Evaluation for Material and Structure Quality Performance	Kanazawa University		
Asset Management Technologies	Establishment and Promotion of the Tohoku Infrastructure Management Platform	Tohoku University		
Asset Management Technologies	Implementation of Effective SIP Maintenance Technologies by the ME Network	Gifu University	completed	
Asset Management Technologies	Development of Local Government Support Systems Focusing on Risks of Serious Accidents	Ehime University		
Asset Management Technologies	Research and Development of Implementation in Society of Innovative Advanced Technology for Civil Infrastructure Maintenance	Nagasaki University		
Asset Management Technologies	Development of Bridge Maintenance Technologies for Subtropical Islands and Training Diagnostic Experts	University of the Ryukyus		

Introduction of Bridge Inspection Robotic Camera in Bangladesh developed by Sumitomo Mitsui Construction Co.,Ltd.

Feature: Safety operation, Excellent camera performance, Easy operation, Portability, and Wide range of applications



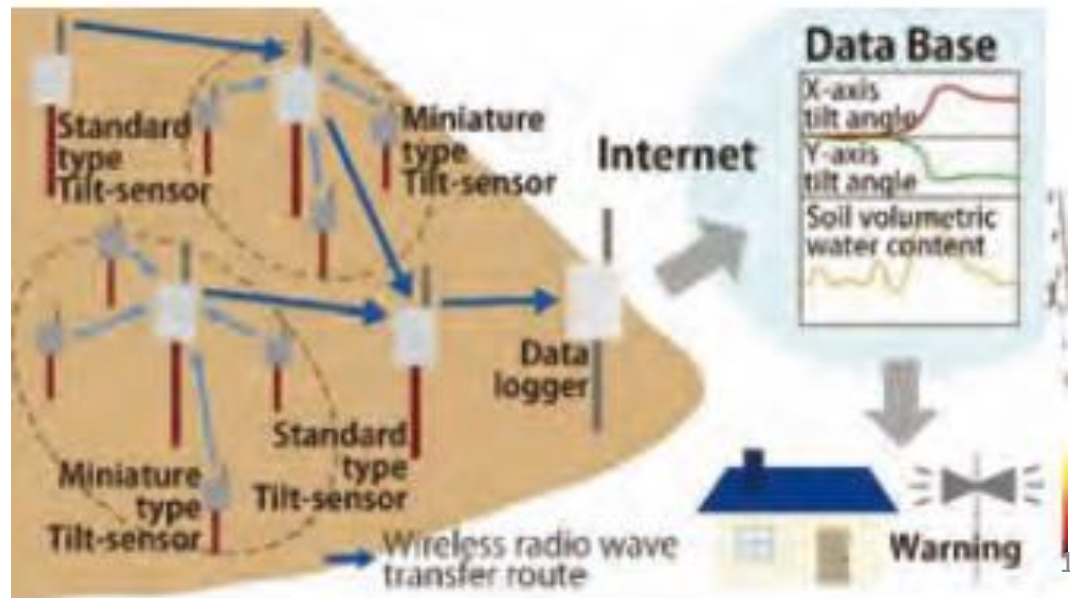
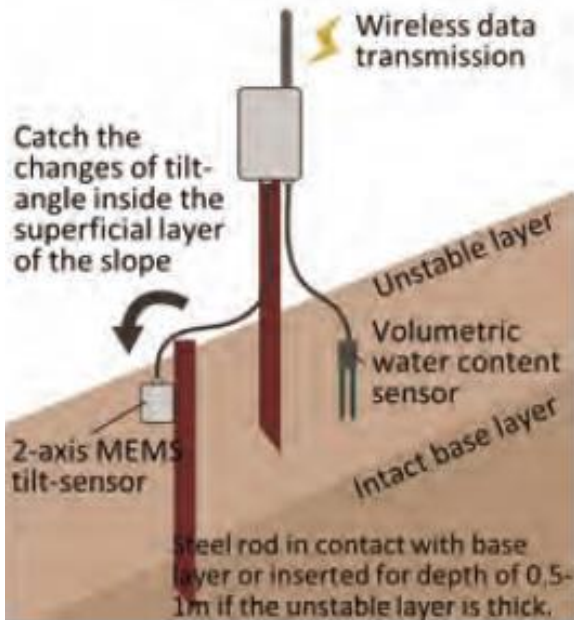
OJT in Japan



OJT in Bangladesh

Introduction of Early Warning Monitoring System of Slope Failure in Bhutan developed by Chuo Kaihatsu Corp.

Feature: Easy to install, Low cost of equipment and installation, and Sensitive to movement of whole area



Smartphone-based Road Condition Evaluation System in Kenya developed by JIP Techno Science Corporation.

Feature: Detect road surface damage simply and inexpensively



Detection of Deterioration by Artificial Intelligence (AI)

- Mechanism**
- Detection of deterioration such as pothole by Computer Vision (Deep Learning)
 - Automatic classification of damage, structure, and repair

- Classification of Damage Categories**
- Damage: Linear cracking, alligator cracking, pothole
 - Structure: Manhole, grating (ditch cover), expansion joint
 - Repair section by resin filling: Linear/alligator cracking, patch



Deterioration Types	Recall	Precision
Linear crack	80%	58%
Manhole	97%	100%
Joint	97%	100%
Alligator crack	96%	75%
Patch	58%	67%



Cooperation with Gifu University in Zambia

The Bridge Maintenance Capacity Building Project in Zambia (Phase2)

Project beneficiaries: RDA(Road Development Agency)

Period: March 2019 to February 2023

Project goal: To improve bridge maintenance operations in RDA

Issue to be solved: Sustainable human resource development system in RDA



To establish a bridge maintenance center in University of Zambia under the support of Gifu University based on Academic Agreement between both Universities, as an organization of sustainable human resource development on bridge engineers

Academic Agreement between the Faculty of Engineering at Gifu University and the Graduate School of Engineering at University of Zambia (Jan. 30, 2019)

2019.02.28

The Faculty of Engineering at Gifu University and the Graduate School of Engineering at University of Zambia signed a faculty-level agreement on Wednesday, January 30, 2019. The signing ceremony was held that day with the presence of Professor Luke Evuta Mumba, Vice-Chancellor, Dr. Michael N. Mulenga, Dean of Graduate School of Engineering, and Mr. Kennedy Msusa, Administrative Assistant to the Vice Chancellor from University of Zambia. The signing ceremony was also attended by the following members from Gifu: Mr. Kanenawa, the Director for Team 1, Transportation and ICT Group, Infrastructure and Peacebuilding Department, and his team member Ms. Kumazawa, from Japan International Cooperation Agency (JICA), Dr. Fumiaki Suzuki, Executive Director for International Relations and Public Relations, Professor Toshiaki Murai, Dean of the Faculty of Engineering, Associate Professor Koji Kinoshita (Liaison for the University of Zambia), and Professor Emeritus Keitetsu Rokugo, from Gifu University.

The Faculty of Engineering at Gifu University has been seeking various ways to support University of Zambia in the Phase II of the Bridge Maintenance Capacity Building Project under JICA's leadership, which has led to this partnership agreement.



Source: http://www.eng.gifu-u.ac.jp/news_en/2019/02/28.html

Bridge Inspection by Drone

Target: 2 Bridges constructed by Japanese ODA (L/A) in Philippines

Activities: Bridge Inspection by Drone, Automatic Deterioration Extraction by AI, and Result Report by 3D-model with a photo of damage point

San Juanico Bridge



Steel Truss/Steel Girder Bridge
Length: 2000m (Main Truss: 416m)
Completed in 1972 by Yen Loan project
Inspection Issue : Difficult to conduct inspection of truss member and undersurface of girder above the sea level

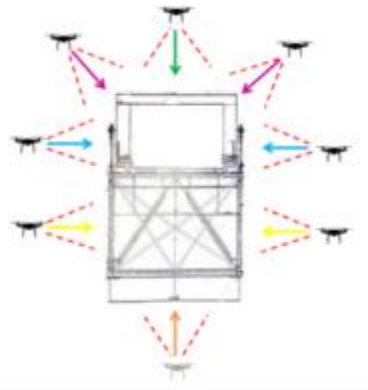
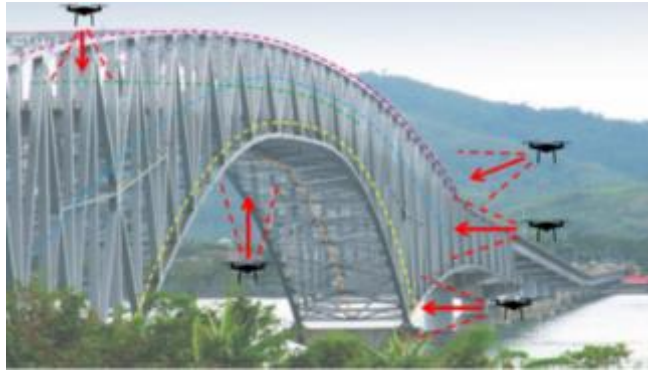
Agas Agas Bridge



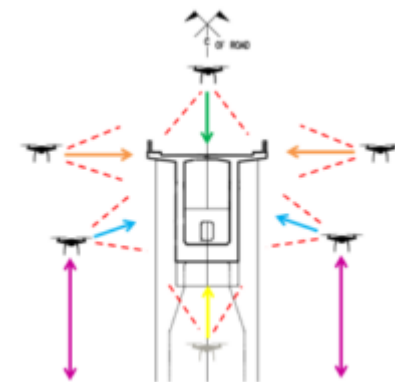
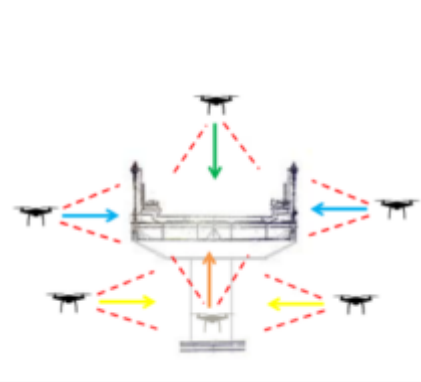
PC Box Girder Bridge
Length: 350m (100+150+100)
Height of Pier: 75m
Completed in 2009 by Yen Loan project
Inspection Issue : Difficult to conduct inspection of high pier and outside of box girder

Photographing Direction

San Juanico Bridge

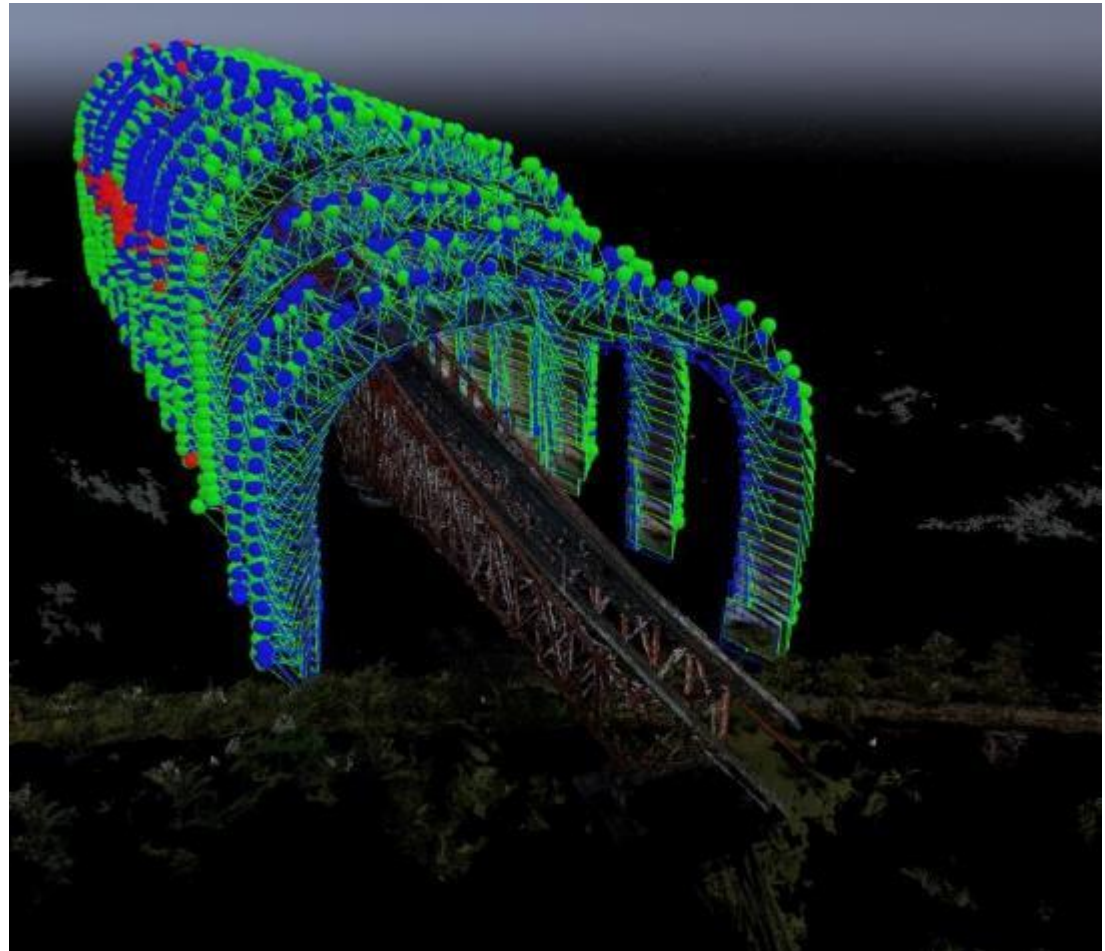
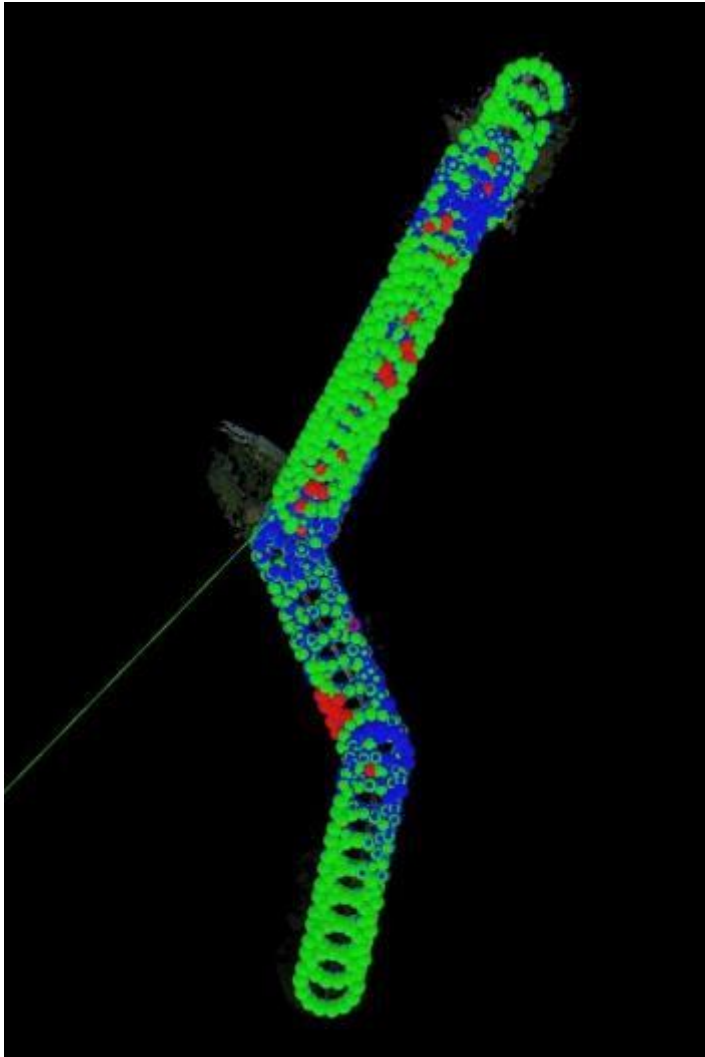


Agas Agas Bridge



Flight Plan

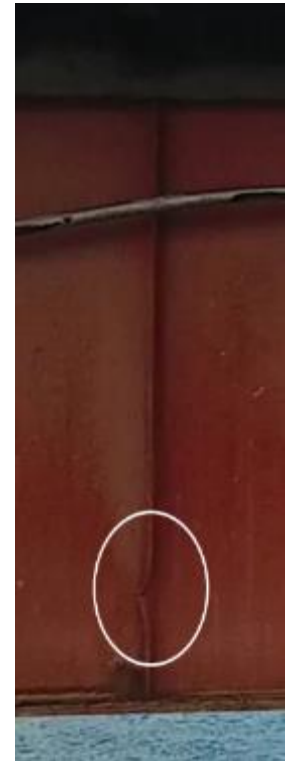
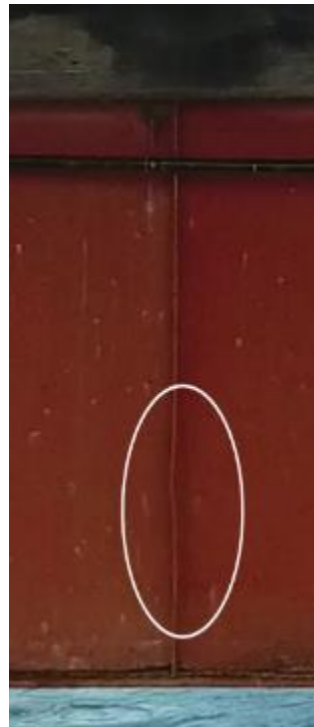
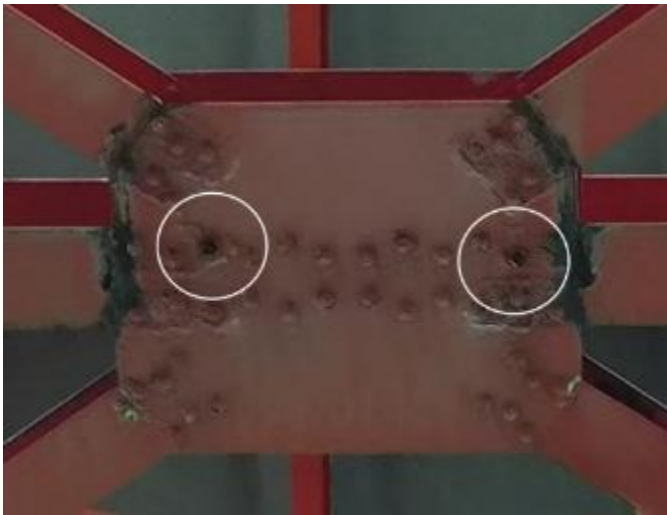
Sample of San Juanico Bridge



Deterioration

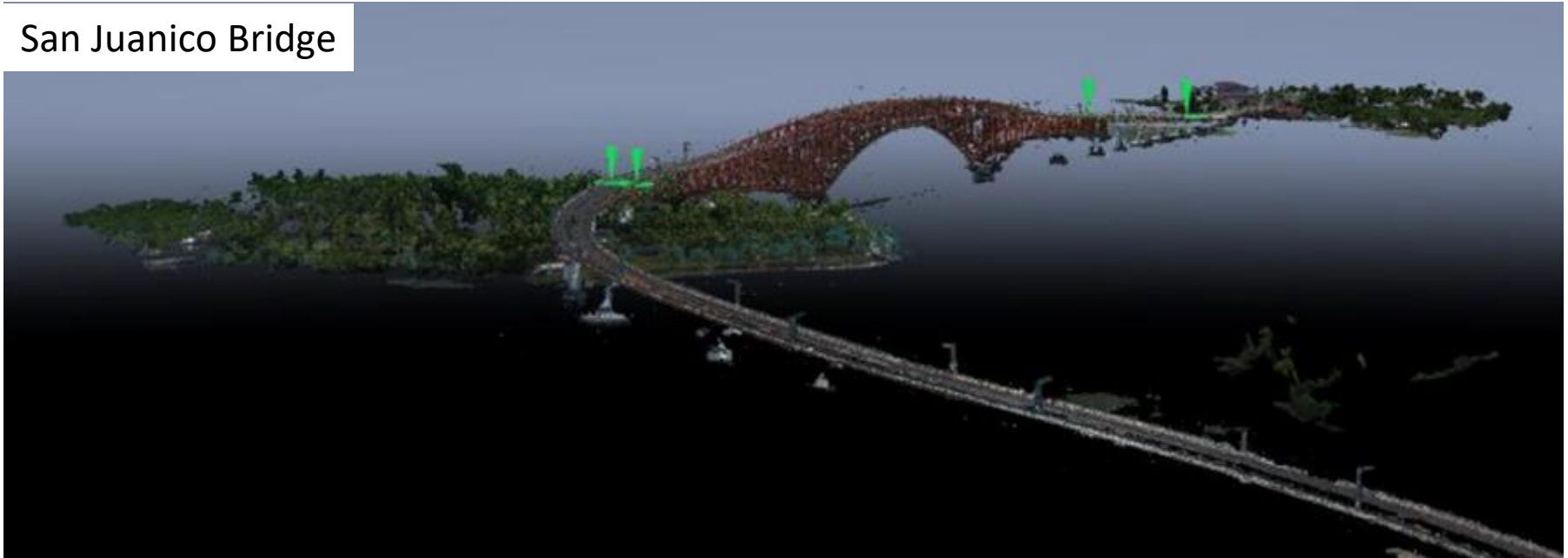
Sample of San Juanico Bridge

Missing/Loose Bolt, Paint Peeling, Reduction of Paint Thickness, Deformation/Buckling Member



3D model made by photographing data

San Juanico Bridge



Cracks Identified by AI



Outline of JICA Scholarship Program (Long Term Training)

JICA Scholarship Program

Purpose	To equip comprehensive and advanced knowledge and technics with participants in order to be Core human resource for Road Asset Management.
Period	More than 1 year, depend on each courses (Most of courses are no more than 2 years)
Implementing Agencies	Universities in Japan (Master or Ph.D. courses) Ex. Univ. of Tokyo, Hokkaido Univ., Nagasaki Univ., Kyoto Univ., Osaka Univ., Kanazawa Univ. etc...
Target Countries	Countries in which implement/implemented JICA's Technical Cooperation Project regarding Road/Bridge Asset Management
Language	English or Japanese

Long Term Training (JICA Scholarship Program)

Country	Research Theme	University	Commencement	Status
Lao PDR	Overloading Policy and Technology on Weigh Control	Hokkaido Univ.	Oct. 2017	Master Course from Apr. 2018
Lao PDR	Application of Lifetime Extending Maintenance Model for Steel Bridges	Nagasaki Univ.	Oct. 2017	Doctor Course from Apr. 2018
Lao PDR	Inspection and Assessment Method of Bridge Structures for Asset Management	Nagasaki Univ.	Oct. 2017	Doctor Course from Apr. 2018
Cambodia	Analysis & Utilization Method of Bridge Inspection Data	Univ. of Tokyo	Apr. 2018	Master Course from Apr. 2018
Philippines	Development of Bridge Management System	Kanazawa Univ.	Apr. 2019	Master Course from Apr. 2019
Philippines	Assessment on Implementation of Department Order Amended Policy Guidelines on the Maintenance of National Roads and Bridges	Univ. of Ryukyus	Apr. 2019	Master Course from Apr. 2019
Mongolia	Asset Management Method for national road network development	Gifu Univ.	Apr. 2019	Master Course from Apr. 2019
Bangladesh	Condition Assessment of Aged Bridges and its Implication	Kanazawa Institute of Technology	Apr. 2019	Master Course from Apr. 2019
Egypt	Highway asset management, a systematic process aimed at efficient and cost-effective preservation and operation of highway assets	Nagasaki Univ.	Apr. 2019	Doctor Course from Apr. 2019

Next Batch: Entering in Apr. 2020

Target country: Myanmar, Bhutan, Pakistan, Kyrgyz, Kenya, and Ethiopia

Special Program on Road Asset Management for Participants of Long Term Training

Period: 5 Days, August 19 to August 23, 2019

Participants: 8 participants for Long Term Training on JICA Road Asset Management,
5 countries from Lao PDR, Cambodia, Mongolia, Bangladesh, and Egypt

Output

- To acquire practical knowledge and experience in line with the actual circumstances in their countries by understanding the current status and issues for maintenance of Japanese road assets
- To build a network contributive to the future activities between participants and the Japanese researchers and various related bodies

Program Contents

1) Lecture:

Introduction of Infrastructure Management in Japan,
How to Identify Deterioration Mechanism of Concrete Member from Inspection,
Human Resource Development on Road & Bridge Engineers in Gifu University

2) Study Tour:

N2U-BRIDG, E-MAC and Infrastructure Museum for Engineers' training facility,
Construction site utilizing advanced technologies for maintenance,
Bridge Inspection utilizing Advanced Technologies on Kakamigahara Bridge

Demonstration of Bridge Inspection utilizing Advanced Technologies



Fig. 1 Kekemigahara Bridge

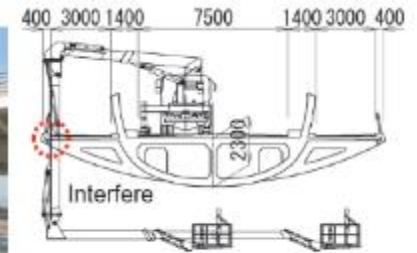
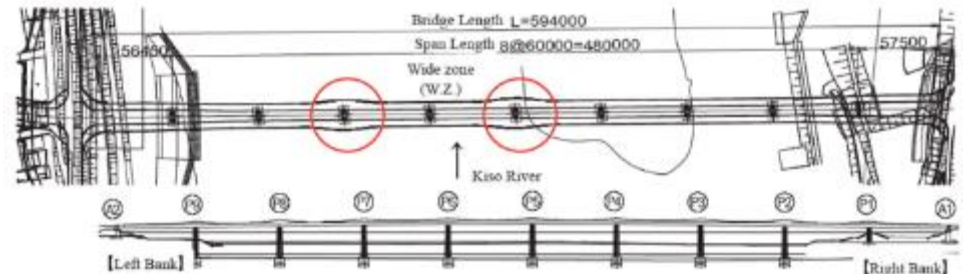


Fig. 2 Inspection with a general large bridge inspection vehicle



	No.1	No.2	No.3	No.4	No.5
Technology	Bridge Inspection Robotic Camera	Bridge Inspection Camera System	Drone Inspection	Internal Steel Materials Rupture Detection	Mobile Mapping System
Instrument					
Efficacy	Capable of measuring crack widths in locations where a person cannot easily go	Implementation of inspection on bridges where inspection is difficult (large bridges having large cross-sections, etc.)	Bridge inspection by Drone, Automatic deterioration extraction by AI, and Result report by 3D-model with a photo of damage point	Nondestructive inspection method for examining soundness of internal steel materials by porcelain sensing and data analysis by IoT	Laser-surveying device mounted on the vehicles for the measurement of 3D coordinate data and the acquisition of sequence of images of the road and its surroundings

Bridge Inspection
Robotic Camera by
Sumitomo Mitsui
Construction Co., Ltd.



Bridge Inspection Camera System

by Zivil, Ltd.



Drone Inspection by
Hitachi Systems, Ltd.



Internal Steel
Materials Rupture
Detection
(Nondestructive
inspection method)
by Konica Minolta,
Inc.

Inc.



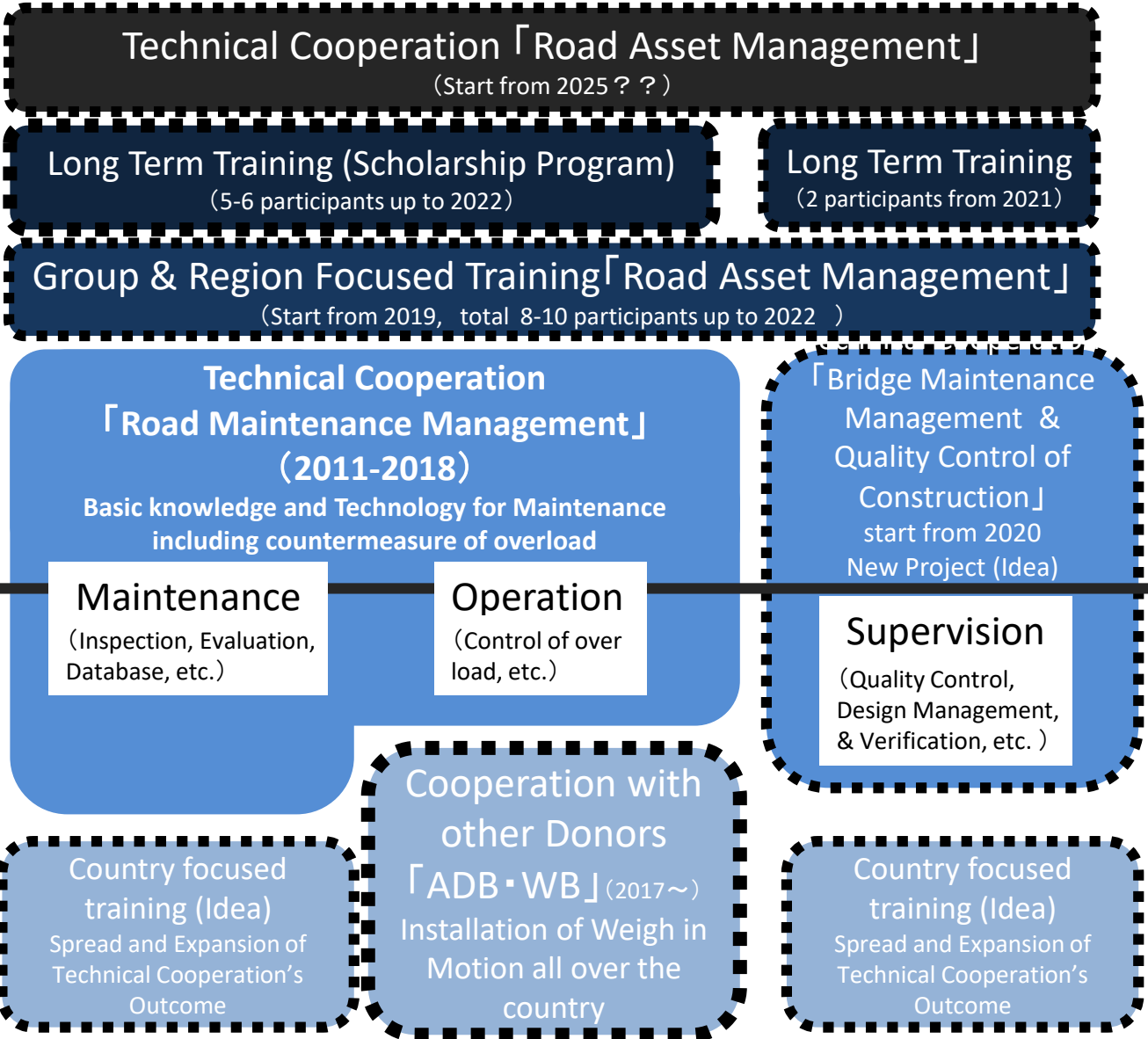
Mobile Mapping
System
(Measurement of
3D coordinate data)
by Pasco
Corporation



Program Approach for Dissemination of Road Asset Management

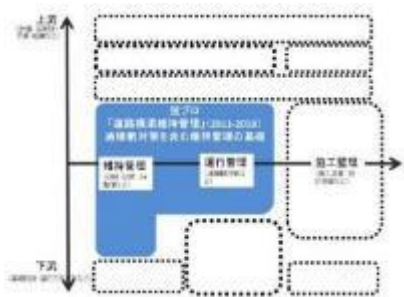
Upstream
(Policy, Plan, Budget, Organization, etc.)

Downstream
(Dissemination of basic knowledge and technology)

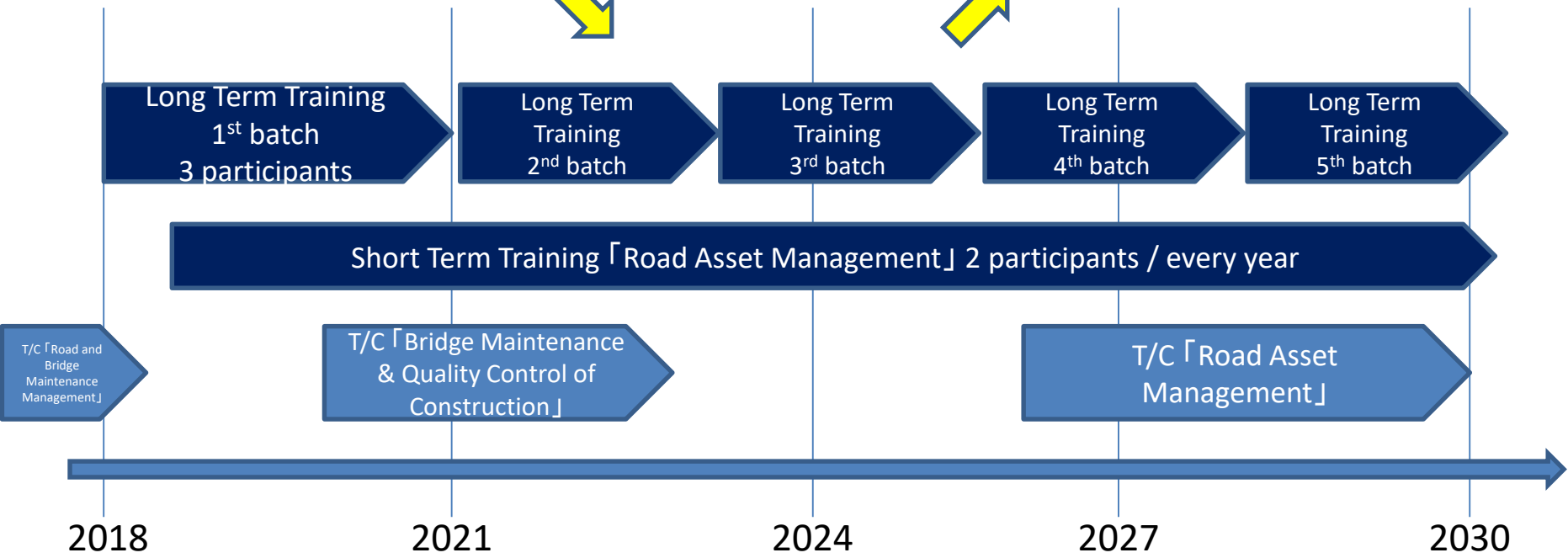
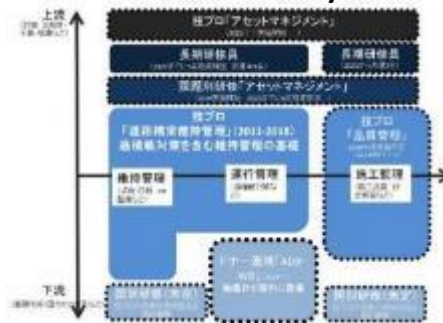


Program Approach for Dissemination of Road Asset Management

【Present Situation】



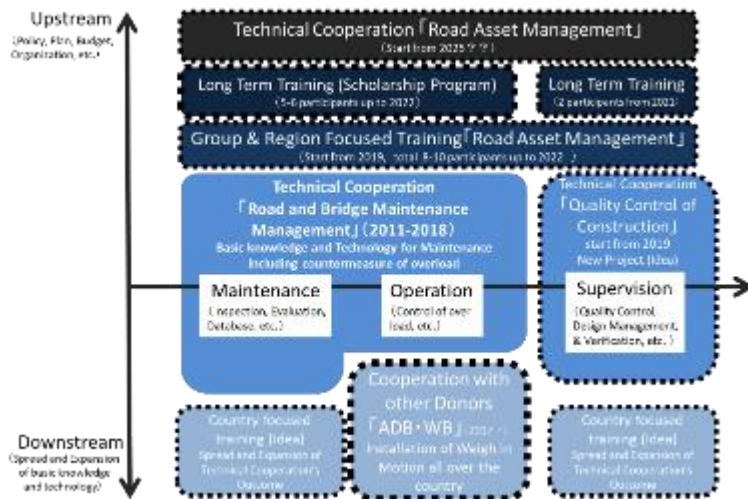
【2030 (After 12 years)】



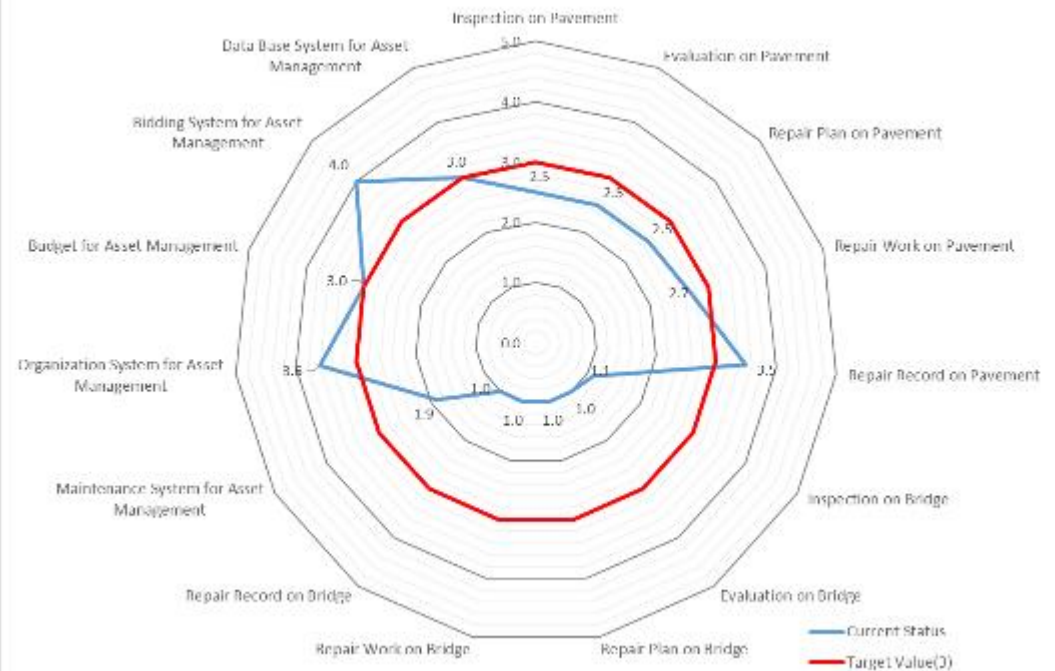
Activities of JICA Road Asset Management Platform

Development of program approach & Evaluation of status of achievement for dissemination of road asset management in each developing country

Program approach for dissemination of Road Asset management



Status of Achievement for Dissemination of Road Asset Management



Succession to Japan Society of Civil Engineers (JSCE)

JSCE and JICA concluded the Memorandums of Cooperation for Road Asset Management on 5th March, 2019 in order to success the results of cooperation with SIP.

Expected Activities

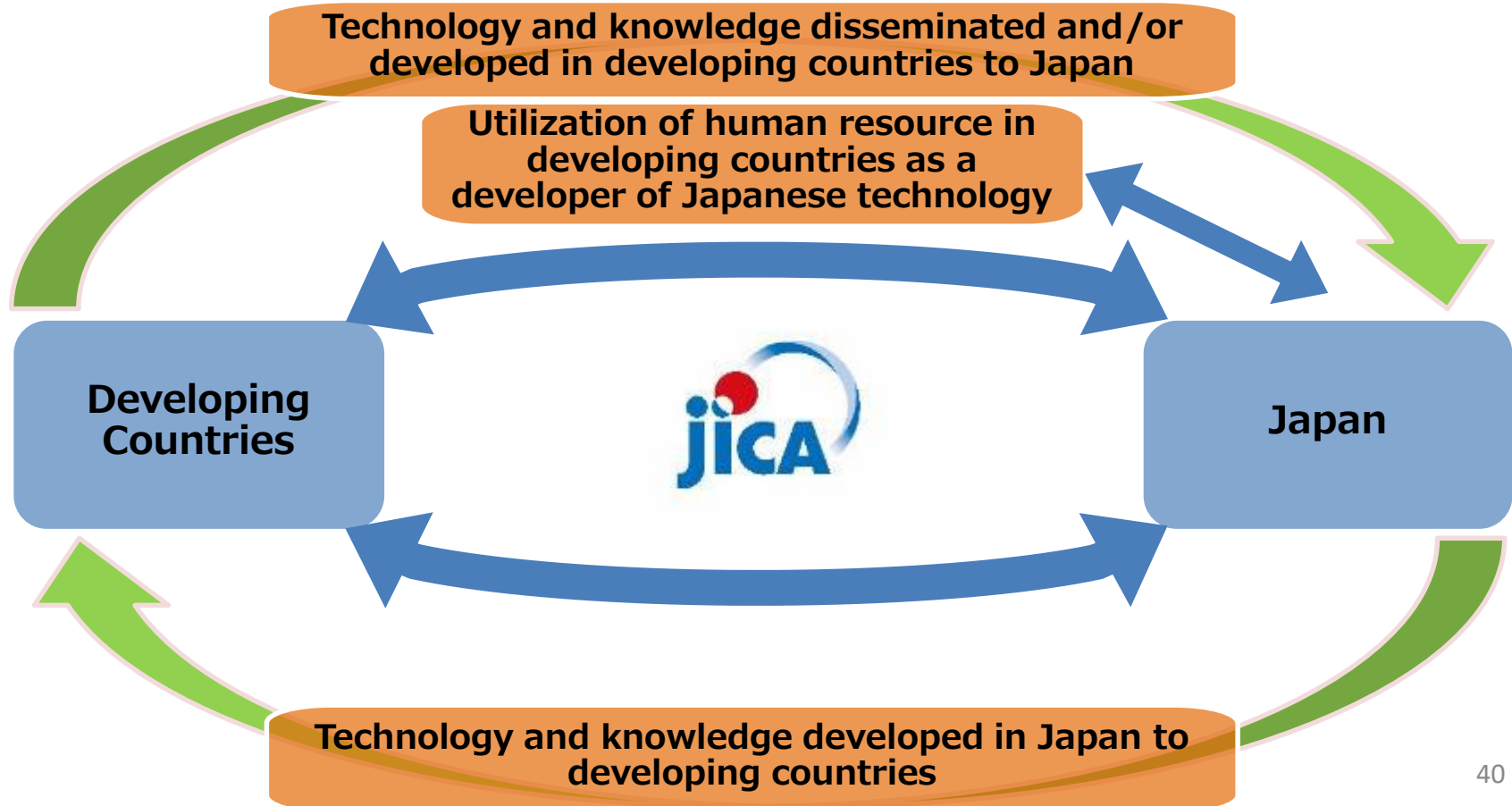
1. Utilization of Technologies which Private Company in JSCE possesses
2. JICA provides the Short Term Internship program in Private Company to JICA Long-Term Participants (Scholarship) for the human network in future.
3. JICA provides the opportunities of study of technical skill in developing countries (JICA projects) for Japanese young engineers.



Prospects for the future

Contribution to Development Issues in Japan

Reverse-Innovation (Co-Innovation)



Prospects for the future

From developing countries to Japan, and
From Japan to developing countries again

Matadi Bridge in Democratic Republic of the Congo



**Experience of Construction of Matadi
Bridge in Democratic Republic of the
Congo to Honshu-Shikoku Bridge**

Akashi-Kaikyo Bridge in Japan



(本州四国連絡高速道路株式会社ホームページより)

Fatih Sultan Mehmet Bridge (The
Second Bosphorus Bridge) in Turkey



**Experience of Construction of Honshu-Shikoku
Bridge in Japan to Fatih Sultan Mehmet Bridge
(The Second Bosphorus Bridge) in Turkey**

Thank you for your kind attention.