Republic of Ghana
Ministry of Roads and Highways

Project Completion Report (PCR)
for
the Project on Capacity Building
for Road and Bridge Management (CBRB)
in
the Republic of Ghana

February 2024

Japan International Cooperation Agency

Eight-Japan Engineering Consultants Inc.
CTI Engineering International Co., Ltd.
Metropolitan Expressway Co., Ltd.

IM
JR
24-004

February 2024

Basic Information of Ghana

■ Capital City: Accra ■ Language: English(Official), Many local languages are used depending on the tribe and region ■Area:239,640km2 ■Population: 32.83 Million (WB,2021), Growth rate 2.2 %(WB, 2019) ■GDP US77.594 billion (US2,280 per person）(WB,2021) ■ Economic Growth Rate:5.3%(Real)(WB2021) ■Specification trade items: Export; Gold, Oil, Cacao beans, Import; Auto, Equipment

■Religion; Christianity (Approx. 70%), Islam (Approx. 17%), other traditional religions, etc. (Ministry of Foreign Affairs of Japan, 2021) ■Price inflation: 9.9% (WB, 2021) ■Average life expectancy: 66 years (WHO2021)

■Climate of the target area: Southern; tropical rainforest climate, Accra; equatorial climate, temperature: 21-32° Celsius, ■Annual precipitation: 1500 mm in the north, 1500 mm or more in the west from the coast to the center, Rainy season: March-October, Dry Season: November-February

Abbreviations

（Alphabetical）

AASHTO	American Association of State Highway and Transportation Officials
AfCAP	The Africa Community Access Partnership
BMMS	Bridge Maintenance Management System
CESM	Civil Engineering Standard Method of Measurement
C/P	Counterpart
DCP	Dynamic Cone Penetrometer
DFID	The Department for International Development
DFR	Department of Feeder Roads
DUR	Department of Urban Roads
EU	European Union
FIDIC	International Federation of Consulting Engineers
GHA	Ghana Highway Authority
GIS	Geographic Information System
GIZ-GTZ	German Corporation for Technical Cooperation
GPS	Global Positioning System
HDM-4	Highway Design and Management-4
iRAP	International Road Assessment Programme
IRI	International Roughness Index
JICA	Japan International Cooperation 公社
KNUST	Kwame Nkrumah University of Science and Technology
M&E	Monitoring and Evaluation
MOT	Ministry of Transport
MRH	Ministry of Roads and Highways
P&P	Policy and Planning
PBC	Performance based Contract
PMMP	Pavement Maintenance Management Programme
PMMS	Pavement Management and Maintenance System
RAMS	Road Asset Management System
ReCAP	Research for Community Access Partnership
RF	Road Fund
RMM	Road Maintenance Manual
SNC	Modified Structural Number
TSIP	Transport Sector Improvement Project
WB	World Bank

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1 Basic Information of the Project

1.1 Country

The Republic of Ghana

1.2 Title of the Project

The Project on Capacity Building for Road and Bridge Management (CBRB)

1.3 Duration of the Project (Planned and Actual)

Stage-1：	February 2019 - January 2022
	(Extension of September 2021 to January 2022)
Stage-2：	March 2022 - November 2023
	(Extension of May 2023 to November 2023)
	November 2023 - December 2023
	(Extension of November 2023 to December 2023)
	December 2023 - February 2024
	(Extension of December 2023 to February 2024)
Total period:	**From February 2019 to February 2023**

1.4 Background of the Project

Ghana has a total estimated road network size of about 71,063 km, out of which 30% is paved and the remaining unpaved. Overland routes play a crucial role in the transportation of goods and services, with approximately 98% of Ghana's cargo relying on these routes. The road network is divided into three main categories based on the type of road and level of service namely: trunk roads (14,873 km), urban roads (14,000 km), and feeder roads (42,190 km).

The management of the road network is distributed among these agencies: the Ministry of Roads and Highways ("MRH"), Ghana Highway Authority ("GHA"), Department of Urban Roads ("DUR"), and Department of Feeder Roads ("DFR"). The MRH is primarily engaged in policymaking, monitoring, evaluation, and cross-sectoral coordination within the road sector. Meanwhile, the GHA, DUR, and DFR serve as implementing agencies, overseeing project execution, including activities like road construction and maintenance.

Over the years, road and bridge maintenance operations relied heavily on post-damage interventions, addressing issues only after they became apparent. Recent efforts to outsource maintenance activities, however, resulted in increased costs and delays, highlighting significant concerns in project management. To better manage constrained budgets, there was a pressing need to strengthen the capacity for road and bridge maintenance. Emphasizing a shift towards preventive maintenance is seen as a crucial strategy to address these challenges effectively.

1.5 Overall Goal and Project Purpose

Overall Goal

Roads including bridges in Ghana are appropriately maintained.

Project Purpose

Capacity of MRH and its Agencies in road and bridge management is improved.

1.6 Implementing Agency

Ministry of Roads and Highways (MRH)

Ghana Highway Authority (GHA)

Department of Urban Roads (DUR)

Department of Feeder Roads (DFR)

Koforidua Training Centre (KTC)

2 Results of the Project

2.1 Results of the Project

2.1.1 Input by the Japanese side (Planned and Actual)

Item: Japanese Experts

Achievement: The total Man/Month of Japanese experts is given in the next table.

Experts	In charge of	MM					
		Stage-1		Stage-2		Total	
		Actual	Plan	Actual	Plan	Actual	Plan
OGAWA Motoki	Team leader/Road maintenance management	8.67	8.46	5.50	5.00	14.17	13.46
ENDO Shigehito	Deputy team leader/Bridge maintenance management	7.22	9.82	3.00	3.00	10.22	12.82
NAKAJIMA Takashi	Road project management (1)	6.35	7.35	4.17	4.00	10.52	11.35
ONO Masazumi	Road project management (2)	8.78	8.87	4.03	3.00	12.81	11.87
OBA Yuki	Pavement inspection (1)	5.18	5.20	0.00	2.00	5.18	7.20
TOYOKAWA Yuki	Pavement inspection (2)	5.60	6.00	0.00	2.00	5.60	8.00
KONDO Ryuhei	Concrete bridge technology	3.85	3.85	0.00	0.00	3.85	3.85
TAKATSU Hikaru	Pavement inspection (2)	0.00	0.00	2.50	0.00	2.50	0.00
OGAWA Koichi	Concrete bridge technology	1.80	4.90	0.00	0.00	1.80	4.90
NAGATA Yoshifumi	Concrete bridge technology	0.00	0.00	0.67	0.00	0.67	0.00
ISHHARA Yosuke	Concrete bridge technology	0.00	0.00	1.00	0.00	1.00	0.00

OCHIAI Eiji	Steel bridge technology	5.55	4.10	2.25	2.00	7.80	6.10
KIMURA Shun	BMS	2.25	2.25	0.00	0.00	2.25	2.25
TAKEDA Yumiko	Monitoring Evaluation/ Operational Coordination	4.63	6.00	0.00	0.00	4.63	6.00
HIRAKAWA Takaaki	Monitoring Evaluation/ Operational Coordination	2.00	0.00	3.03	3.00	5.03	3.00
KAWASAKI Ikumasa	BMS	1.95	2.75	0.00	0.00	1.95	2.75
IEHISA Tomoe	BMS	0.00	0.00	1.43	0.00	1.43	0.00
SAITO Ryo	Road project management (4)	4.10	4.45	0.00	0.00	4.10	4.45
MUSHIAKE Yasuyuki	Road project management (3)	0.00	0.00	1.00	1.00	1.00	1.00
Total		68.43	76.25	28.58	25.00	97.01	101.25

Local Expenses

Local operation cost was mainly utilized for the following items. Local Operation inputs by Ghana side is shown in Attachment-4.

No.	Items	Stage	US $	No.	Items	Stage	US$
1	Transport Cost	Stage-1	45,400	5	Meeting, Workshop, JCC	Stage-1	2,900
		Stage-2	37,339			Stage-2	38,438
2	Communication Cost	Stage-1	4,400	6	Allowance and Accomodation	Stage-1	7,900
		Stage-2	482			Stage-2	80,643
3	Equipment Purchased	Stage-1	13,900	7	Public Relations	Stage-1	73,500
		Stage-2	10,394			Stage-2	207,900
4	Third Country Training	Stage-1	6,900	8	Others	Stage-1	1,500
		Stage-2	0			Stage-2	59,487

Equipment

Refer to Attachement-2

The Third Country Tour

The third country tour to South Africa and Kenya was conducted as follows.

1) Duration: From 1st September to 13th September 2019

2) Members:

1	Mr. Balika Edmond Mwinbamon	MRH
2	Mr. Gmachin Nachinjya	MRH
3	Mr. Apraku Ernest Akwasi	MRH
4	Mr. Kuttin-Mensah Andrew William Akwasi	GHA
5	Mr. Damalie Lovestone Kwame	GHA
6	Mr. Neequaye Roland Kotei	GHA
7	Mr. Arman Isaac Birikorang	DUR
8	Ms. Saani Nimatu Maltima	DUR
9	Mr. Ankrah Mac Richmond	DFR
10	Mr. Agyemang Frank Amofa	DFR
11	Dr. Afetornu Charles	KTC
12	Mr. Zakari Abdul Razak	MoF
13	Mr. Motoki Ogawa	CBRB

3) Schedule

1-Sep.	Move to Johannesburg

2-Sep.	Visit Ministry of Public Works (MoPW)
3-Sep.	Visit Council for Scientific and Industrial Research (CSIR)
4-Sep.	Visit South African National Road Agency (SANRAL)
5-Sep.	Internal Discussion
6-Sep.	Internal Discussion /Preparation for training in Kenya
7-Sep.	Move to Nairobi
8-Sep.	OFF
9-Sep.	Visit Ministry of Transport and Infrastructure, Housing, Urban Development (MoTIHUD) Join meeting with JICA Project in Kenya
10-Sep.	Join Final Seminar of JICA Project in Kenya
11-Sep.	Visit Kenya National Highway Authority (KeNHA) Site Visit (New Weight Bridge System, PBC maintenance)
12-Sep.	Visit Kenya Roads Board (KRB)
13-Sep.	Move to Accra

Japan Tour

The Japan tour was conducted as follows:

1) Duration: From 13th October 2022 to 29th October 2022

2) Member:

	Name	Sex	Organization	Position
1	Alfretina Adjetey-Chirawura	F	MRH	Senior Programme Officer
2	Joseph Makata Narhiorh	M	MRH	Quantity Surveyor(M&E)
3	Eullan Asiedu	F	GHA	Principal Quantity Surveyor
4	Lovestone K. Damalie	M	GHA	Principal Engineer (Bridge)
5	Isaac Brown	M	GHA	Engineer (Bridge)
6	Constance Paintsil (No attendance)	F	GHA	Senior Engineer (Rd. Mtce)
7	Samuel Egyir	M	GHA	Senior Engineer (Materials)
8	Bernard Owusu	M	GHA	Principal Engineer
9	Nimatu Saani	F	DUR	Engineer (Bridge)
10	Jeffry Darkwah	M	DUR	Engineer (Rd. Mtce)
11	Shadrach Nartey	M	DUR	Senior Engineer
12	Richmond Ankrah	M	DFR	GIS manager
13	Don F. Kuubeterzie	M	DFR	Chief Engineer
14	Nathan N. Odjhao	M	DFR	Engineer （Bridge Mtce）
15	Eric Forson	M	DFR	Senior Engineer
16	Frank Amofa-Agyemang	M	DFR	Engineer, maintenance
17	Daniel Asare	M	KTC	Dept. Director

3) Schedule

Date			Schedule	Contents	Stay
2022/10/13	Thu		Arrival to Japan (Tokyo Narita Int. Airport)		Tokyo
2022/10/14	Fri		Move to Kobe, JICA KANSAI		Kobe
2022/10/15	Sat		Documentation		Kobe
2022/10/16	Sun		Documentation		Kobe
2022/10/17	Mon	AM	TOA Road Corporation	Use of Cold Mix Asphalt -its mechanizim and use in other African countries	Kobe
		PM	MLIT Kinki Regional Bureau	MLIT “Latest technologies in	

					road/bridge maintenance in Japan"	
	2022/10/18	Tue	AM	NEXCO West Japan	Road and bridge maintenance system in motorways	Kobe
			PM	Ibukiyama Driveway	Example of road maintenance through application of PPP	
	2022/10/19	Wed	AM	Kyoto University - Matsushima Lab.	Kyoto Univ. "Pavement deterioration prediction using road inspection data"	Tokyo
			PM	Move to Tokyo		
	2022/10/20	Thu	AM	JIP Corporation (iDRIMS)	Examples of application of iDRIMS and AI processing in Japan	Tokyo
			PM	Tokyo University Prof. Oguchi	Contens of Intersection planning and design guideline in Japan, and policy of updating technical documents	
	2022/10/21	Fri	AM	Metropolitan Expressway	Bridge inspection technology and its practice in urban areas	Tokyo
			PM			
	2022/10/22	Sat		Documentation		Tokyo
	2022/10/23	Sun		Documentation		Tokyo
	2022/10/24	Mon	AM	Chofu City	Road/Bridge maintenance system in local government in Japan	Tokyo
			PM	Hachioji City	Estblishment of Roadside Station "Hachioji Takiyama" - Case Study of Local Development (Procedures, Budget, Legislation, Effectiveness)	

	2022/10/25	Tue	AM	Move to Okayama		Kobe
			PM	ISE OHASHI BRIDGE	Observation of Suspension Bridge	
	2022/10/26	Wed	AM	Move to Matsuyama		Matsuyama
			PM	AIKI Corporation	Production of cold mix asphalt and usage	
	2022/10/27	Thu	AM	Move to KOBE		Kobe
			PM	AKASHI KAIKYO BRIDGE	Observation of Suspension Bridge	
	2022/10/28	Fri	AM	Wrap up of the Training		Kobe
			PM	Presentation		
	2022/10/29	Sat		Depart Japan		

2.1.2 Input by the Ghanaian side (Planned and Actual)

Item	Achievement	
JCC Member	Following 15 governmental officials have been appointed as the JCC members.	
	MRH	1 Chief Director (Project Director) 1 Director of Policy and Planning (Project Manager)
	GHA	1 Road Maintenance Manager (Deputy Project Manager) 1 Director of Bridges 1 Director of Contracts 1 Director of Road Maintenance 1 Director of Planning 1 Director of Survey and Design
	DUR	1 Principal Engineer, Bridges (Deputy Project Manager) 1 Deputy Director of Maintenance 1 Greater Accra Regional Director
	DFR	1 Principal Engineer, Bridges (Deputy Project Manager) 1 Deputy Director of Planning 1 Deputy Director of Maintenance
	MoF	1 Officer
Counterparts	15 officials were assigned to the Project as the Counterparts in May 2019. As of February 2021, following 20 counterparts were confirmed for the Project activities.	
	MRH (2)	1 Principal Engineer 1 Quantity Surveyor/M&E
	GHA (6)	1 Principal Engineer (Road Design) 1 Principal Engineer (Bridge) 1 Engineer (Bridge) 1 Engineer (Material) 1 Senior Engineer (Road) 1 Principal Engineer (for Road Design)
	DUR (6)	1 Principal Engineer (Road Design) 1 Regional Maintenance Engineer, GAR, 1 Engineer (Road) 1 Assistant Engineer (Bridge) 1 Assistant Engineer (Road) 1 Principal Engineer (for Road Design)
	DFR	1 Senior Engineer (Road Design)

	(5) KTC(1)	1 Principal Engineer Development (Bridge) 1 Maintenance Engineer (Bridge) 1 Head of GIS/IT 1 Senior Engineer (for Road Design) 1 Director

2.1.3 Activities (Planned and Actual)

Details are given in Annex 1-7.

2.2 Achievements of the Project

2.2.1 Outputs and indicators

[Output 1: Enhance the capacity of road planning and design]

Indicator 1: The updated road design guide is officially approved by MRH

The Ministry of Roads and Highways (MRH) has officially certified the Road Design Guide (RDG), which was developed with substantial contributions from the C/P, responsible for road planning and design. It is imperative for agencies to continue advancing the quality of the RDG, acknowledging the ongoing potential for improvement, even though certification has been released by the MRH.

Indicator 2: The level of understanding of seminar participants on the road design guide exceeds 70% on average.

Seminar participants constitutes the C/P from each agency involved in the Project and representatives (Regional Directors/Managers) of GHA, DUR, and DFR from all 16 regions across the country. Participants specializing in road design (Output 1), road inspection (Output 2), and bridge inspection (Output 3) underwent assessment based on their proficiency and understanding of the Road Design Guide. Furthermore, a detailed analysis was conducted using the results obtained from the survey instrument (questionnaire)

The technical seminars focused on participants involved in road design (Output 1) from each agency, along with regional representatives from all 16 regions in Ghana. The evaluation of participants' comprehension of the Road Design Guide (RDG) employs a five-point scale, considering specific question items. The assessment, as shown in Table 1 below, gauges perspectives on these questions, and the average rating is computed through the calculation of each question.

The target value was established at 70.0% in consultation with the C/P, and the average ratings from Q1 to Q8 were 76.1% and 81.5% in the 1st and 2nd technical seminars respectively. The ratings successfully exceeded the target value, and the rating results of the 2nd seminar exceeded the 1st seminar.

Table 1: Level of understanding of seminar participants on the road design guide

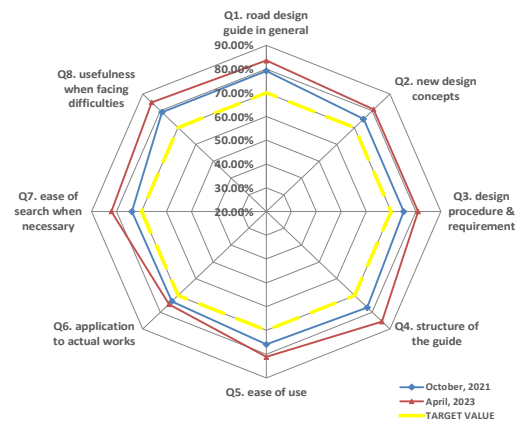
	1st Seminar (Oct 2021) 49 respondents	2nd Seminar (Apr 2023) 51 respondents
Q1. Road Design Guide updated in general	79.2 %	83.5 %
Q2. New design concepts added to the Road	75.1 %	80.8 %

Q3. Road design procedures and requirements	75.1 %	80.8 %
Q4. Structure of the Road Design Guide	77.1 %	85.5 %
Q5. Ease of use of the Road Design Guide	75.9 %	81.2 %
Q6. Application to actual road planning and design works	73.5 %	75.2 %
Q7. Ease of search with the Road Design Guide when necessary to refer	73.9 %	82.1 %
Q8. Usefulness of the Road Design Guide when facing with difficulties	79.2 %	85.0 %
Rating on average (Q1 – Q8)	76.1 %	81.5 %

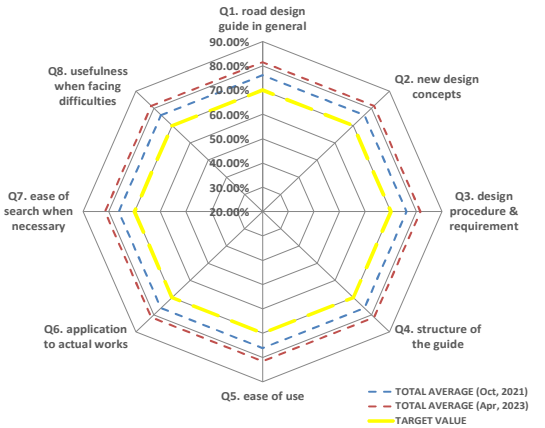
Source: Results of the Questionnaire Survey (Form 1) of the Monitoring System

The questionnaire outcome indicated that participants in the second seminar demonstrated a higher understanding of the structure outlined in the Road Design Guide (RDG) (Q4: 85.5%) and acknowledged the usefulness of RDG when faced with challenges (Q8: 85.0%). The rating results exceeded the target value of 70.0%, reaching a higher percentage of 85.0%.

On the other hand, despite Q6 exceeding the target value, it recorded the lowest percentage (75.2%) among the eight question items. The results indicate a demand for additional knowledge regarding the application of the Road Design Guide (RDG) to practical road planning and design tasks. As a future undertaking, therefore, it is indispensable to indicate how to apply the RDG to actual road planning and design works according to the users' needs.



History of actual ratings (solid line) in October 2021 and April 2023



History of average ratings (dotted line) in October 2021 and April 2023

Figure 1: Level of understanding of seminar participants on the road design guide for the 1st and 2nd Technical Seminars (actual and average rating results)

The feedback provided by seminar participants includes the following points:

- There is a need to promote the widespread adoption of the RDG across all agencies.

- Emphasizing the importance of regularly reviewing the RDG, especially when there is a shift in trends after several years of use.
- Suggesting the inclusion of road pavement designs and standards within the RDG.
- Appreciating the thorough review of the RDG, highlighting its effectiveness in bridging gaps between old guidelines and current situations.
- Proposing the possibility of organizing certain topics within the RDG into distinct volumes, such as RDG Volume I, and so forth.

[Output 2: Enhance the road maintenance capacity]

Indicator 1: RMM is officially approved by MRH

The Ministry of Roads and Highways (MRH) has officially certified the Road Maintenance Manual (RMM), which was developed with substantial contributions from the C/P, responsible for road maintenance. It is imperative for agencies to continue advancing the quality of the RMM, acknowledging the ongoing potential for improvement, even though certification has been released by the MRH.

Indicator 2: The level of understanding of seminar participants on the road maintenance exceeds 70% on average.

The technical seminars focused on participants involved in road maintenance (Output 2) from each agency, along with regional representatives from all 16 regions in Ghana. The evaluation of participants' comprehension of the Road Maintenance (RMM) employs a five-point scale, considering specific question items. The assessment, as shown in Table 2 below, gauges perspectives on these questions, and the average rating is computed through the calculation of each question.

The target value, established in consultation with the C/P, was set at 70.0%. The average ratings from Q1 to Q9 were 78.2% and 79.0% in the 1st and 2nd technical seminars, respectively. These ratings not only exceeded the target value but also indicated a slight improvement in the rating results of the 2nd seminar compared to the 1st seminar.

The results from the questionnaire indicated that participants in the 2nd seminar possess a higher understanding of the planning process in the RMM (Q1: 85.2%) and road condition survey (Q2: 88.4%). The rating outcome not only exceed the target value of 70.0% but also represents a high percentage of 85.0%.

On the other hand, Q3 recorded the lowest percentage at 66.3% out of the nine question items, marking a decrease from the 1st seminar results. This indicates the essential need for comprehensive knowledge on effectively utilizing iDRIMS, as emphasized by participants' responses to this particular item.

Table2: Level of understanding of seminar participants on the road maintenance

	1st Seminar (Oct 2021) 47 respondents	2nd Seminar (Apr 2023) 50 respondents
Q1. Planning skills and knowledge of road maintenance works	82.6 %	85.2 %
Q2. Road condition survey	86.4 %	88.4 %

Q3. How to utilize the iDRIMS	72.3 %	66.3 %
Q4. Inspection works for road maintenance	80.9 %	84.9 %
Q5. How to apply roughness index to road maintenance works	77.5 %	76.4 %
Q6. Detection method of road defects	78.3 %	78.4 %
Q7. Cost estimation method for road maintenance works	75.3 %	76.7 %
Q8. Road threshold of construction methods	73.2 %	75.1 %
Q9. Paving methods, such as cold asphalt, chip and spray, etc.	77.0 %	77.1 %
Rating on average (Q1 – Q9)	78.2 %	79.0 %

Source: Results of the Questionnaire Survey (Form 2) of the Monitoring System

The survey results reveal a high level of comprehension among seminar participants regarding the planning process (Q1: 85.2%) and road condition survey (Q2: 88.4%), with ratings exceeding 85%. However, Q3 received the lowest percentage (66.3%) among the nine question items, showing a decline from the first seminar. This highlights the participants' need for knowledge on effectively utilizing iDRIMS. To enhance future outcomes, it is crucial to provide guidance on iDRIMS utilization, aiming to improve questionnaire results.

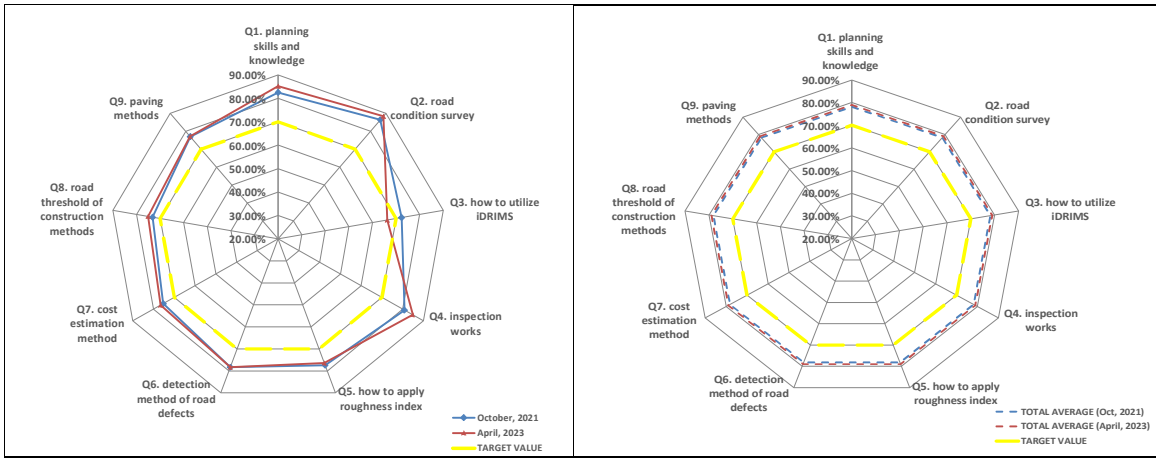


Figure 2: Level of understanding of seminar participants on the road maintenance for the 1st and 2nd Technical Seminars (actual and average rating results)

Additionally, seminar participants expressed concerns, including the availability and costs of Excel patch materials. There is also a recognized need for training engineers and relevant technical staff on utilizing iDRIMS for detecting road roughness and distresses. These insights underscore the importance of addressing these specific areas for improvement in upcoming initiatives.

[Output 3: Enhance the bridge maintenance capacity]

Indicator 1: The Bridge Maintenance and Management Manual is officially approved by MRH

The Bridge Maintenance and Management Manual, which encompasses the Bridge Inspection Manual, has been created through significant contributions from the C/P responsible for bridge maintenance and has received official certification from MRH. Despite the issuance of the certification letter from MRH, each agency is encouraged to persist in its endeavors to enhance the quality of the manuals further, recognizing that there is still room for improvement.

The Bridge Maintenance and Management Manual, including Bridge Inspection Manual, has been developed with the tremendous contributions of the C/P responsible for the bridge maintenance, and it was officially certified by the MRH. Although the certification letter of the MRH was released, each agency shall continue their efforts to grade up the quality of the Manuals because it is a still room to be improved.

Indicator 2: 2/2/3 bridge specialists of GHA, DUR, and DFR become able to utilize the BMS

Table 3 displays the seven (7) bridge specialists from each agency. Based on their feedback, the following comments were provided regarding their satisfaction with the BMS.

Seven (7) bridge specialists of each agency are as shown in the Table 3 below. According to them, the following comments were made from the perspective of their satisfaction with the BMS.

Table 3: Bridge specialists of GHA, DUR, and DFR

No.	Agency	Name
1	GHA	Mr. Lovestone Damalie
2		Mr. Isaac Brown
3	DUR	Ms. Nimatu Saani
4		Mr. Jeffrey Darkwah
5	DFR	Mr. Don Kuubeterzie
6		Mr. Nathan Odjao
7		Mr. Richmond Ankrah

The current frequency of BMS usage among bridge specialists is relatively low, as the BMS has recently been developed, and remote connections to the BMS from agency offices have only just commenced. In terms of BMS utilization, when seven (7) bridge specialists were surveyed about their ability to use the BMS through the W/S, 4 out of 7 specialists indicated that they could. Additionally, comments from Output-3 C/P are as follows:

- The performance is satisfactory, considering that all the functions of the BMS are operational and responsive.
- The BMS is still in its developmental stage and requires updates to become an effective tool for bridge management.
- While the BMS proves to be a useful tool for bridge management, it needs full development to align with the expectations and demands of the agencies.

The bridge specialists are not using the BMS so frequently as of this moment because the BMS has been developed and the agency offices have just started remote connection to the BMS. Regarding the BMS usage, however, when seven (7) bridge specialists were asked if they were

able to use the BMS through the W/S, 4 out of 7 specialists responded "yes." Also, the comments from the Output-3 C/P are as follows.

- It is satisfactory, considering all the functions of the BMS working and responding appropriately.
- The BMS is in its developmental stage and needs to update to be an effective tool in the management of bridges.
- The BMS is a useful tool for bridge management, but it has to be fully developed to meet the expectations and demands of the agencies.

The completion of the BMS marks a milestone, yet regular utilization is essential for its optimization. In order to enhance the BMS, bridge specialists must systematically inspect and identify any challenges or flaws encountered during its use. Crucially, they should persist in refining the system to achieve a user-friendly BMS in the future.

Indicator 3: The level of understanding of seminar participants on the bridge maintenance exceeds 70% on average.

The technical seminars focused on participants engaged in bridge maintenance (Output 3) from each agency, along with representatives from 16 regions. The aim of this indicator is to evaluate the participants' comprehension of bridge maintenance using a five-point scale. Table 4 presents the assessment based on various perspectives, and the average rating was determined by calculating responses to each question.

In consultation with the C/P, a target value of 70.0% was set. The average ratings for questions Q1 to Q10 were 73.8% and 76.6% during the 1st and 2nd technical seminars, respectively. These ratings exceeded the target value, with the 2nd seminar outperforming the 1st seminar in terms of ratings.

The target participants in the technical seminars are involved in bridge maintenance (Output 3) from each agency and the representatives from 16 regions. This indicator is to assess the level of understanding of seminar participants on the bridge maintenance with five-point scale. As shown in Table 4 below, it was assessed from the perspectives of the following items, and the rating on average was extracted through the calculation of each question.

The target value was established at 70.0% in consultation with the C/P, and the average ratings from Q1 to Q10 were 73.8% and 76.6% in the 1st and 2nd technical seminars respectively. The ratings successfully went beyond the target value, and the rating result of the 2nd seminar exceeded the one of the 1st seminar.

Table 4: Level of understanding of seminar participants on the bridge maintenance

	1st Seminar (Oct 2021) 49 respondents	2nd Seminar (Apr 2023) 47 respondents
Q1. Visual inspection planning	78.8 %	83.4 %
Q2. Procedure of visual inspection	78.4 %	83.8 %
Q3. How to identify the parts to be checked for bridge structure	81.2 %	80.0 %
Q4. Assessment skills of actual bridge situations	76.7 %	75.3 %

Q5. Recordkeeping skills of bridge inspection results	76.3 %	78.7 %
Q6. Basic concept of BMS	71.8 %	74.2 %
Q7. How to input the inspection results into the BMS	68.6 %	69.8 %
Q8. How to prioritize bridge maintenance works through the BMS	70.6 %	74.2 %
Q9. How to develop the bridge maintenance plan	69.4 %	72.9 %
Q10. Cost estimation of bridge maintenance works	66.5 %	69.3 %
Rating on average (Q1 – Q10)	73.8 %	6.6 %

Source: Results of the Questionnaire Survey (Form 3) of the Monitoring System

The results from the questionnaire suggest a high level of comprehension among seminar participants regarding visual inspection planning (Q1: 83.4%), the procedure of visual inspection (Q2: 83.8%), and the identification of parts to be checked for bridge structure (Q3: 80.0%). The ratings for these aspects exceeded 80%.

However, Q7 and Q10 fell below the target value, indicating a need for participants to enhance their understanding of inputting inspection results into the BMS (Q7: 69.8%). Additionally, there is a requirement for a more profound understanding of the cost estimation associated with bridge maintenance works (Q10: 69.3%).

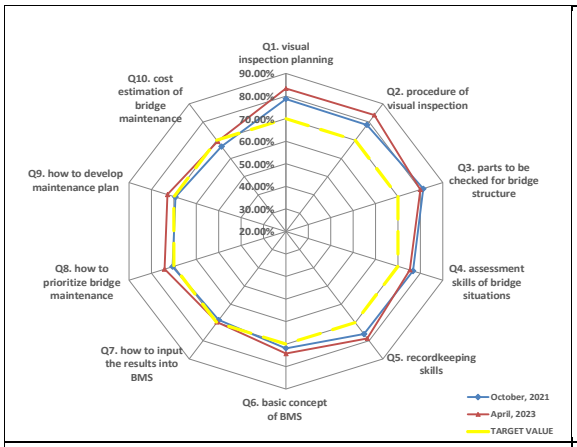
To address these gaps, it is essential to provide those responsible for bridge maintenance with instructions on effectively utilizing the BMS, as information related to bridge maintenance plans and cost estimation is derived from this system.

This becomes particularly crucial for future endeavours in the field of bridge maintenance.

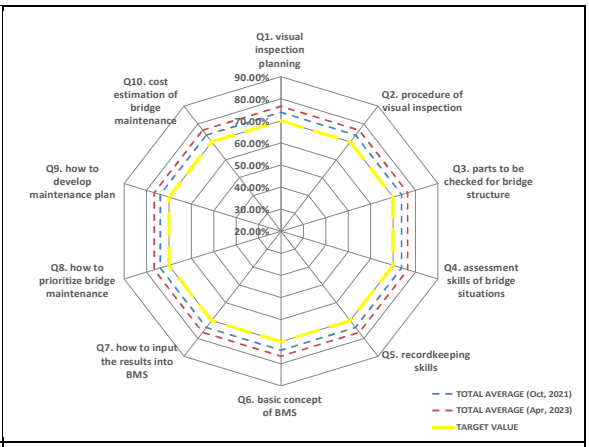
The questionnaire result indicates that the seminar participants highly understand the visual inspection planning (Q1: 83.4%), procedure of visual inspection (Q2: 83.8%), and how to identify the parts to be checked for bridge structure (Q3:

80.0%). The rating results went over 80%.

However, Q7 and Q10 were below the target value. They need to deepen their understanding of how to input the inspection results into the BMS (Q7: 69.8%). Moreover, it is required for them to intensely understand the cost estimation of bridge maintenance works (Q10: 69.3%). As the future undertakings, therefore, it is crucial to provide the persons responsible for bridge maintenance with the instructions on how to use the BMS because the information of bridge maintenance plan and cost estimation is extracted from the BMS.



History of actual ratings (solid line) in October 2021 and April 2023



History of average ratings (dotted line) in October 2021 and April 2023

Figure 3: Level of understanding of seminar participants on the bridge maintenance for the 1st and 2nd Technical Seminars (actual and average rating results)

2.2.2 Project Purpose and indicators: Improve the capacity for road and bridge management.

Indicator 1: More than 82/445/500 projects are planned and designed with the updated road design guide under the supervision of GHA, DUR, and DFR respectively.

Initially, the road design C/P personnel projected estimates for 2022, taking into account data from the past few years as outlined in Table 5. The target values for 2022 were set at 82 (GHA) / 445 (DUR) / 500 (DFR) projects, planned or designed using the checklist provided in the updated Road Design Guide (RDG). However, in 2022, the figures were collected without utilizing the checklist, following the conventional approach, as the RDG was not finalized by the end of that year.

The outcomes for 2022 reveal that the DUR figure exceeded the target value with 626 projects, while GHA (60 projects) and DFR (103 projects) fell short of their respective target values. In the case of DFR, insufficient approvals hindered the preparation of road designs in 2022. Some contractors with approved or signed contracts faced delays in mobilizing to sites due to payment delays and unavoidable factors such as adverse weather conditions.

Conversely, the number of projects designed by GHA did not meet the 2022 target, as only 60 projects received approval for road design during the year. Consequently, there is a strong anticipation that the figures in 2023 will surpass the 2022 targets. Additionally, the checklist provided in the updated RDG will be employed to tally the figures in 2023 and beyond.

Table 5: Number of road projects planned and designed

Agency	FY2020	FY2021	FY2022	
			Achievements	Target values
GHA	115	75	60	82
DUR	529	510	626	445
DFR	606	48*	103	500

*Due to the pandemic outbreak of COVID-19, DFR was not able to make sufficient number of agreements with contractors for the road projects planned or designed in 2021. That is the main reason why the number was drastically declined from 606 to 48.

Source: Road Design Division of GHA, DUR, and DFR

Despite the project's scheduled completion in May 2023, each agency is mandated to enumerate the road projects designed from 2023 onwards using the checklist (see Figure 4) provided in the updated RDG. However, since the project count relies on the number of checklists completed by RDG users, it is anticipated that the figures in 2023 will be lower than those in 2020-2022, reflecting the time required for the preparation and submission of checklists to be fulfilled.

Although this Project will be completed in May 2023, it is required for each agency to count the number of road projects designed from 2023 by using the checklist (refer to the Figure 4) attached to the updated RDG. However, as the number of projects is counted based on the number of checklists fulfilled by the RDG users, it is expected that the figures in 2023 will be lower than the ones in 2020-2022 due to the preparation and submission of checklists to be fulfilled.

Name : **Position :**

Agency: GHA / DUR / DFR **Date:**

No.	Tick when used	Items to be checked	Tick if you feel: Ease of use	Tick if you feel: Usefulness
1	☐	Road Class (Chapter 2)	☐ Good ☐ Fair ☐ Poor	☐ Good ☐ Fair ☐ Poor
2	☐	Road Design and Corridor Selection (Chapter 3)	☐ Good ☐ Fair ☐ Poor	☐ Good ☐ Fair ☐ Poor
3	☐	Road Survey Procedure and Requirements (Chapter 4)	☐ Good ☐ Fair ☐ Poor	☐ Good ☐ Fair ☐ Poor
4	☐	Road Safety, Design Control and Criteria (Chapter 5)	☐ Good ☐ Fair ☐ Poor	☐ Good ☐ Fair ☐ Poor
5	☐	Cross Section Elements (Chapter 6)	☐ Good ☐ Fair ☐ Poor	☐ Good ☐ Fair ☐ Poor
6	☐	Elements of Design (Chapter 7)	☐ Good ☐ Fair ☐ Poor	☐ Good ☐ Fair ☐ Poor
7	☐	At-Grade Intersection (Chapter 8)	☐ Good ☐ Fair ☐ Poor	☐ Good ☐ Fair ☐ Poor
8	☐	Grade Separated Intersections (Chapter 9)	☐ Good ☐ Fair ☐ Poor	☐ Good ☐ Fair ☐ Poor
9	☐	Traffic Calming Measures (Chapter 10)	☐ Good ☐ Fair ☐ Poor	☐ Good ☐ Fair ☐ Poor
10	☐	Accessories to Road (Chapter 11)	☐ Good ☐ Fair ☐ Poor	☐ Good ☐ Fair ☐ Poor
11	☐	Road Furniture (Chapter 12)	☐ Good ☐ Fair ☐ Poor	☐ Good ☐ Fair ☐ Poor
12	☐	Drainage (Chapter 13)	☐ Good ☐ Fair ☐ Poor	☐ Good ☐ Fair ☐ Poor

Figure 4: Checklist attached to the Road Design Guide (RDG)

Note 1: As the above items are optional (multiple answers allowed), you do not have to put your tick ☑ in all the checking columns. Also, when using above chapter(s), please fulfill the columns for "ease of use" and "usefulness" of the same chapter(s).

Note 2: Since the Chapter 1 is the "Introduction", the item is not included in the checking columns.

Indicator 2: The length of roads inspected by using the RMM reaches more than 1,529/587/4,246 km in Eastern Region, 1,294/1,280/3,387 km in Central Region, and 357/8,036/1,320 km in Greater Accra Region under the supervision of GHA, DUR, and DFR respectively.

The road maintenance C/P team estimated targets for 2022 by considering historical data outlined in Table 6.

The three agencies (GHA/DUR/DFR) established target values for road inspection in 2022: 1,529/587/4,246 km in the Eastern Region, 1,294/1,280/3,387 km in the Central Region, and 357/8,036/1,320 km in the Greater Accra Region, respectively.

The figures for the three agencies in 2022 remained unchanged from previous years due to challenges in determining the lengths (km) of road inspection, attributed to the following reasons:

- GHA, despite using GPS for measuring trunk road networks, could not conduct road inspections in 2022 due to their software system update and financial constraints.
- DUR's ongoing road inventory and condition survey prevented the provision of road inspection results for 2022 at that moment. However, the results will be updated upon completion of their assignment.
- DFR, typically conducting in-house road inspections, faced challenges in performing adequate inspections in 2022 due to financial difficulties and a lack of vehicular logistics.

C/P responsible for road maintenance estimated the targets in 2022 in consideration of the data for the past few years as indicated in the Table 6. The three Agencies (GHA/DUR/DFR) have established the target values of road inspection in 2022 at 1,529/587/4,246 km in Eastern Region, 1,294/1,280/3,387 km in Central Region, and 357/8,036/1,320 km in Greater Accra Region respectively.

The figures of three agencies in 2022 were the same as previous years because they could not figure out the lengths (km) of road inspection for the following reasons.

- Although the GHA undertook the measurement of trunk road networks by using the GPS, they were not able to carry out the road inspection in 2022 due to the ongoing measurement works to update their software system as well as the financial constraints.
- As the road inventory and condition survey for DUR is ongoingly carried out, they could not provide the road inspection results in 2022 at this moment. However, the inspection results will be updated when their assignment is complete.
- Although the DFR usually carries out in-house road inspection, they could not perform adequate inspections in 2022 due to their financial difficulties and lack of vehicular logistics.

The GHA, DUR, and DFR have opted to adopt the 2021 figures as the baseline for 2022, anticipating that the road inspection results for 2022 will closely align with those of 2021. Consequently, while it cannot be asserted that the indicators have been met, the three Agencies will monitor and adjust the figures as necessary.

Additionally, the lengths of road inspections will be determined using the road inspection form (refer to Figure 5) attached to the revised RMM1 from 2023 onward. In conclusion, there is an expectation of augmenting the lengths (km) of inspected roads by employing the iDRIMS through cost-effective operations in accordance with the RMM.

Finally, each agency has set target values for the Overall Goal in 2025, three years after the Project's conclusion, with the lengths of road inspections across the country established at 15,548/28,480/48,357 km by GHA/DUR/DFR respectively.

Therefore, the GHA, DUR, and DFR have decided to adopt the figures in 2021 as the ones in 2022, assuming that the road inspection results in 2022 will be close to the ones in 2021 as of this moment.

From that reason, it could not be said that the indicators are achieved, but the figures shall be followed up and modified by the three Agencies as needed.

Moreover, the lengths of road inspection shall be extracted by using the road inspection form (refer to the Figure 5) attached to the revised RMM[1] in 2023 and after.

In conclusion, it is expected to increase the lengths (km) of roads inspected by using the iDRIMS with low-cost operations according to the RMM[1] from now on.

Lastly, each agency has established the lengths of road inspected across the country at 15,548/28,480/48,357 km by GHA/DUR/DFR respectively as target values of the Overall Goal in 2025 which will be achieved three years after the termination of the Project.

Table 6: Length (km) of road inspected

Agency	Region	FY2020	FY2021	FY2022		FY2025
				By December	Target values	
GHA	Eastern	1,511.4	1,438.6	1,438.6	1,529.4	1,587.0
	Central	1,205.0	1,180.7	1,180.7	1,294.0	1,302.5
	Greater Accra	383.3	427.6	427.6	357.1	471.7
	Whole country	14,080.5	14,094.3	14,094.3	13,895.1	15,548.2
DUR	Eastern	573.8	573.8	573.8	587.4	587.4
	Central	1,249.9	1,249.9	1,249.9	1,279.6	1,279.6
	Greater Accra	7,850.3	7,850.3	7,850.3	8,036.4	13,777.3
	Whole country	16,808.7	16,808.7	16,808.7	17,207.1	28,480.1
DFR	Eastern	4,121.3	3,787.2	3,787.2	4,245.5	4,200.5
	Central	3,205.0	3,290.2	3,290.2	3,387.1	3,579.8
	Greater Accra	1,291.1	246.0	246.0	1,320.1	2,681.7
	Whole country	42,045.6	48,356.8	48,356.8	48,254.6	48,356.8

Source: Road Maintenance Division of GHA, DUR, and DFR

Concerning the Means of Verification (MOV) for the length (km) of inspected roads, the Project revises the inspection form by building upon existing templates. Starting in 2023, road inspections will be conducted using the updated Road Maintenance Manual (RMM).

The Contracting/Implementing Agencies then quantify the length (km) of inspected roads by utilizing the modified inspection form.

To facilitate this process, a new column labeled "Use of RMM (highlighted part)" is incorporated on the right side of the GHA form.

[1] RMM is composed of technical, institutional, and supervision parts, and the Project has revised the technical part only, i.e., (1) Road Maintenance Activities Manual and (2) Road Condition Survey Manual

This adjustment aims to streamline the preparation of the revised form, ensuring simplicity and sustainability even beyond the Project's conclusion.

In terms of the Means of Verification (MOV) on the length (km) of roads inspected, the Project prepares the revised inspection form based on existing ones. As road inspection is carried out based on revised RMM from 2023, the C/P Agencies measure the length (km) of roads inspected by using the modified inspection form. By referring to the following GHA form, a column of "Use of RMM (highlighted part)" is added at the end of right side. In this way, the revised form will be prepared as simple as possible in consideration of the sustainability after the termination of the Project.

Road No.	Road Name	Link No.	Link from	Link to	Segment No.	Section No.	From km	To km	IRI value	Use of RMM*

* iDRIMS and road condition survey in the RMM are the main parts for the road inspection.

Figure 5: Road Inspection Form attached to the Road Condition Survey Manual in the RMM

[Indicator 3: 30 bridges prioritized by the Project are inspected according to the Bridge Maintenance and Management Manual]

This indicator can be considered accomplished. The Project prioritized 30 bridges, and an extra 11 bridges are detailed in Table 7. All 41 bridges have undergone inspection since 2020, adhering to the guidelines set forth in both the drafts of the Bridge Maintenance and Management Manual and the Bridge Inspection Manual.

It could be said that this indicator was achieved. 30 bridges prioritized by the Project and additional 11 bridges are as indicated in the Table 7. Those 41 bridges have been inspected since 2020 according to the drafts of the Bridge Maintenance and Management Manual as well as the Bridge Inspection Manual.

Table 7: List of bridges prioritized by the Project

No.	Bridge Name	Agency	Region
1	Saglemi Bridge	GHA	Greater Accra
2	Bridge at Achimota	DUR	
3	Kwame Nkrumah Circle		
4	Lavender Hill Bridge		
5	Papase -Domfase	DFR	
6	Adomi Bridge	GHA	Eastern Region
7	Frankadua - Afode	DFR	
8	Mankesim Bridge	GHA	Central Region
9	Iture (UCC)		
10	Kasoa Bypass Bridge	DUR	
11	Krispol City Overpass		
12	Elmina Prestressed Bridge		
13	Baifikrom - Akotogua	DFR	
14	Adidome - Juapong	DFR	Volta Region
15	Western Region	DUR	Western Region
16	Asaasetre - Banso - Kwesikrom	DFR	
17	Anyinam	GHA	Ashanti

18	Sofoline	DUR	Region
19	Asafo Interchange		
20	Kaase Bridge		
21	Nkawkaw Truss Bridge/River Pra	DFR	
22	Kyekyease-Nyamebekyere- Nkontomire		
23	Nasia 1	GHA	Northern Region
24	Yapei		
25	Buipe		
26	Fufulso		
27	Northerh Region	DUR	
28	Jimle	DFR	
29	Pwalugu 1	GHA	Upper East
30	Navrongo - Mirigu - Kandiga	DFR	
31	Bridge at Achimota_Railway	DUR	Greater Accra
32	Aklikpa Bridge 1	GHA	Eastern Region
33	Aklikpa Bridge 2		
34	Aklikpa Bridge 3		
35	Kasoa Interchange	DUR	Central Region
36	Baifikrom Bridge	GHA	
37	Okye Bridge at Eshiro	DFR	
38	Sogakope Bridge	GHA	Volta Region
39	Ewusijoe Bridge	GHA	Western Region
40	Amazuri Bridge at Alabokazo		
41	Nabogo Bridge	GHA	Upper East

Source: Bridge Division of GHA, DUR, and DFR

2.2.3 Overall Goal and indicators: Appropriately maintain the roads including bridges in Ghana.

[Indicator 1: The length of roads inspected by using the road maintenance manual (RMM) reaches more than 15,548/28,480/48,357 km across the country under the supervision of GHA, DUR, and DFR respectively]

Refer to the explanation on the length of road inspection in "Project Purpose and indicators" as mentioned above.

[Indicator 2: The number of bridges inspected by using the Bridge Maintenance and Management Manual* attains to more than 200/103/98 across the country under the supervision of GHA, DUR, and DFR respectively]

Each agency strives to reach the specified number of bridge inspections nationwide by 2025, three years post-Project completion, as outlined in Table 8. Targeting annual bridge inspections of 200 (GHA), 103 (DUR), and 98 (DFR) in 2025, they have set these goals with reference to the Bridge Maintenance and Management Manual, including the Inspection Manual.

However, the bridge inspection figures for 2022 fell short, recording 30 (GHA), 17 (DUR), and 35 (DFR), failing to meet the intermediate targets. To address this, additional efforts are necessary to attain the 2025 objectives. The Contracting/Implementing Partners cite reasons such as understaffing and budget constraints as the primary factors contributing to the non-achievement of intermediate targets in 2022.

Each agency aims to achieve the number of bridge inspections across the country by 2025, three years after the termination of the Project, as shown in Table 8. They have established the number of bridge inspection annually at 200 (GHA) / 103 (DUR) / 98 (DFR) across the country as targets in 2025 with reference to the Bridge Maintenance and Management Manual, including the Inspection Manual as well.

As the numbers of bridge inspection in 2022 were 30 (GHA) / 17 (DUR) / 35 (DFR) which did not attain to the intermediate targets in 2022, further efforts to achieve the targets in 2025 are required. According to the C/P, the intermediate targets in 2022 were not achieved due to the understaffing situation and budget shortage, etc. as the major reasons.

Table 8: Number of bridges inspected annually across the country

Agency	FY2021	FY2022		FY2025
		Actual figures by December	Intermediate targets	
GHA	52	30*1	80	200
DUR	14	17*2	103	103
DFR	16	35	39	98

*1: GHA was not able to attain to the intermediate target (80 in 2022 as shown in the table above) due to the understaffing situation (insufficiency of bridge engineers) and budget shortage, etc.

*2: As DUR tries to secure the budget for bridge inspection in 2023 and after, there are prospects that the number of bridge inspection will gradually come close to the target value, i.e., 103, by the end of 2025. Source: Bridge Division of GHA, DUR, and DFR

[Indicator 3: The Road Maintenance Plans are formulated by GHA, DUR, and DFR respectively according to the RMM]

Each agency (GHA, DUR, and DFR) will formulate its own Road Maintenance Plan. The pertinent organizations in each region will then disseminate the information and data from these plans to the respective line agencies. Following the consolidation of this data and information, each agency will compile and summarize the Road Maintenance Plan, as illustrated in the accompanying figure.

Road Maintenance Plan will be prepared by each agency (GHA, DUR, and DFR). Responsible organizations in each region share the information and data of road maintenance plan with the line agencies. After the aggregation of the data and information, each agency summarizes the Road Maintenance Plan as shown in the Figure 6.

Figure 6: Formulation Flow of Road Maintenance Plans

The Road Maintenance Plan is expected to be developed in alignment with the RMM, and the indicator will be considered fulfilled once the elements outlined in the Plan are incorporated, as indicated in Table 9.

The Road Maintenance Plan is supposed to be prepared according to the RMM, and the indicator will be achieved when the following items (Table 9) are reflected to the Plan.

Table 9: Check Sheet for the Road Maintenance Plan (DRAFT)

Name :		
Agency: GHA / DUR / DFR		Date:
No.	Confirmation column	Items to be checked
1	Yes / NO	Does the Plan include the PDCA cycle of inspection, planning, implementation, and evaluation?
2	Yes / NO	Does the Plan include the results of road roughness?
3	Yes / NO	Does the Plan include the degree of damage to the roads?
4	Yes / NO	Does the Plan prioritize the road projects?
5	Yes / NO	Does the Plan select an appropriate repair method/countermeasure?
6	Yes / NO	Does the Plan indicate the estimated maintenance costs?
7	Yes / NO	Does the Plan include the issues and challenges of roads, the opinions from the construction sites, etc.?

For bridges, the Bridge Management System (BMS) encompasses essential information and data vital for maintenance plans, including bridge inventories, repair histories, defect details, estimated costs, and priorities for bridge maintenance. Consequently, it is anticipated that the BMS will significantly contribute to the formulation of bridge maintenance plans going forward.

In case of bridges, the BMS includes the information and data necessary for maintenance plans, such as bridge inventories, repair records, defect information, estimated costs, priorities of bridge maintenance, etc. Thus, it is expected that BMS is able to greatly contribute to the preparation for bridge maintenance plan from now on.

2.3 History of PDM Modification

2.3.1 Transition of PDM0 to PDM2-1

In order to practically and effectively utilize the PDM, the target groups, project period, narrative summary, indicators, and means of verification were modified as shown in the Table 10-1, 10-2, and 10-3 below.

Table 10-1: Modification of the PDM (PDM0 to PDM1: December 2020)

Components of the PDM		Corrections
Narrative Summary	**Output 1**	Following discussions with C/P, it was identified that certain design issues were not addressed in the existing road design guide. Road engineers tend to address problems based on their individual experiences, leading to inconsistencies with road design standards in Ghana. Updating the road design guide is crucial for enhancing road project outcomes in Ghana. As a result, Output 1 is revised as follows: **Before**: The road and bridge project management capacity of MRH and its Agencies is enhanced. **After**: The capacity on road planning and design of MRH and its Agencies is enhanced.
	Activities Activity 1-1	The Activities (from 1-1 to 1-4) are amended according to the revised Output 1 as mentioned above. **Before**: Identify the current status, issues and challenges of road and bridge project management. **After**: Identify the current status, issues and challenges of road planning and design.
	Activity 1-2	**Before**: Agree with the Counterpart (C/P) the basic concept and major items of trainings related to the road and bridge project management. **After**: Agree with the Counterpart (C/P) the basic concept and major items of trainings related to road planning and design.
	Activity 1-3	**Before**: Prepare a handbook related road and bridge project management. **After**: Prepare an updated road design manual of the existing GHA road design guide.
	Activity 1-4	**Before**: Conduct lectures with the Handbook and apply the Handbook to the project management works. **After**: Conduct lectures and seminars with the updated road design manual and apply it on an actual project management works.
Indicators	**Project Purpose** Indicator 1	Based on the modification of the Output 1, the Handbook is changed into road design manual. **Before**: X% of projects are monitored and evaluated with the Handbook. **After**: X% of projects are planned and designed with the updated road design manual.
	Output 1 Indicator 1-1	Due to the change in the Output 1, the corresponding indicators are also adjusted as follows. **Before**: The Handbook is officially approved by MRH. **After**: The updated road design manual is officially approved by MRH.
	Indicator 1-2	**Before**: The Handbook is understood by X% of seminar participants. **After**: The road design manual is understood by X% of seminar participants.

Means of Verification (MOV)	**Output 1** MOV 1-1	As MRH is able to endorse the updated manual under its jurisdiction, the updated manual, *per se*, is regarded as MOV. **Before**: Official endorsement by MRH **After**: The updated road design manual

Table 10-2: Modification of the PDM (PDM1 to PDM2: October 2021)

Components of the PDM		Corrections
Basic Info.	**Target Group**	The capacity of Koforidua Training Centre (KTC) for road and bridge management is also enhanced through the project activities. Thus, KTC is added to the Target Group.
Narrative Summary	**Activities** Activity 1-3&1-4	"Road design manual" is modified to "road design guide" because of using the official title. * The indicator 1-1 is also modified from "manual" to "guide."
	Activity 2-4, 2-5, 2-7	PMMP is amended to the iDRIMS supported by JICA because PMMP is transferred to TSIP. **Before**: PMMP **After**: iDRIMS (User Manual)
	Activity 3-3, 3-4, 3-5, and 3-10	The following titles are changed as follows because of using the official title. **Before**:(1) Bridge Maintenance Manual (2) BMS Manual **After**: (1) Bridge Maintenance and Management Manual (2) BMS User Manual
Indicators	**Overall Goal** Indicator 1	As the Project focuses on road inspection, the road maintenance is modified to the road inspection. "Manuals" is specified into "road maintenance manual (RMM)." Also, target values are established separately by each agency, *i.e.*, GHA, DUR, and DFR. The indicator modified: The length of roads inspected by using the road maintenance manual (RMM) reaches more than XX/YY/ZZ km across the country under the supervision of GHA, DUR, and DFR respectively.
	Indicator 2	As the Project focuses on bridge inspection, the preventive maintenance of bridges is modified to the bridge inspection. Also, the target values are established separately by each agency in the same way as mentioned above. The indicator modified: The number of bridges inspected by using the Bridge Maintenance and Management Manual attains to more than XX/YY/ZZ across the country under the supervision of GHA, DUR, and DFR respectively.

	Indicator 3	A new indicator for road maintenance plan is established to conduce to the road maintenance through the results of road inspection. **The indicator modified:** The Road Maintenance Plans are formulated by GHA, DUR, and DFR respectively according to the RMM.
	Project Purpose Indicator 1	Target values of the projects planned and designed are established separately by each agency with the actual number, not the percentage (%). **The indicator modified:** More than 82/445/500 projects are planned and designed with the updated road design guide under the supervision of GHA, DUR, and DFR respectively.
	Indicator 2 Indicator 3	This indicator is changed from road maintenance works into the length of road inspection in Eastern, Central, and Greater Accra Regions. **The indicator modified:** The length of roads inspected by using the RMM reaches more than 1,529/587/4,246 km in Eastern Region, 1,294/1,280/3,387 km in Central Region, and 357/8,036/1,320 km in Greater Accra Region under the supervision of GHA, DUR, and DFR respectively. As the Project focuses on the bridge inspection, the selection of repair works for bridges is modified to the inspection of 30 bridges. **The indicator modified:** 30 bridges prioritized by the Project are inspected according to the Bridge Maintenance and Management Manual.
	Output 1 Indicator 1-2	The expression is amended as shown below. Also, the target value is established in 70% in consultation with C/P. **The indicator modified:** The level of understanding of seminar participants on the road design guide exceeds 70% on average.
	Output 2 Indicator 2-2	In consistency with the Output 1 and Output 3, the Project confirms how much seminar participants understand the road maintenance on behalf of the rate of increase in road maintenance works. **The indicator modified:** The level of understanding of seminar participants on the road maintenance exceeds 70% on average. As the Project focuses on road inspection, the quality of the road maintenance works is deleted.

	Output 3 Indicator 3-2	Since it is difficult to confirm whether or not BMS is functional, this indicator is modified as "bridge specialists utilize the BMS." **The indicator modified:** 2/2/3 bridge specialists of GHA, DUR, and DFR become able to utilize the BMS.
	Indicator 3-3	Data collection method is changed from the examination to questionnaire survey in consultation with C/P. Thus, questionnaire survey to seminar participants is carried out on behalf of the examination to participants. Also, the target value is established in 70% through the discussion with C/P. **The indicator modified:** The level of understanding of seminar participants on the bridge maintenance exceeds 70% on average.
Means of Verification (MOV)	**Overall Goal**	As MOVs were composed of reports and interview of each agency, those MOVs are properly amended as follows. **The indicator modified:** (1) Road inspection form attached to the RMM (2) Bridge Management System (BMS) (3) Road Maintenance Plans formulated by GHA, DUR, and DFR
	Project Purpose	As MOVs were composed of "Project Completion Report," those MOVs are properly amended as follows. **The indicator modified:** (1) Checklist attached to the updated road design guide (2) Road inspection form attached to the RMM (3) BMS
	Outputs MOV 1-1, 2-1, 3-1	The MOV for approval of guide and manuals is revised as follows. "Approval letter of MRH"
	MOV 1-2, 2-2, 3-3	The figure in each indicator is collected through the questionnaire survey to seminar participants, and its result is explained in the Seminar Evaluation Report. Also, the Report is attached to the Project Monitoring Sheet (PMS) which is a JICA reporting form. Thus, the MOV is modified in the following way. "Seminar Evaluation Report, Project Monitoring Sheet (PMS)"
	MOV 2-3	As mentioned above, this MOV is deleted because of the elimination of the corresponding indicator.
	MOV 3-2	The MOV is modified as "interview to bridge specialists" because the corresponding indicator is amended.

Inputs	**Japanese side**	The titles of JICA experts are modified as follows based on the actual project activities and the demarcation with the other expert. **Before**: (1) Project Leader / Road Design and Maintenance (2) Deputy Project Leader / Bridge Design and Maintenance **After**: (1) Project Leader / Road Maintenance (2) Deputy Project Leader / Bridge Maintenance

Table 10-3 Modification of the PDM (PDM2 to PDM2-1: April 2022)

Components of the PDM		Corrections
Basic Info.	**Project Period**	Project period was extended for three (3) months from February to May 2023 due to the late start of the Stage-2 of the Project.
Indicators	**Overall Goal** Indicator 1	The target values achieved by 2025 are fulfilled in the indicator as shown below. **The indicator modified:** The length of roads inspected by using the road maintenance manual (RMM) reaches more than **15,548/28,480/48,357** km across the country under the supervision of GHA, DUR, and DFR respectively.
	Indicator 2	The target values achieved by 2025 are fulfilled in the indicator as shown below. **The indicator modified:** The number of bridges inspected by using the Bridge Maintenance and Management Manual attains to more than **200/103/98** across the country under the supervision of GHA, DUR, and DFR respectively.

2.4 Others

2.4.1 Results of Environmental and Social Considerations

N/A

2.4.2 Results of Considerations on Gender/Peace Building/Poverty Reduction

N/A

3 Results of Joint Review

3.1 Results of Review based on DAC Evaluation Criteria

3.1.1 Relevance

The Project's relevance is deemed moderate for several reasons. Firstly, the alignment of the project with government policies in both Ghana and Japan is noteworthy. Additionally, there was a high demand for the project. Nevertheless, considering the incorporation of numerous components into a single project, a thorough examination of the project approach during the formulation period would have been advisable.

The relevance of the Project is ***moderate*** for the following reasons. In the first place, the government policies in Ghana and Japan are consistent with the direction of the Project. Also, the project needs were extremely high. However, as many components were incorporated into a single project, the project approach should have been scrutinized during the project formulation period.

[Government Policy in Ghana]

In the "National Medium-term Development Policy Framework 2022-2025," the Government of Ghana (GOG) aims to enhance the efficiency and effectiveness of road transport infrastructure while prioritizing the safety and security of all transport users. However, the GOG acknowledges challenges in road infrastructure, including poor road condition and network quality, as well as a deficient road maintenance and rehabilitation culture.

Consequently, the GOG is implementing strategies to establish a robust maintenance scheme for the transport system, enhance capacity to ensure the necessary skills for infrastructure maintenance, and develop an asset register detailing infrastructure conditions. These initiatives are part of the medium-term objective to promote an effective maintenance culture. Furthermore, the Policy Framework encourages the GOG to execute road infrastructure maintenance programs as a means of generating employment opportunities for the youth.

Furthermore, the Ministry of Roads and Highways remains committed to prioritizing routine and periodic maintenance activities. This commitment aims to safeguard the substantial investment made by the Government of Ghana (GOG) in the development of road infrastructure within the Medium-term Expenditure Framework (MTEF) for the period 2022-2025.

[Government Policy in Japan]

Economic Infrastructure Development" stands as a pivotal focus within the "Rolling Plan for Ghana (September 2019)," emphasizing the enhancement of infrastructure to contribute to the overall development of the West African region, fostering industrial promotion, and expanding exports. Despite these efforts, challenges persist, including the degradation of road surfaces on ageing trunk roads and the imperative for higher specifications to meet growing traffic demands. The "Economic Infrastructure Development Program" addresses these issues as part of its priority area, with the CBRB Project positioned within the framework of this program. Consequently, the Project aligns with the strategic direction set forth by the Government of Japan.

“Economic Infrastructure Development” is one of the priority areas of the “Rolling Plan for Ghana (September 2019)” and undertakes the infrastructure development which contributes to the development of the West African region as a whole in order to improve the industrial promotion and export expansion. Also, there are still rooms for the improvement, such as the deterioration of road surface conditions due to the aging trunk roads, the needs for higher specifications to meet traffic demand, etc. There is the “Economic Infrastructure Development Program” in the priority area, and the CBRB Project is also positioned within the framework of this Program. Therefore, the Project is in line with the direction of the Government of Japan.

[Needs of the Project]

Road and bridge maintenance activities lack a systematic approach, primarily relying on corrective measures (addressing damages when they occur), leading to inadequacies in the overall maintenance process. Prior to the initiation of the project, although maintenance tasks were outsourced, there was a notable absence of effective project management, resulting in escalated construction costs and project delays. Strengthening the capacity of implementation agencies for road and bridge maintenance, emphasizing preventive maintenance, emerged as a pressing requirement to effectively manage the limited budget.

The Road Design Guide (RDG), established in 1991 by a JICA expert in accordance with the Government Order on Road Design Standards in Japan, gained widespread recognition among Ghanaian engineers as a standard technical document for road design. However, the RDG did not originally encompass intersections and flyovers, necessitating its update to address this crucial gap.

Furthermore, despite the significant accomplishments of other donors in infrastructure development, the bridges on trunk roads suffered deterioration due to inadequate maintenance. This underscored the critical necessity for enhancing the capabilities of implementing agencies in road and bridge maintenance.

[Appropriateness of the Project Approach]

The viability of incorporating three components, each associated with a specific agency, into a single project raises questions about the project framework. It is essential to evaluate which aspects should be chosen and prioritized to ensure the effective utilization of limited project inputs and resources. Developing high-quality, user-friendly documents for sustainable use post-project termination becomes particularly crucial. Consequently, a thorough examination of the project approach should have occurred during the formulation period, considering priorities and predetermined project resources.

Taking Output 1, the updated RDG, as an example, required extensive efforts, with over 70 workshops (more than 100 sessions daily) dedicated to its completion. The comprehensive nature of the project, involving three agencies, suggests that it might have been more appropriate to narrow down the project scope by selecting one or two outputs based on priority and available project resources. This would have streamlined efforts and enhanced the efficiency of the project framework.

The project framework is questionable whether or not three components with the three agencies are incorporated into a single project. It shall be considered that which parts shall be selected and focused on for the effective use of the limited project inputs and resources. It might be quite crucial to develop the quality and user-friendly documents for the sustainable usage after the termination of the Project. Thus, the project approach should have been scrutinized during the project formulation period based on the priority and the project resources to be predetermined. In terms of the updated RDG in the Output 1, for example, more than 70 workshops[3] (more than 100 times if daily basis) have been held to complete it. There were many operations and C/P's efforts even to achieve a single output only. From this perspective, as the project scope was expanded quite widely with the three agencies, it might have been appropriate to select either one or two output(s) based on the priority and the project resources as a project framework.

3.1.2 Effectiveness

The Project's effectiveness is considered moderate, as the indicators for the Project Purpose were only partially achieved, and the accomplishments of the three Outputs made some contribution to the Project Purpose.

The primary objective of the Project is to enhance the capacity of the Ministry of Roads and Highways (MRH) and its agencies in road and bridge management. To fulfill this objective, the Project employs the Road Design Guide (RDG), Road Maintenance Manual (RMM), and Bridge Maintenance and Management Manual. These manuals are utilized for road design, road inspection, and bridge inspection on the project sites. The indicators for the Project Purpose were developed based on this framework, with the details explained below.

The first indicator measures the number of projects planned and designed using the updated RDG. Although the checklist associated with the updated RDG was intended to guide the design of road projects, the numbers in this indicator were derived without using the updated version due to the RDG development lagging behind schedule by December 2022. Despite not using the updated RDG for this purpose, the numbers of projects planned and designed were 60, 626, and 103 for GHA, DUR, and DFR, respectively.

In 2022, only the Department of Urban Roads (DUR) exceeded its target, as highlighted in the Project Purpose earlier. It can be noted that Indicator 1 was partially achieved. However, the Ghana Highway Authority (GHA), DUR, and Department of Feeder Roads (DFR) are to assess the number of road projects planned and designed using the checklist in 2023 and subsequent years.

Moving on to Indicator 2, which gauges the length of roads inspected using the Road Maintenance Manual (RMM), the figures for the three agencies in 2022 remained the same as previous years. This decision was made under the assumption that road inspection results in 2022 would closely align with those of 2021. Additionally, challenges such as road network measurements, road inventory surveys, financial constraints, and a lack of vehicular logistics hindered road inspections in 2022. Therefore, it cannot be asserted that the indicators have been achieved at this point. The figures will be monitored and adjusted by the agencies as necessary. Importantly, since the lengths of road inspection were not measured using the RMM due to its incomplete status by the end of December 2022, GHA, DUR, and DFR will begin measuring road inspection lengths with the RMM from 2023 onward, aligning with Indicator 1.

Indicator 3 entails inspecting 30 prioritized bridges according to the Bridge Maintenance and Management Manual (BMM) and the Bridge Inspection Manual. While 41 prioritized bridges underwent pilot inspections, the BMM was not finalized by December 2022. Nevertheless, since effective and efficient inspection methods identified in the pilot inspections have been incorporated into the BMM, it can be stated that 41 bridges were partially inspected using the BMM. Following the Project's completion and in the future, GHA, DUR, and DFR are expected to inspect other bridges by fully leveraging the experiences, results, and good practices outlined in the BMM.

Although all indicators were intended to be measured using the provided guides or manuals, the figures were obtained without utilizing those documents due to their incomplete status before December 2022. Therefore, effective utilization of these documents is anticipated in 2023 and subsequent years.

3.1.3 Efficiency

In spite of the project duration being prolonged by three months, spanning from February to May 2023 due to the delayed commencement of Stage-2, the project exhibited a high level of efficiency. The outputs were achieved successfully in accordance with the set indicators, and the transformation of activities into outputs was executed with commendable efficiency.

[Workshops for the Output 1, 2 and 3]

In general, the transition of Inputs and Activities into Outputs was favorable, even though there were no opportunities to utilize the updated RDG for actual road designs and the Maintenance Manuals for road and bridge inspections due to their delayed completion. However, the development of the RDG, RMM (technical parts), iDRIMS User Manual, Bridge Maintenance and Management Manual, etc., was achieved through significant contributions and efforts from the C/P. Additionally, the level of understanding among seminar participants exceeded the predetermined target value, indicating a satisfactory outcome.

While three ambitious Outputs were initially established during the project formulation stage, it can be acknowledged that the Activities were well-managed under the constraints of project inputs, particularly the limited assignments of JICA experts. Notably, strong relationships between the C/P and JICA experts were cultivated through frequent and intense communication, both offline and online, during workshops for Output 1, 2, and 3. These workshops, held on a weekly basis, totaled more than 133 sessions, demonstrating the dedication to Project Activities and contributing to the successful achievement of Outputs.

[Training in Japan]

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3.1.4 Impact

While it is premature to evaluate the fulfillment of the Overall Goal at this juncture, there are indications that the Overall Goal may be realized three years after the conclusion of the Project (refer to Section IV.1 for more detailed insights on the prospects of achieving the Overall Goal). Furthermore, discernible impacts have emerged from the implementation process of the Project.

[Road and Bridge Maintenance Plans]

Each agency (GHA, DUR, and DFR) will draft a Road Maintenance Plan. The relevant organizations in each region will then collaborate to share information and data from these maintenance plans with the respective agencies. Subsequently, upon the aggregation of this data and information, each agency will compile and summarize the Road Maintenance Plan, as illustrated in Figure 6.

The preparation of the Road Maintenance Plan should adhere to the guidelines outlined in the RMM. The indicator's achievement will be confirmed when the elements detailed in Table 9 are incorporated into the plan.

Conversely, for bridges, the Bridge Management System (BMS) encompasses essential information and data required for maintenance plans. This includes bridge inventories, repair records, defect information, estimated costs, and prioritization of bridge maintenance. Consequently, the BMS is anticipated to significantly facilitate the formulation of the bridge maintenance plan.

[Collaboration with the World Bank]

The Transport Sector Improvement Program (TSIP), a World Bank project, aimed to implement an asset management system, incorporating the International Roughness Index (IRI) as one of the indicators for developing road maintenance plans. However, as the measurement method for IRI was beyond the scope of the TSIP project, a more efficient IRI measurement technology was sought to replace the conventional approach.

In response to this challenge, the Ministry of Roads and Highways (MRH) proposed collaboration between the CBRB Project and TSIP to effectively utilize the iDRIMS system introduced by the CBRB Project. Recognizing the need for IRI measurement technology, the MRH requested cooperation to enhance the efficiency of the TSIP project.

Given the interest of TSIP in training its staff on IRI measurement using iDRIMS, the C/P, who possesses sufficient familiarity with iDRIMS, provided training to TSIP consultants, enabling them to act as trainers. This collaborative effort is anticipated to not only deepen the C/P's understanding but also significantly contribute to the nationwide expansion of iDRIMS following the completion of the CBRB Project.

[Contract for iDRIMS after the Overall Goal]

iDRIMS users are required to engage with the service provider, JIP Techno Science, for the processing and analysis of data using the system. Should the Ghanaian stakeholders demonstrate a strong commitment to the ongoing utilization of iDRIMS in the future, it becomes imperative for them to secure a budget for IRI measurement and AI processing beyond the three-year contract supported by the Project (until April 2026). Despite the anticipated achievement of the Overall Goal three years post-project completion, the continued use of iDRIMS after the contract expiration is uncertain. Decisions regarding the use of iDRIMS post-contract will be contingent upon the determination and commitment of the Ghanaian side, emphasizing the importance of implementing IRI data collection efficiently while minimizing costs and time.

[Materials for road maintenance]

The C/P expressed favorable impressions of the Excel Patch (cold mix asphalt) for road maintenance based on the successful pilot project. Subsequently, the manufacturer, IKEE company, conducted training sessions in Ghana to impart knowledge on the use of Excel Patch. Distinguished by its direct application to potholes and an extended lifecycle compared to current materials, the Excel Patch proves effective even during rainy seasons. Despite the higher costs associated with the Excel Patch compared to locally used materials, its potential importation from overseas is expensive. An alternative is to consider producing the material in Ghana by obtaining a license from the IKEE company. Although the primary focus of the project was on road and bridge inspections, the incorporation of maintenance works using the Excel Patch is anticipated to positively impact infrastructure development in Ghana.

3.1.5 Sustainability

The sustainability of the Project is deemed moderate. Although there are anticipated advancements in policy, operational, and technical aspects following the Project's conclusion, the financial aspect remains uncertain and is not securely ensured for road and bridge maintenance over the next three years.

[Policy aspect]

As noted in the Relevance section, the "National Medium-term Development Policy Framework 2022-2025" emphasizes strategies to establish a robust maintenance scheme for the transport system. It also aims to build the capacity required for infrastructure maintenance skills and develop an asset register on infrastructure conditions by fostering an effective maintenance culture. Additionally, the Ministry of Roads and Highways (MRH) maintains its focus on routine and periodic maintenance activities, aligning with the substantial investment in road infrastructure outlined in the Medium-term Expenditure Framework (MTEF) for 2022-2025.

Hence, if the policy framework's and MTEF's directives are upheld in the future, the ongoing sustainability of project operations will be in accordance with governmental principles. the directions of the policy framework and MTEF are retained for the future, the project operations will be sustained according to the governmental principles.

[Operational aspect]

Since 2021, a series of intensive workshops (W/S) has been organized to facilitate in-depth discussions for the preparation of the Road Design Guide (RDG) and various types of manuals (guides and manuals). These workshops were conducted 71 times for Output 1, 29 times for Output 2, and 33 times for Output 3, as detailed in Table 11. The Collaborating Partner (C/P) has actively participated in developing the guides and manuals, integrating insights from presentations at the workshops and on-site activities.

The guides and manuals have been crafted to incorporate the knowledge derived from these workshops and activities. This approach ensures that knowledge is retained within the organization, allowing the C/P to continuously and regularly review and revise the guides and manuals. By repeatedly convening workshops and establishing a well-defined formulation process, the C/P has fostered a strong sense of ownership towards the guides and manuals. Consequently, the sustainability of project operations is considered exceptionally high.

Table 11: The number of workshops for the Output 1, 2 and 3 (2021-2023)

	2021	2022	2023	TOTAL
Output 1: Road Design Guide (RDG)	8	52	11	71
Output 2: Road Maintenance Manual (RMM)	4	18	7	29
Output 3: Bridge Maintenance and Management Manual	9	12	12	33

Note: The number of workshops convened is counted on a weekly basis (even if the workshops convened three times a week, it is counted as “one (1)” workshop).

Source: Project records

The C/P took the lead in autonomously developing guides and manuals, under the supervision and technical guidance of JICA experts. Actively participating in workshops, the C/P provided significant input during discussions, demonstrating a committed interest in project activities with a focus on sustainability.

To ensure the continuous use of the guides/manuals, a systematic approach involves regular reviews and updates, incorporating new topics, data, and information—specifically, conducting reviews every five years and major updates every 10 years. In addressing this concern, a dedicated team/staff should be consistently available. This team/staff will be responsible for the periodic review and update of the manuals, aiming to continually enhance the documents. Importantly, each implementing agency must allocate the necessary budget for this task.

[Financial aspect]

As per the Medium-Term Expenditure Framework (MTEF) covering the period from 2022 to 2025, Program 3, focusing on road rehabilitation and maintenance, encompasses routine maintenance, periodic maintenance, and minor rehabilitation. The primary funding sources for Program 3 include the Government of Ghana (GOG), donor agencies, the Road Fund, and others. The budget allocations for the years 2023 to 2025 are detailed in Table 12.

Table 12: Budget for the road maintenance and rehabilitation (Program 3)

Unit: Ghanaian Cedi (GHS)

	2023	2024	2025
Routine maintenance	292,295,350	292,295,350	292,295,350
Periodic maintenance	81,826,906	81,826,906	81,826,906
Minor rehabilitation	50,000,000	50,000,000	50,000,000
Total	424,122,256	424,122,256	424,122,256

Source: MTEF for 2022–2025

While the Government of Ghana endeavors to maintain the budget for road maintenance and rehabilitation over the next three years to preserve road conditions, there is uncertainty regarding financial assurance for road and bridge maintenance beyond the conclusion of the project.

[Technical aspect]

Road Design Guide (Output 1)

Regarding road design, the C/P gained firsthand insights into roads and structures during their training in Japan, sparking more profound ideas and discussions about the development of the RDG. This shift in awareness has cultivated a sense of ownership within the C/P, motivating them to self-develop the RDG without relying on external donors. Furthermore, they delved extensively into the cultural background, contributing to the enhancement of the RDG.

Looking ahead to future design guides, the C/P needs to acquire the necessary technology and knowledge of road design to update the RDG in subsequent cycles, with a specific emphasis on reviewing it every five years and revising it at least every 10 years, with sustainability as a priority.

iDRIMS (Output 2)

As previously mentioned, TSIP has expressed interest in receiving training on IRI measurement using iDRIMS. With the C/P's expertise in iDRIMS, they are well-positioned to provide training to TSIP consultants, effectively serving as trainers. The skills and knowledge gained in iDRIMS can be consistently applied nationwide, extending beyond the conclusion of the Project. This is crucial for solidifying the C/P's ownership of project activities, emphasizing sustainability.

Bridge maintenance (Output 3)

The C/P underwent practical training on the operation of repair equipment and received on-the-job training for repair tasks on real sites during their training in Japan. As highlighted in the section on Efficiency, it is crucial that the knowledge and skills acquired by the C/P in Japan are effectively

transferred through pilot projects in Ghana, and the technologies obtained by the C/P agencies should be consistently applied going forward.

Furthermore, the Project has already conducted inspections on 41 prioritized bridges, along with the development of the Bridge Maintenance and Management Manual, which includes the Bridge Inspection Manual. Valuable experiences, ideas, and practical methods gleaned from these prioritized bridge inspections have been incorporated into these manuals. Consequently, the C/P is well-equipped to independently continue bridge inspections nationwide using these manuals. This ensures that other bridges in Ghana will undergo continuous inspections in accordance with the guidelines outlined in the manuals.

3.2 Key Factors Affecting Implementation and Outcomes

In terms of the Important Assumption, the Project shall pay attention to the condition for the achievements of the Outputs during the cooperation period. It seems that there are no risks to be found for this condition.

(1) Important Assumption for the achievements of the Outputs:

[Budget and human resources are appropriately secured]

No significant hindrances were encountered in attaining Output 1 (road design), Output 2 (road inspection), and Output 3 (bridge inspection). Particularly, human resources, represented by the C/P members assigned to each output throughout the project's implementation period, have been effective, this resulted in the successful achievement of the outputs.

In summary, it can be concluded that the project’s objective has been met, as the project activities remained largely unaffected by budgetary and personnel issues during the collaboration period.

3.3 Evaluation on the Results of the Project Risk Management

The ex-ante evaluation report of this Project elucidates the insights gained from a technical cooperation initiative focused on roads and bridges in the Philippines. This endeavor involved the development and revision of manuals, and the implementing agencies undertook a series of activities through pilot projects, applying the knowledge and technologies acquired from these manuals. The practical application of the manuals proved to be highly effective in fostering knowledge and technological capabilities within the implementing agencies. Drawing from these lessons, the CBRB Project conducted real road and bridge inspections through pilot projects. Consequently, the CBRB Project successfully implemented practical activities based on the draft manuals.

3.4 Lessons Learned

[Project formulations for new projects]

Concerning the CBRB Project, despite the integration of three components into a unified project, it is advisable to channel limited project inputs and resources towards one or two components. This strategic concentration aims to enhance the effectiveness of achieving the Project Purpose and Outputs. The creation of a user-friendly guide and high-quality manuals is deemed crucial for ensuring sustainability beyond the Project's conclusion. In light of this lesson learned, it is recommended to reassess the prioritization of components and allocation of project resources when formulating a new project, with predetermined priorities and resources before commencement of the project.

[Review and update of the guide and manuals]

In order to keep the guide and/or manual to be used continuously in the future, the most reasonable approach is to regularly review and update those documents with new topics, data, and information, *i.e.*, review after five years and major update after 10 years. Hence, this shall be considered for the long span when a project includes the development of guide and/or manual. In terms of the sustainability, moreover, the taskforce of the guide and/or manual shall be established with the budget for the taskforce operations.

4 For the Achievement of Overall Goals after the Project Completion

4.1 Prospects to achieve Overall Goal

According to the Project Manager, the Project has tried to strengthen the capacities of C/P through the W/S and presentations on the initiative of the C/P, which is highly evaluated within the MRH. A good point is that the Project has carried out various activities, such as W/S, presentations, on-site works, etc., together with JICA experts. It is crucial to promote project activities as a team with mutual communication under different cultures between the two countries.

Moreover, since the C/P in charge of each area was able to accumulate the knowledge necessary for road design as well as road and bridge maintenance, it is significant for the C/P to proactively share the knowledge and experiences with other engineers in their departments as a trainer, not as a trainee, from now on.

Specially, although the RDG had not been updated since 1991, the Project has updated this during the cooperation period. It is necessary to examine specific specifications for the future in order to make the RDG to be employed more practically on sites.

[Road inspection]

iDRIMS is the data collection system with iPhone which is used for IRI data collection. By using this, it becomes easier and faster to collect the road roughness data compared to the conventional methods. In terms of road inspection, therefore, there are prospects that the lengths of roads inspected by using iDRIMS will exceed the targets set for the Overall Goal by the end of 2025.

However, iDRIMS users have to contract with the service provider, JIP Techno Science, for processing and analyzing the data by using this system. If Ghanaian side shows the strong commitment to use the iDRIMS continuously for the future, they have to secure the budget for the IRI measurement and AI processing after the three-year contract supported by the Project (until April 2026). Although there are prospects that the Overall Goal will be achieved three years after the project completion, it does not make sure whether or not iDRIMS will be used continuously after the contract expires. While it is crucial to implement IRI data collection with minimum cost and time, whether to use the iDRIMS or not after expiring the current contract depends on the willingness of the Ghanaian side.

[Road maintenance plan]

Each agency (GHA, DUR, and DFR) is tasked with preparing the Road Maintenance Plan. The relevant organizations in each region are expected to share information and data from these plans with the respective line agencies. Following the aggregation of this information and data, each agency will then consolidate the Road Maintenance Plan. In preparation for the future, a check sheet for the Plan (Table 9) has been devised to verify its adherence to the items essential for road maintenance outlined in the Road Maintenance Manual (RMM). The indicator will be considered achieved when the check sheet confirms the inclusion of these requisite items. Subsequently, after the completion of the Project, the Ghanaian side is expected to independently undertake this activity on their own initiative.

[Bridge inspection]

In the context of bridges, each agency formulates a maintenance plan based on their own bridge inspections, contrasting with the road section where information is collected from responsible regional offices. Emergency responses, rather than proactive bridge maintenance, are prioritized, often occurring as ex-post actions following bridge collapses. Despite bridges serving as bottlenecks in road networks, the allocation of budgets for bridge maintenance is insufficient. Properly executed bridge maintenance holds the potential to significantly reduce costs associated with bridge replacements.

Emphasizing the importance of undertaking bridge maintenance before any collapse occurs, a well-maintained database, as accumulated by inspections, plays a pivotal role in prioritizing maintenance. The Bridge Management System (BMS) gathers data on bridge inventories, repair records, defects, and maintenance priorities. Extracting valuable information from the BMS aids in prioritizing bridge maintenance works, potentially bringing the number of bridges inspected by the three agencies closer to the target values by the end of 2025, driven by the need for inspection data in the BMS for future bridge maintenance.

Furthermore, since the BMS facilitates the preparation of a bridge maintenance plan, conducting bridge inspections for data entry into the system is essential for ensuring smooth road networks and efficient budget utilization.

4.2 Plan of Operations and Implementation Structure of the Ghanaian side to achieve the Overall Goal

The subsequent tasks are to be carried out upon the conclusion of the CBRB Project, as outlined in Figure 7 of the operational schedule:

(1) Confirm the number of projects designed with the checklist attached to the updated RDG.

(2) Confirm the lengths of roads inspected by using the RMM.

(3) Confirm the numbers of bridges inspected by using the Bridge Maintenance and Management Manual, including the Bridge Inspection Manual.

(4) Formulate the Road Maintenance Plans by GHA, DUR, and DFR according to the RMM.

(5) Ex-post evaluation survey.

The figures are verified every six months, and annual data must be finalized by the commencement of the following year, specifically before March. Concerning the RDG, C/P members are required to conduct an annual review. This involves gathering the number of projects designed using the updated RDG and referencing the checklist results.

Additionally, given that the initial contract for the iDRIMS concludes three years after the Project's termination, the Ghanaian side will assess whether to renew the iDRIMS contract for road inspection around the beginning of 2026.

Ultimately, the Overall Goal is anticipated to be accomplished three (3) years post the Project's termination. An ex-post evaluation survey, overseen by the consultant appointed by JICA Headquarters, is slated for execution around May 2026.

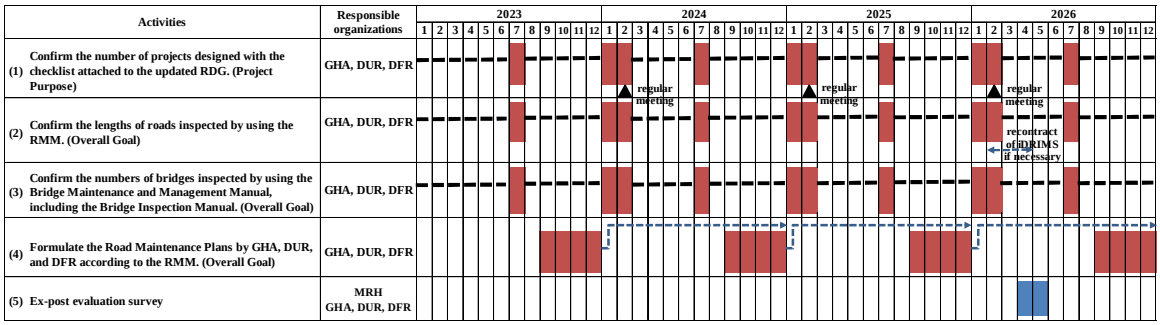


Figure 7: The operational schedule to achieve the Overall Goal

4.3 Recommendations for the Ghanaian side

The recommendations are separately extracted from the analysis results as explained above.

To MRH, GHA, DUR, and DFR:

[Achievement of the Overall Goal with the indicators]

As delineated in the aforementioned operational schedule, the MRH is responsible for overseeing the advancement of the following indicators in pursuit of the Overall Goal:

- The tally of road projects planned and designed from 2023 onwards will be assessed using the checklist provided in the updated RDG.
- The determination of the lengths of roads inspected through iDRIMS from 2023 onwards will be verified with the checklist associated with the RMM.
- The count of inspected bridges from 2023 onwards will be conducted using the Bridge Maintenance and Management Manual, inclusive of the Bridge Inspection Manual. Additionally, the prompt and regular input of data and information on bridges into the BMS is imperative.

[Contract for iDRIMS after the Overall Goal]

iDRIMS users are required to engage in a contractual agreement with the service provider, JIP Techno Science, for the processing and analysis of data through this system. In the event that the MRH demonstrates a strong commitment to the ongoing use of iDRIMS, it is imperative to secure the budget for IRI measurement and AI processing in subsequent contracts.

[Ongoing Maintenance of BMS post Project Conclusion]

Given that the BMS has recently been completed and implemented at various agency offices, maintenance periods are essential for identifying and rectifying any bugs or defects while utilizing the system. Since the Project is set to conclude in May 2023, the MRH must contemplate budget allocation for the continuous maintenance of the BMS to ensure sustained system operations moving forward.

4.4 Monitoring Plan from the End of the Project to Ex-post Evaluation

The JICA Ghana Office will annually monitor the operational schedule outlined in Figure 7, aiming to achieve the Overall Goal, until the ex-post evaluation, which is scheduled three (3) years after the Project's conclusion.

ANNEX 1: Results of the Project

Annex 1-1: List of Dispatched Experts

Annex 1-2: Operational Expenses

Annex 1-3: List of Training

Annex 1-4: List of Equipment

Annex 1-5: List of Counterparts

Annex 1-6: Plan of Operations

Annex 1-7: Achievements of Activities

ANNEX 2: List of Products produced by the Project

Annex 2-1: Ghana Road Design Guide 2023

Annex 2-2: Road Maintenance Operations Manuals 2023

- Activity Manual 2023
- Organisation Structure 2023
- Road Condition Survey Manual 2023
- Works Supervision 2023
- Road Procurement 2023

Annex 2-3: Ghana Bridge Maintenance and Management Manual 2023

Annex 2-4: Ghana Bridge Management Inspection Manual 2023

Annex 2-5: BMS User Manual 2023

ANNEX 3: PDM (All versions of PDM)

ANNEX 4: R/D, M/M, Minutes of JCC (copy)

ANNEX 5: Project Monitoring Sheet (copy)

Annex 1 Results of the Project

1-1 List of dispatched experts

1-2 Operational expense

1-3 List of Training

1-4 List of Equipment

1-5 List of Counterparts

1-6 Plan of Operations

1-7 Achivement of Activities

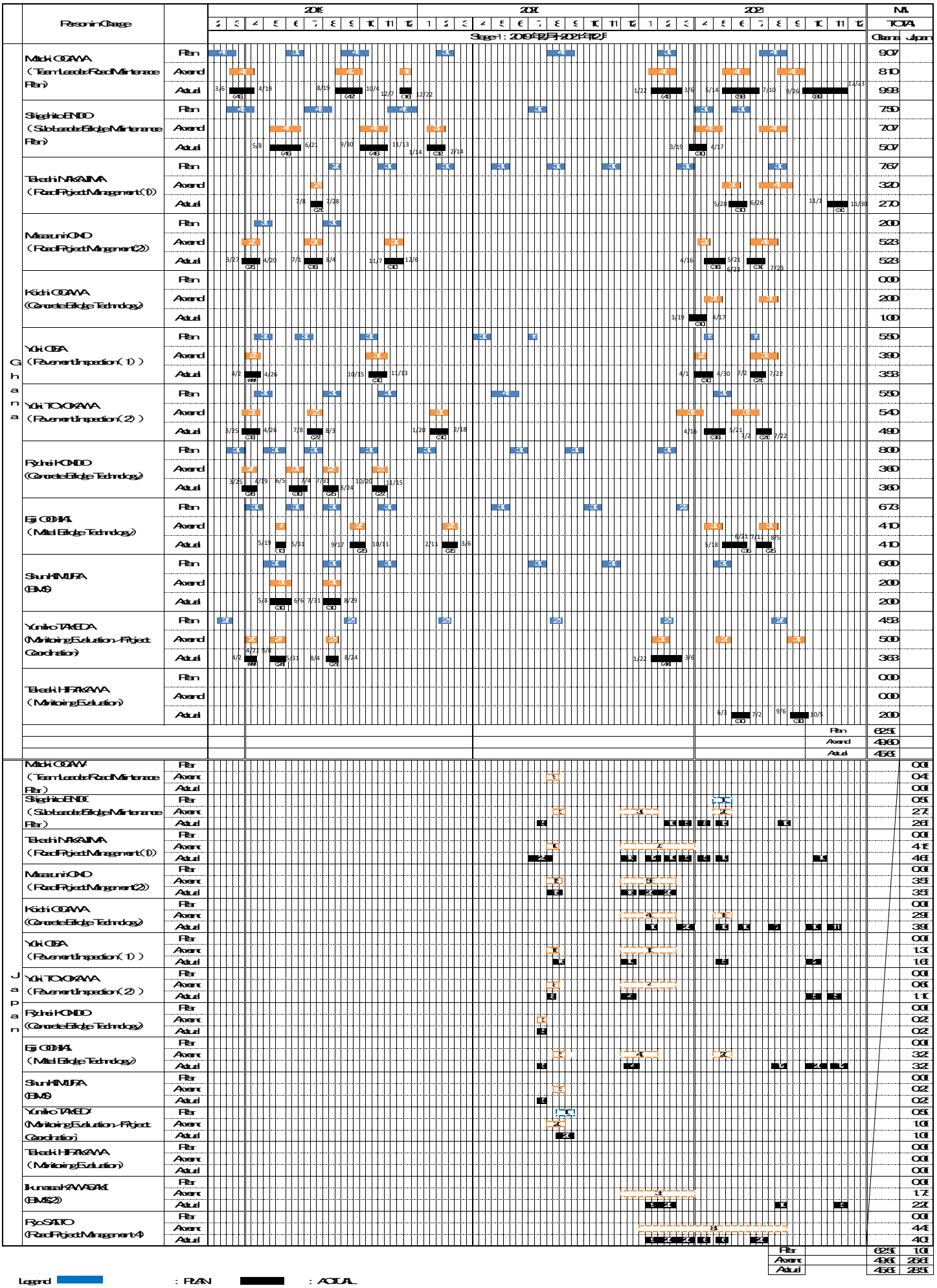
Annex-2

Annex 1-1 List of Dispatched Experts

The list and assignment of the dsipatched experts are given in the table given next pages.

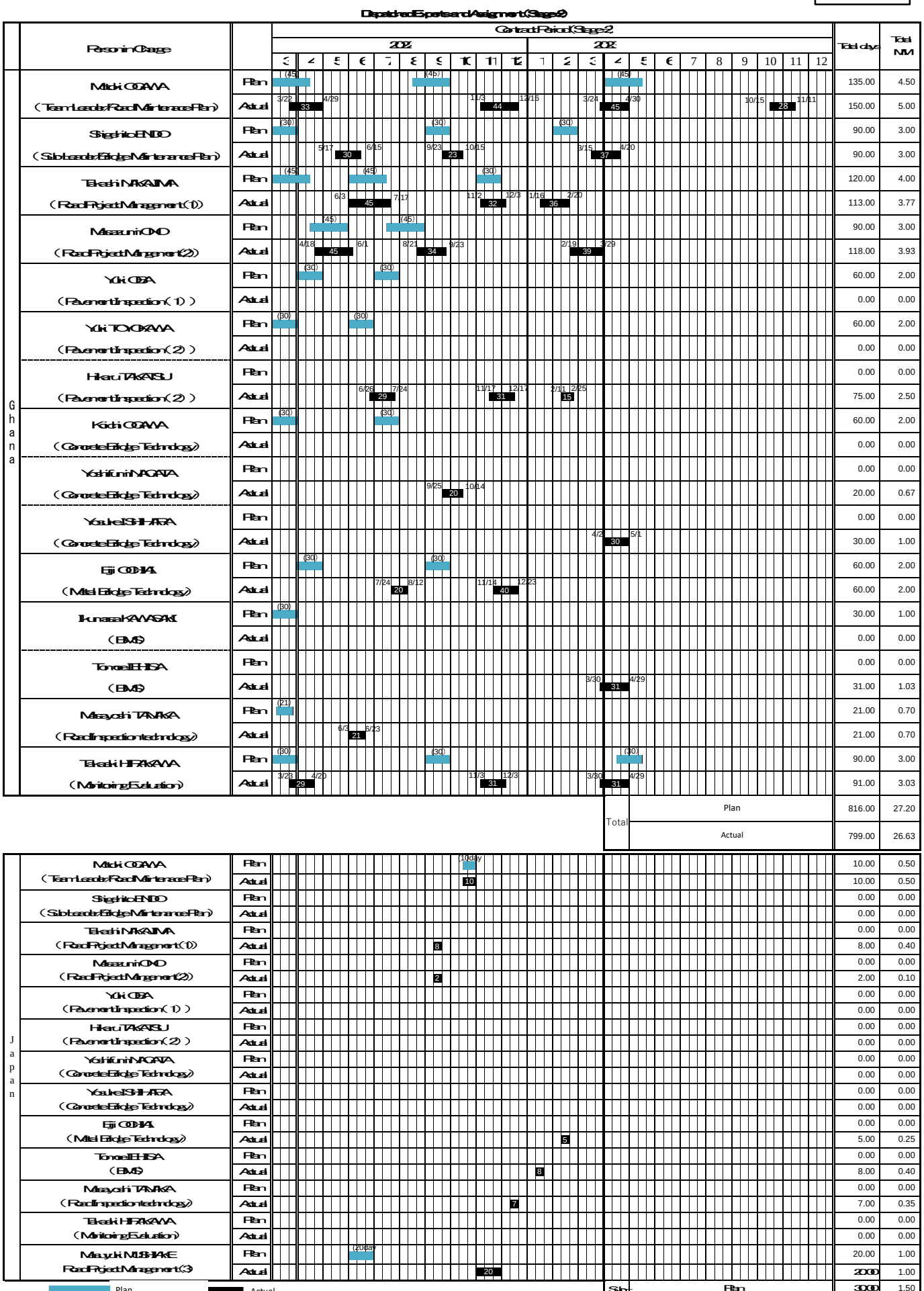
STAGE-1

Dispatched Experts and Assignment (Stage-1)



Annex-4

STAGE-2



Annex-5

Annex-6

Annex 1-2 Operational Expense

Annex-2 Operational Expense

Items			MS Ver.1	MS Ver.2	MS Ver.3	MS Ver.4	MS Ver.5	MS Ver.6	MS Ver.7.0	MS Ver. 8.0
			17th April 2019	31st, Sep. 2019	31st March 2020	30th September 2020	28th February 2021	27th October, 2022	19th April 2022	31st October 2022
1	1-1	C/P Personals	Chief Director Director of P&P /MRH Engineer P&P /MRH Engineer M&E /MRH Engineer GHA Engineer DUR Engineer DFA Principal KTC Officer RFB Officer Ministry of finance 15 officials appointed for JCC members. 15 officials appointed for C/P members.	Same as ver.2 15 officials appointed for JCC members. 15 officials appointed for C/P members.	Same as ver.2 15 officials appointed for JCC members. 15 officials appointed for C/P members. .	Same as ver.2 15 officials appointed for JCC members. 15 officials appointed for C/P members.	Same as ver.2 15 officials appointed for JCC members. 15 officials appointed for C/P members. .	Same as ver.2 15 officials appointed for JCC members. 15 officials appointed for C/P members. Project Director changed.	Same as ver.2 15 officials appointed for JCC members. 15 officials appointed for C/P members.	Same as ver.2 15 officials appointed for JCC members. 15 officials appointed for C/P members.
2	2-1	Office space	MRH prepared Room G10 as office space	Same as ver.2	Same as ver.2	Same as ver.2	Same as ver.2	Same as ver.2	Same as ver.2	Same as ver.2
3	3-1	Furniture	MRH provided desk table and bookshelf for the project	Same as ver.2	Same as ver.2	Same as ver.2	Same as ver.2	Same as ver.2	Same as ver.2	Same as ver.2
4	4-1	Internet	MRH provided internet WIFI for the Project	Same as ver.2	Same as ver.2	Same as ver.2	Same as ver.2	Same as ver.2	Same as ver.2	Same as ver.2
5		Others								

Annex 1-3 List of Training

Annex 1-3 List of Training

The list of trainings conduction in the project are given in the next pages.

The summary of the 3 outputs are given in the following table.

Monitoring Sheet (MS)		OP-1	OP-2	OP-3	Others	Total
MS-1	Workshop (days)	0	0	0	16	16
2019.4.17	Cumulated number of participants	0	0	0	152	152
MS-2	Workshop (days)	0	0	0	38	38
2019.9.30	Cumulated number of participants	0	0	0	330	330
MS-3	Workshop (days)	0	0	1	7	8
2020.3.31	Cumulated number of participants	0	0	12	55	67
MS-4	Workshop (days)	0	0	0	0	0
2020.9.30	Cumulated number of participants	0	0	0	0	0
MS-5	Workshop (days)	0	0	1	0	1
2021.2.28	Cumulated number of participants	0	0	5	0	5
MS-6	Workshop (days)	34	32	41	0	107
2021.10.27	Cumulated number of participants	101	143	114	0	358
MS-7	Workshop (days)	3	0	0	0	3
2022.4.19	Cumulated number of participants	30	0	0	0	30
MS-8	Workshop (days)	52	24	26	0	102
2022.10.31	Cumulated number of participants	333	220	48	0	601
Subtotal	Workshop (days)	89	56	69	61	275
	Cumulated number of participants	464	363	179	537	1543
Final	Workshop (days)	134	86	81	61	362
	Cumulated number of participants	934	1036	498	537	3005

Note-1: Others consist of interview to MRH, Agencies, Private companies and others
Note-2: There was no workshop on 2020 due to COVID-19 pandamic.

S/N	Year	Month	Date	Output	Number of participant	Contents
1	2019	3	14	MRH	15	Commencement Meeting
2	2019	3	19	GHA	7	Meeting with GHA
3	2019	3	19	DUR	6	Meeting with DUR
4	2019	3	20	DFR	7	Meeting with DFR
5	2019	3	20	M&E	4	Meeting with M&E
6	2019	3	21	MRH	3	Meeting with MRH
7	2019	3	27	GHA	8	Meeting with GHA
8	2019	3	28	DFR	10	Meeting with DFR
9	2019	3	28	DUR	8	Meeting with DUR
10	2019	4	1	MRH	19	Kick Off Meeting (Workshop)
11	2019	4	8	JCC	28	First JCC
12	2019	4	9	DFR	10	Meeting with DFR
13	2019	4	10	GHA	8	Meeting with GHA
14	2019	4	11	DUR	9	Meeting with DUR
15	2019	4	16	MRH	7	Meeting with MRH (AfCAP)
16	2019	4	17	MRH	3	Meeting with MRH (M&E)
17	2019	4	18	MRH	18	Monthly Meeting
18	2019	5	10	MRH	10	Meeting with MRH
19	2019	5	15	GHA	4	Meeting with GHA
20	2019	5	16	DUR	4	Meeting with DUR
21	2019	5	17	DFR	4	Meeting with DFR
22	2019	5	22	DFR	4	Meeting with DFR
23	2019	5	22	MRH	8	Meeting with MRH
24	2019	5	23	MRH	22	Monthly Meeting
25	2019	5	27	DUR	8	Meeting with DUR
26	2019	5	27	DFR	6	Meeting with DFR
27	2019	5	29	DFR	8	Meeting with DFR
28	2019	6	3	MRH	5	Meeting with MRH
29	2019	6	4	GHA	4	Meeting with GHA
30	2019	6	6	GHA	4	Meeting with GHA
31	2019	6	7	DUR	3	Meeting with DUR
32	2019	6	10	MRH	7	Meeting with MRH
33	2019	6	10	GHA	7	Meeting with GHA
34	2019	6	18	ALL	18	Monthly Meeting
35	2019	7	10	MRH	7	Meeting with MRH
36	2019	7	15	MRH	4	Meeting with MRH
37	2019	7	15	MRH	3	Meeting with MRH
38	2019	7	18	GHA	7	Meeting with GHA
39	2019	7	19	DUR	9	Meeting with DUR
40	2019	7	19	DFR	7	Meeting with DFR
41	2019	7	23	MRH	6	Meeting with MRH
42	2019	7	24	ALL	22	Monthly Meeting
43	2019	8	1	GHA	6	Meeting with GHA
44	2019	8	1	DFR	8	Meeting with DFR
45	2019	8	2	DUR	7	Meeting with DUR
46	2019	8	7	GHA	7	Meeting with GHA
47	2019	8	7	MRH	6	Meeting with MRH
48	2019	8	8	DFR	8	Meeting with DFR
49	2019	8	8	DUR	9	Meeting with DUR

S/N	Year	Month	Date	Output	Number of participant	Contents
50	2019	8	9	DFR	5	Meeting with DFR
51	2019	8	19	MRH	4	Meeting with MRH
52	2019	8	22	ALL	23	Monthly Meeting
53	2019	9	18	MRH	12	Meeting/Study Tour Team
54	2019	9	25	JCC	26	2nd JCC Meeting
55	2019	10	22	MRH	4	Meeting with MRH (TSIP)
56	2019	10	30	JICA	8	Meeting with MRH,GHA,JICA
57	2019	11	5	3	12	First Workshop(output-3)
58	2019	11	8	GHA	8	Meeting with GHA & DFR
59	2019	11	11	MRH	6	Meeting with MRH
60	2019	11	27	ALL	9	Meeting with GHA,DUR&DFR
61	2019	12	17	MRH	9	Meeting with MRH & JICA,
62	2019	12	19	ALL	11	Meeting with GHA,DUR&DFR
63	2021	1	27	3	5	Inspection Manual
64	2021	3	4	3	5	Inspection Manual
65	2021	3	23	3	10	Inspection Manual
66	2021	3	29	3	12	Site tour
67	2021	3	30	3	11	Site tour
68	2021	3	31	3	11	Site tour
69	2021	4	1	3	11	Inspection Manual
70	2021	4	7	3	11	Site tour
71	2021	4	8	3	11	Site tour
72	2021	4	9	3	11	Site tour
73	2021	4	13	2	13	Activity Manual
74	2021	4	14	2	10	Activity Manual
75	2021	4	15	2	10	Activity Manual
76	2021	4	16	2	10	Activity Manual
77	2021	4	17	2	10	Activity Manual
78	2021	4	18	2	10	Condition Survey
79	2021	4	20	2	10	Condition Survey
80	2021	4	21	2	10	Condition Survey
81	2021	4	22	2	10	Condition Survey
82	2021	4	23	2	10	Condition Survey
83	2021	4	19	2	10	Condition Survey
84	2021	4	22	1	5	Chapter 2, 3 and 4
85	2021	5	6	1	5	Chapter 2, 3 and 4
86	2021	5	12	1	5	Chapter 2, 3 and 4
87	2021	5	17	1	5	Chapter 2, 3 and 4
88	2021	5	18	2	10	Condtion Survey
89	2021	5	27	1	6	Chapter 5
90	2021	5	27	3	9	Inspection Manual
91	2021	5	28	3	0	Inspection Manual
92	2021	6	3	1	5	Chapter 5
93	2021	6	8	3	6	Inspection Manual
94	2021	6	10	1	6	Chapter 6
95	2021	7	3	1	5	Chapter 6
96	2021	7	8	1	8	Chapter 6
97	2021	7	13	3	6	Site tour
98	2021	7	14	3	0	Site tour

S/N	Year	Month	Date	Output	Number of participant	Contents
99	2021	7	15	3	0	Site tour
100	2021	7	15	1	7	Chapter 7
101	2021	7	29	1	3	Chapter 7
102	2021	6	4	2	7	Condition Survey
103	2021	6	5	2	7	Condtion Survey
104	2021	6	6	2	6	Condition Survey
105	2021	8	3	1	3	Chapter 8
106	2021	8	5	1	3	Chapter 8
107	2021	8	10	1	3	Chapter 8
108	2021	8	12	1	2	Chapter 8
109	2021	8	17	1	2	Chapter 8
110	2021	8	19	1	2	Chapter 8
111	2021	8	24	1	2	Chapter 8
112	2021	8	26	1	4	Chapter 8
113	2021	8	31	1	4	Chapter 9
114	2021	9	2	1	4	Chapter 9
115	2021	9	14	1	4	Chapter 9
116	2021	9	16	1	4	Chapter 9
117	2021	9	18	1	4	Chapter 9
118	2022	4	4	1	10	Chapter 6
119	2022	4	8	1	10	Chapter 6
120	2022	4	13	1	10	Chapter 6
121	2022	4	20	1	10	Chapter 7
122	2022	4	22	1	10	Chapter 7
123	2022	4	26	1	10	Chapter 7
124	2022	4	27	1	10	Chapter 7
125	2022	5	5	1	9	Chapter 8
126	2022	5	6	1	9	Chapter 8
127	2022	6	2	1	9	Chapter 8
128	2022	6	7	1	14	Chapter 8
129	2022	6	9	1	12	Chpater 8
130	2022	6	10	1	8	Chpater 8
131	2022	6	15	1	12	Chpater 9
132	2022	6	17	1	11	Chapter 9
133	2022	6	20	1	12	Chapter 9
134	2022	6	22	1	10	Chapter 9
135	2022	6	23	1	11	Chapter 1,2,3 and 4
136	2022	6	28	1	13	Chapter 1,2,3 and 4
137	2022	6	29	1	12	Chapter 1,2,3 and 4
138	2022	7	5	1	12	Chapter 5
139	2022	7	7	1	11	Chapter 5
140	2022	7	8	1	12	Chapter 5
141	2022	7	12	2	14	Activity Manual
142	2022	7	13	2	16	Activity Manual
143	2022	7	14	2	14	Activity Manual
144	2022	7	15	2	14	Activity Manual
145	2022	7	22	1	5	Chapter 8
146	2022	7	26	1	5	Chapter 8
147	2022	7	26	2	12	Activity Manual

S/N	Year	Month	Date	Output	Number of participant	Contents
148	2022	7	27	2	15	Activity Manual
149	2022	7	28	1	5	Chapter 8
150	2022	7	28	2	15	Activity Manual
151	2022	7	29	2	12	Activity Manual
152	2022	8	1	3	3	BMS
153	2022	8	2	1	8	Chapter 10
154	2022	8	5	1	9	Chapter 10
155	2022	8	8	1	8	Chapter 10
156	2022	8	9	2	12	Condtion Survey
157	2022	8	10	2	12	Condition Survey
158	2022	8	11	2	12	Condtion Survey
159	2022	8	12	2	12	Condtion Survey
160	2022	8	19	1	4	Chapter 10
161	2022	8	23	2	16	Field Training
162	2022	8	24	2	14	Field Training
163	2022	8	25	2	14	Field Training
164	2022	8	26	2	16	Field Training
165	2022	8	26	1	6	Chapter 10 and 11
166	2022	9	1	1	10	Chapter 10 and 11
167	2022	9	6	1	10	Chapter 10 and 11
168	2022	9	7	1	10	Chapter 10 and 11
169	2022	9	13	1	12	Chapter 10 and 11
170	2022	9	15	1	11	Chapter 10 and 11
171	2022	9	19	1	7	Chapter 10 and 11
172	2022	9	22	1	6	Chapter 10 and 11
173	2022	9	29	3	4	BMS
174	2022	10	3	3	12	BMS
175	2022	10	4	3	13	BMS
176	2022	10	5	3	13	BMS
177	2022	10	11	3	3	BMS
178	2022	11	14	1	12	Chapter 12
179	2022	11	15	1	12	Chapter 12
180	2022	11	16	1	12	Chapter 12
181	2022	11	28	1	12	Chapter 12
182	2022	11	29	1	10	Chapter 12
183	2022	11	30	1	12	Chapter 12
184	2022	11	30	2	9	AI Image sytem
185	2022	12	1	2	12	AI Image sytem
186	2022	12	5	1	10	Chapter 12
187	2022	12	5	3	10	BMS
188	2022	12	6	1	10	Chapter 12
189	2022	12	6	3	10	BMS
190	2022	12	7	1	10	Chapter 12
191	2022	12	7	3	10	Site tour
192	2022	12	8	3	10	Site tour
193	2022	12	9	3	12	Site tour
194	2022	12	20	3	7	Management Manual
195	2023	1	18	2	12	Origanization and Procurement
196	2023	1	19	2	13	Origanization and Procurement

S/N	Year	Month	Date	Output	Number of participant	Contents
197	2023	1	20	2	14	Origanization and Procurement
198	2023	1	30	3	12	Site tour
199	2023	1	31	3	15	Site tour
200	2023	2	1	3	15	Site tour
201	2023	2	2	3	15	Site tour
202	2023	2	3	3	15	Site tour
203	2023	2	8	2	9	AI Image sytem and reviced iDRIMS
204	2023	2	9	2	9	AI Image sytem and reviced iDRIMS
205	2023	2	13	1	10	Chapter 13
206	2023	2	14	1	10	Chapter 13
207	2023	2	15	1	10	Chapter 13
208	2023	2	20	1	8	Chapter 13
209	2023	2	21	1	7	Chapter 13
210	2023	2	22	1	7	Chapter 13
211	2023	2	22	2	8	AI Image sytem
212	2023	2	23	2	11	AI Image sytem
213	2023	2	27	3	11	Site tour
214	2023	2	28	3	11	Site tour
215	2023	3	1	3	11	Site tour
216	2023	3	2	3	11	Site tour
217	2023	3	3	3	11	Site tour
218	2023	3	6	2	27	EXCEL
219	2023	3	7	2	27	EXCEL
220	2023	3	8	2	27	EXCEL
221	2023	3	7	1	7	Chapter 13
222	2023	3	8	1	7	Chapter 13
223	2023	3	9	1	7	Chapter 13
224	2023	3	9	2	23	Work Supervision
225	2023	3	20	2	13	EXCEL
226	2023	3	21	2	13	EXCEL
227	2023	3	22	2	13	EXCEL
228	2023	3	23	2	13	EXCEL
229	2023	3	24	2	13	EXCEL
230	2023	3	21	1	6	Chapter 13
231	2023	3	22	1	6	Chapter 13
232	2023	3	23	1	6	Chapter 13
233	2023	3	20	3	8	Chapter 13
234	2023	3	27	2	10	EXCEL
235	2023	3	28	2	10	EXCEL
236	2023	3	29	2	10	EXCEL
237	2023	3	30	2	10	EXCEL
238	2023	3	31	2	10	EXCEL
239	2023	3	28	1	5	Appendix
240	2023	3	29	1	5	Appendix
241	2023	3	30	1	5	Appendix
242	2023	3	28	3	8	Management Manual
243	2023	3	29	3	8	Management Manual
244	2023	3	30	3	8	Management Manual
245	2023	4	3	2	9	Organization, Procurement and Work Supervision

S/N	Year	Month	Date	Output	Number of participant	Contents
246	2023	4	4	2	9	Organization, Procurement and Work Supervision
247	2023	4	5	2	9	Organization, Procurement and Work Supervision
248	2023	4	6	2	9	Organization, Procurement and Work Supervision
249	2023	4	4	3	5	Organization, Procurement and Work Supervision
250	2023	4	11	2	10	EXCEL
251	2023	4	12	2	10	EXCEL
252	2023	4	13	2	10	EXCEL
253	2023	4	14	2	10	EXCEL
254	2023	4	11	1	5	Chapter 1,2,3,4 and 5
255	2023	4	12	1	5	Chapter 1,2,3,4 and 5
256	2023	4	13	1	5	Chapter 1,2,3,4 and 5
257	2023	4	14	1	5	Chapter 1,2,3,4 and 5
258	2023	4	17	2	11	AI Image sytem and reviced iDRIMS
259	2023	4	18	2	11	AI Image sytem and reviced iDRIMS
260	2023	4	19	2	11	AI Image sytem and reviced iDRIMS
261	2023	4	20	2	11	AI Image sytem and reviced iDRIMS
262	2023	4	21	2	11	AI Image sytem and reviced iDRIMS
263	2023	4	17	3	5	Inspection and Management Manual
264	2023	4	18	1	5	Chapter 6 and 7
265	2023	4	19	1	5	Chapter 6 and 7
266	2023	4	20	1	5	Chapter 6 and 7
267	2023	4	18	3	3	Inspection and Management Manual
268	2023	4	20	3	3	Inspection and Management Manual
269	2023	4	21	3	3	Inspection and Management Manual
270	2023	4	24	TS	93	Technical Seminor
271	2023	4	25	TS	93	Technical Seminor
272	2023	5	3	2	6	EXCEL
273	2023	5	3	1	8	Chapter 8
274	2023	5	4	1	8	Chapter 8
275	2023	5	5	1	8	Chapter 8
276	2023	5	9	1	5	Chapter 9
277	2023	5	10	1	5	Chapter 9
278	2023	5	11	1	5	Chapter 9
279	2023	5	12	1	5	Chapter 9
280	2023	5	15	2	12	Organization, Procurement and Work Supervision
281	2023	5	16	2	12	Organization, Procurement and Work Supervision
282	2023	5	17	2	12	Organization, Procurement and Work Supervision
283	2023	5	18	2	12	Organization, Procurement and Work Supervision
284	2023	5	19	2	12	Organization, Procurement and Work Supervision
285	2023	5	16	3	8	Inspection and Management Manual
286	2023	5	17	3	8	Inspection and Management Manual
287	2023	5	18	3	8	Inspection and Management Manual
288	2023	5	19	3	8	Inspection and Management Manual
289	2023	5	16	1	5	Chapter 9
290	2023	5	17	1	5	Chapter 9
291	2023	5	18	1	5	Chapter 9
292	2023	5	19	1	5	Chapter 9
293	2023	6	5	2	14	Organization, Procurement and Work Supervision
294	2023	6	6	2	14	Organization, Procurement and Work Supervision

S/N	Year	Month	Date	Output	Number of participant	Contents
295	2023	6	7	2	14	Organization, Procurement and Work Supervision
296	2023	6	8	2	14	Organization, Procurement and Work Supervision
297	2023	6	9	2	14	Organization, Procurement and Work Supervision
298	2023	6	13	1	8	Chapter 10,11 and 12
299	2023	6	14	1	8	Chapter 10,11 and 12
300	2023	6	15	1	8	Chapter 10,11 and 12
301	2023	6	16	1	8	Chapter 10,11 and 12
302	2023	6	19	3	10	Inspection and Management Manual
303	2023	6	20	3	10	Inspection and Management Manual
304	2023	6	21	3	10	Inspection and Management Manual
305	2023	6	22	3	10	Inspection and Management Manual
306	2023	6	23	3	10	Inspection and Management Manual
307	2023	6	20	1	5	Chapter 10,11 and 12
308	2023	6	21	1	5	Chapter 10,11 and 13
309	2023	6	22	1	5	Chapter 10,11 and 14
310	2023	6	23	1	5	Chapter 10,11 and 15
311	2023	7	4	1	7	Chapter 13
312	2023	7	5	1	7	Chapter 13
313	2023	7	6	1	7	Chapter 13
314	2023	7	7	1	7	Chapter 13
315	2023	7	17	2	10	Activity and Condition Survery
316	2023	7	18	2	10	Activity and Condition Survery
317	2023	7	19	2	10	Activity and Condition Survery
318	2023	7	20	2	10	Activity and Condition Survery
319	2023	7	21	2	10	Activity and Condition Survery
320	2023	7	19	1	4	Chapter 13
321	2023	7	20	1	4	Chapter 13
322	2023	7	21	1	4	Chapter 13
323	2023	7	22	1	4	Chapter 13
324	2023	7	23	1	4	Chapter 13
325	2023	7	25	1	5	Chapter 13
326	2023	7	26	1	5	Chapter 13
327	2023	7	27	1	5	Chapter 13
328	2023	7	28	1	5	Chapter 13
329	2023	8	3	2	15	Activity and Condition Survery
330	2023	8	10	2	13	Activity and Condition Survery
331	2023	8	17	2	15	Activity and Condition Survery
332	2023	8	20	1	5	Chapter 13
333	2023	8	21	1	5	Chapter 13
334	2023	8	23	1	5	Chapter 13
335	2023	9	3	1	5	Appenix
336	2023	9	4	1	5	Appenix
337	2023	9	5	1	5	Appenix
338	2023	9	6	1	5	Appenix
339	2023	9	7	1	5	Appenix
340	2023	9	28	1	5	Appenix

Annex 1-4 List of Equipment

Equipment given in the next pages were provided to the receipent country.

List of Provided Equipment

Equipment	Description	Qnt.	Handover Date
Hammer Drill	-Li-ion impact drill -Drill volts: 18v -No-load speed:0-400/0-1350min-1 -Impact frequency: 0-20000/min -Chuck capacity: 0.8-10mm -Max torque force: 30N.m -Torque settings: 21+1+1 Accessories -1pcs battery pack -1pcs 2hr charger -1pcs magnetic holder -6pcs Cr-V bits -6pcs HSS drill bits	3	28th January, 2020
iPhone	iPhone 7 32GB	10	3rd February, 2021
Personal Computer	HP-Envy X360 - Intel Core i7 10th GEN - 16 GB 512 SSD - 15.6" Touch screen - Keyboard light - Windows 10	10	3rd March, 2021
Potable Road Hump	H6005BK (300x300x50)	2	4th April, 2021
Video Camera	GoPro Hero 7 Silver	10	3rd April, 2021
Micro SD Card	256GB SDXC A2 SDSQXA1	10	3rd April, 2021
Digital Distance Meter	BOSCH GLM250VF	3	16th May, 2021
Portable Road Hump	Rubber	3	7th October, 2021
Concrete Test Hammer	N-6500	3	7th October, 2021
Re-bar Survey Device	RC-Radar NJJ-105	1	7th October, 2021
Ultrasonic Plate Thickness Gauge	MVX Version 2	3	7th October, 2021
Film Thickness Measuring Instrument	Surfix easy F	3	7th October, 2021
Bridge Inspection Drone	Mavic 2 Pro	2	7th October, 2021
Drone Camera	Gopro Hero 8	2	7th October, 2021
CD Card for the Drone Camera	256GB	2	7th October, 2021
Drone Attachment Kit	Mavic-2 Fly more kit	2	7th October, 2021
Drone Attachment	Connection parts of Drone and Camera	2	7th October, 2021
BMS software	File Maker Pro	12	7th October, 2021
GPS Logger	Nomad 5	3	7th October, 2021
Data Server	HPML30 Gen10 Server 16GB Ram 4TB HDD MS Windows Server 2019 Standard MS Server 2019 Client Access	1	7th October, 2021

	License (CAL) Device HP 19” Monitor APC 1400 VA UPS		
HDD	1TB HDD	3	7th October, 2021
Personal Computer	HP ENVY X360 Convertible Notebook - Intel Core i5 11th Generation Processor - 8GB RAM, 512 SSD, 15.6” Touch Display Screen, Keyboard light - Fingerprint Reader, - Windows 10	9	22nd November, 2022
HDD	Toshiba 4TB External HDD	1	22nd November, 2022
Photocopy Machine	CANON IMAGE RUNNER C5535i	1	10th November 2023

Annex 1-5 List of Counterparts

List and assignment of counterparts are given in the next page.

Annex-24

Name	Position	Organization	2019												2020												2021												2022												2023												2024		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	8
Mr. Edmond Offei-Annor	Chief Director (Project Director)	MRH																																																																				
Dr. Abass M. Awolu	Chief Director (Project Director)	MRH																																																																					
Ms. Rita Ohene Sarfoh	Director P&P (Project Manager)	MRH																																																																					
Mr. Sawherr-Markwari	Director Maintenance	GHA																																																																				
Mr. David Sitsofe Addo	Director of Planning	GHA																																																																				
Mr. Gordon Amartey	Director, Survey and Design	GHA																																																																			
Mr. Collins Donkor	Director of Contractors	GHA																																																																			
Mr. Victor N. Baah	Principal Engineer, Bridges	GHA																																																																		
Mr. Akwasi Nuamah	Director of Maintenance	DUR																																																																		
Ms. Adwoa Duku	Regional Director, GA	DUR																																																																		
Mr. I. B. Armah	Principal Engineer, Bridges	DUR																																																																
Mr. Mawutor Keketsyor	Principal Engineer	DUR																																																																	
Mr. K. N. Akosah-Koduah	Deputy Director, Planning	DFR																																																																	
Mr. Roosevelt Odai Otoo	Deputy Director, Maintenance	DFR																																																															
Ms. Efua Effah	Principal Engineer, (P&P)	MRH																																																															
Mr. James K. Atiemo	Quantity Surveyor, (M&E)	MRH																																																														
Mr. George Luttrodt	Engineer, (M&E)	MRH																																																														
Mr. Ernest Apreku	Assistant Engineer, (M&)	MRH																																																												
Mr. Mark Okyere	Road M'tce Manager/NS	GHA																																																												
Mr. Issak Icwofie	Road M'tce Manager/NS	GHA																																																											
Ms. Constance Paintsil	Road M'tce Manager/NS	GHA																																																											
Mr. Andrew Kuttin-Mensah	Senior Engineer	GHA																																																											
Mr. Lovestone Damalie	Principal Engineer (Bridges)	GHA																																																											
Mr. Roland Neequeye	Engineer (Bridges)	GHA																																																											
Mr. Issac Brown	Engineer (Bridges)	GHA																																																										
Mr. Carlos Mensah	Reg. M'tce Engineer, GAR	DUR																																																										
Mr. Shadrach Nartey	Engineer	DUR																																																									
Mr. Jeffrey Darkwah	Assistant Engineer	DUR																																																									
Ms. Nimatu Saani	Assistant Engineer	DUR																																																								
Mr. K. N. Akosah-Koduah	Deputy Director, Planning	DFR																																																								
Mr. Richmond Ankrah	Head, IT/GIS	DFR																																																							
Mr. Frank Amofa Agyemang	Assistant Engineer	DFR																																																							
Mr. Don Kuubeterzie	Principal Engineer, Dev.	DFR																																																						
Mr. Nathan Odjao	Engineer (Bridges)	DFR																																																					
Dr. Charles Afetornu	Deputy Director	KTC																																																				
Mr. Daniel Azare	Director	KTC																																																				

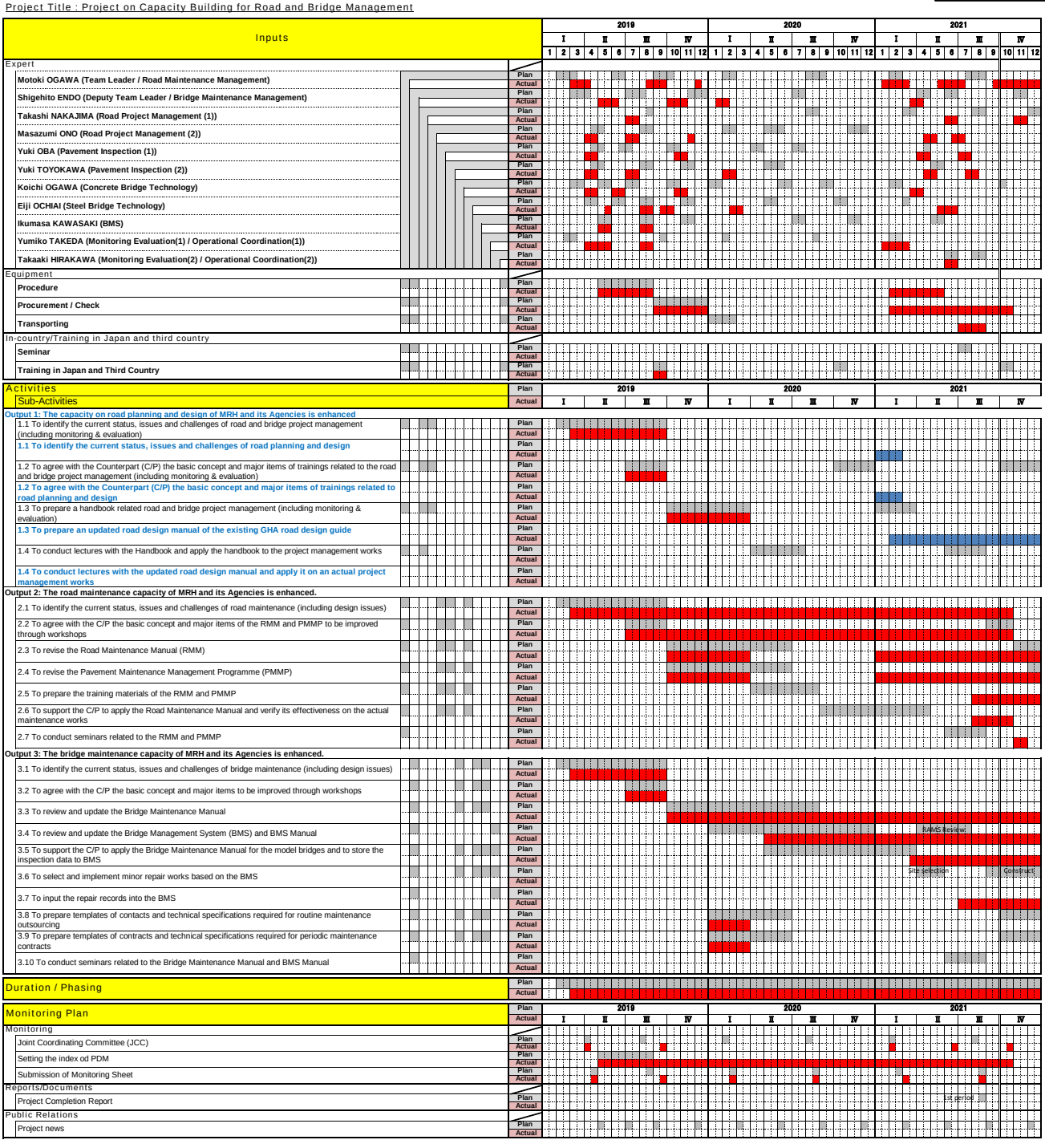
Annex 1-6 Plan of Operation

The Plan of Operation is given in next pages.

Project Monitoring Sheet II (Revision of Plan of Operation)

STAGE-1

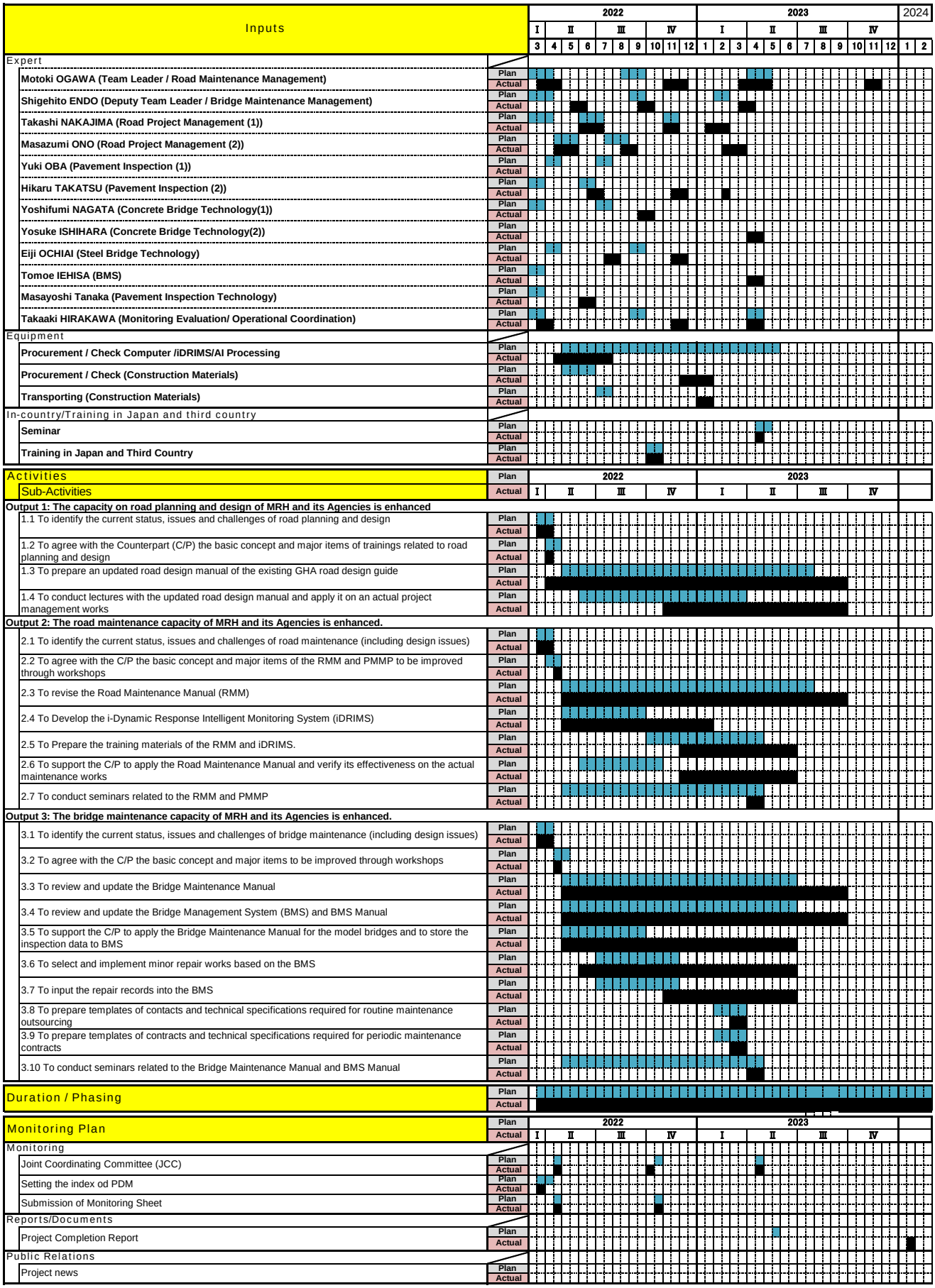
Project Title : Project on Capacity Building for Road and Bridge Management



Project Monitoring Sheet II (Revision of Plan of Operation)

STAGE-2

Project Title : Project on Capacity Building for Road and Bridge Management（Stage-2）



Annex 1-7 Achiivement of Activities

Attachment 1-7: Progress of Activities

*Note: Activities and status for Output-1 are reflected from the amended R/D and PDM-1, i.e. Road Design Manual.

<table>
<tr><td colspan="2">OUTPUT-1 The capacity on road planning and design of MRH its Agencies is enhanced.</td></tr>
<tr><td>Activity 1-1
<u>Completed</u></td><td><u>< To identify the current status, issues and challenges of road planning and design. ></u>
• Existing GHA Road Design Manual and other relevant documents were reviewed.
• Japanese Road Design Guidelines as the reference was reviewed.</td></tr>
<tr><td>Activity 1-2
<u>Competed</u></td><td><u>< To agree with the Counterpart (C/P) on the basic concept and major items of trainings related to road planning and design.></u>
• Regarding OP-1, target manuals to be updated was agreed as the existing GHA “Road Design Manual” for OP-1 in the JCC-3 on 12th February 2021.
• Regarding OP-3, Updating Bridge Inspection Manual, Bridge Management Manual and re-building of BMS was agreed.</td></tr>
<tr><td>Activity 1-3
<u>Completed</u></td><td><u>< To prepare an updated road design manual of the existing GHA road design guide.></u>
• Draft contents is going to be discussed among the C/Ps and the Project when the C/Ps are re-assigned.
• Draft version based on the Japanese Ordinance prepared by CBRB Experts support
• Workshop carried out with CBRB experts and C/P in Koforidua Training Centre or MRH Room G10.</td></tr>
<tr><td>Activity 1-4
<u>Completed</u></td><td><u><i><To conduct lectures and seminars with the updated road design manual and apply it on the actual project management works.</i>></u>
• The first technical seminar was conducted on 28th October 2021 in Accra. All regional engineers of 3 agencies attend.
• The second technical seminar was conducted on 26th and 27th April 2023. All regional engineers of 3 agencies attended. Television, newspapers, and other public relations media also participated, and coverage was made the following day.
• Following workshop, field training, interviews were conducted.
<table>
<tr><th colspan="2">Monitoring Sheet (MS)</th><th>OP-1</th><th>OP-2</th><th>OP-3</th><th>Others</th><th>Total</th></tr>
<tr><td>MS-1</td><td>Workshop (days)</td><td>0</td><td>0</td><td>0</td><td>16</td><td>16</td></tr>
<tr><td>2019.4.17</td><td>Cumulated number of participants</td><td>0</td><td>0</td><td>0</td><td>152</td><td>152</td></tr>
<tr><td>MS-2</td><td>Workshop (days)</td><td>0</td><td>0</td><td>0</td><td>38</td><td>38</td></tr>
<tr><td>2019.9.30</td><td>Cumulated number of participants</td><td>0</td><td>0</td><td>0</td><td>330</td><td>330</td></tr>
<tr><td>MS-3</td><td>Workshop (days)</td><td>0</td><td>0</td><td>1</td><td>7</td><td>8</td></tr>
<tr><td>2020.3.31</td><td>Cumulated number of participants</td><td>0</td><td>0</td><td>12</td><td>55</td><td>67</td></tr>
<tr><td>MS-4</td><td>Workshop (days)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>2020.9.30</td><td>Cumulated number of participants</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>MS-5</td><td>Workshop (days)</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>2021.2.28</td><td>Cumulated number of participants</td><td>0</td><td>0</td><td>5</td><td>0</td><td>5</td></tr>
<tr><td>MS-6</td><td>Workshop (days)</td><td>34</td><td>32</td><td>41</td><td>0</td><td>107</td></tr>
<tr><td>2021.10.27</td><td>Cumulated number of participants</td><td>101</td><td>143</td><td>114</td><td>0</td><td>358</td></tr>
<tr><td>MS-7</td><td>Workshop (days)</td><td>3</td><td>0</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>2022.4.19</td><td>Cumulated number of participants</td><td>30</td><td>0</td><td>0</td><td>0</td><td>30</td></tr>
<tr><td>MS-8</td><td>Workshop (days)</td><td>52</td><td>24</td><td>26</td><td>0</td><td>102</td></tr>
<tr><td>2022.10.31</td><td>Cumulated number of participants</td><td>333</td><td>220</td><td>48</td><td>0</td><td>601</td></tr>
<tr><td>Subtotal</td><td>Workshop (days)</td><td>89</td><td>56</td><td>69</td><td>61</td><td>275</td></tr>
<tr><td></td><td>Cumulated number of participants</td><td>464</td><td>363</td><td>179</td><td>537</td><td>1543</td></tr>
<tr><td>FINAL</td><td>Workshop (days)</td><td>134</td><td>86</td><td>81</td><td>61</td><td>362</td></tr>
<tr><td></td><td>Cumulated number of participants</td><td>934</td><td>1036</td><td>498</td><td>537</td><td>3005</td></tr>
</table></td></tr>
<tr><td colspan="2">OUTPUT-2 The road maintenance capacity of MRH and its Agencies is enhanced.</td></tr>
<tr><td>Activity 2-1
<u>Completed</u></td><td><u>< To identify the current status, issues and challenges of road maintenance (including design issues)></u>
• Working group was formulated with assigned C/Ps and the Project, current Institutional and Technical Challenges of MRH and its agencies (GHA, DUR and DFR) were identified.
• Existing manuals and guidelines for road maintenance were observed.
• Interview to Directors of Road maintenance in GHA, DUR and DFR was carried out to identify the gap in</td></tr>
</table>

	current RMM and PMMP.
Activity 2-2 **Completed**	*< To agree with the C/P the basic concept and major items of the RMM and PMMP to be improved through workshops>* • Part of focus of the manuals to be updated was agreed on Activity Manual and Road Condition Survey Manual of RMM. Items to be improved was agreed by increasing accuracy of IRI measurement by using iDRIMS to contribute to the prioritization of the road maintenance plan. They are approved in JCC-3 on 12th February 2021. • Regarding OP-2, agreement was made in the JCC-6 on 27th October 2021 to demarcate the target to updated on RMM between MRH and CBRB that CBRB handles the technical part which is the Activity and Condition Survey Manual while C/P take care of the Organisation, Procurement and Work Supervision. Also, it was agreed with the C/P to store the iDRIMS data in the expanded the BMS.
Activity 2-3 **Completed**	*< To revise the Road Maintenance Manual (RMM)>* • iDRIMS operation manual and training manual are drafted as a part of revision of Road Condition Survey Manual • iDRIMS software updated to reflect the Ghana needs. • Field training conducted to confirm the usage of the current iDRIMS system in Ghana. • Introduction of AI image system (calculate damage of the surface automatically by dash camera images) and trail of cold mix asphalt designed in Japan.
Activity 2-4 **Completed**	*< To revise the Pavement Maintenance Management Programme (PMMP)>* • Current usability of PMMP and software of PMMP was reviewed by the expert team. • Since TSIP system funded WB replace PMMP, instead updating PMMP, it was agreed to prepare iDRIMS user manual. • BMS system build and IP Global introduced for 3 years after termination to transfer data from site to BMS directly.
Activity 2-5 **Completed**	*< To prepare the training materials of the RMM and PMMP>* • PMMP is agreed to be replace to iDRIMS operational manual. • Video of field training of iDRIMS was taken and edited as a training material of introduction. • Video of field training of AI image system and cold mix asphalt was taken and edited as a training material of introduction.
Activity 2-6 **Completed**	*< To support the C/P to apply the Road Maintenance Manual and verify its effectiveness on the actual maintenance works >* • Refer to Activity 1-4.
Activity 2-7 **Completed**	*< To conduct seminars related to the RMM and PMMP >* • Refer to Activity 1-4.
OUTPUT-3 The bridge maintenance capacity of MRH and its Agencies is enhanced.	
Activity 3-1 **Completed**	*< To identify the current status, issues and challenges of bridge maintenance (including design issues)>* • Working group was settled with assigned C/Ps and the Project, current Institutional and Technical Challenges of MRH and its agencies (GHA, DUR and DFR) were identified. • Selected bridge sites were visited in the Greater Accra, Eastern, Central and the Volta Regions of Ghana.
Activity 3-2 **Completed**	*< To agree with the C/P the basic concept and major items to be improved through workshops>* • Agreed in JCC-3 on 12th February 2021 to update the current manuals to “Bridge Inspection Manual”, “Bridge Management Manual” and “BMS User Manual”.
Activity 3-3 **Completed**	*< To review and update the Bridge Maintenance Manual>* • Revision of Bridge Inspection Manual and Bridge Management Manual was drafted in the workshops through discussion with counterparts.
Activity 3-4 **Completed**	*< To review and update the Bridge Management System (BMS) and BMS Manual >* • BMS build and server installed. • BMS user manual drafted.
Activity 3-5 **Completed**	*< To support the C/P to apply the Bridge Maintenance Manual for the model bridges and to store the inspection data to BMS >* • Data collected from the field training (bridge inspection) installed to the system. • Global IP installed so that data collected at site could directly transferred to BMS located at MRH from site • 3 years extension of Global IP after termination of Project secured by the Project.
Activity 3-6 **Completed**	*< To select and implement minor repair works based on the BMS>* • Two sites are expected where one for metal and another for concrete. Due to budget reasons, site shall be chosen near Accra based on the priority of the Agencies.

Activity 3-7 **Completed**	*< To input the repair records into the BMS >* • *Refer to Activity 3-6.*
Activity 3-8 **Completed**	*< To prepare templates of contracts and technical specifications required for routine maintenance outsourcing >* • The subject specification is excluded from the scope of this project because it was confirmed that currently FIDIC is used.
Activity 3-9 **Completed**	*< To prepare templates of contracts and technical specifications required for periodic maintenance contracts >* • The subject specification is excluded from the scope of this project because it was confirmed that currently FIDIC is used.
Activity 3-10 **Completed**	*< To conduct seminars related to the Bridge Maintenance Manual and BMS Manual >* • Refer to Activity 1-4.

Annex-2 List of Products produced by the Project

Extract of the following manuals are attached in the next pages

Annex 2-1 Ghana Road Design 2023

Annex 2-2 Road Maintenance Operations Manual 2023

- Activity Manual 2023
- Organisation Structure 2023
- Road Condition Survey Manual 2023
- Words Supervision 2023
- Road Procurement 2023

Annex 2-3 Bridge Inspection Manual 2023

Annex 2-4 Bridge Management Manual 2023

Annex 2-5 BMS User Manual

RDG 2023

GHANA ROAD DESIGN GUIDE 2023

MINISTRY OF ROADS AND HIGHWAYS

JAPAN INTERNATIONAL COOPERATION AGENCY

Volume I

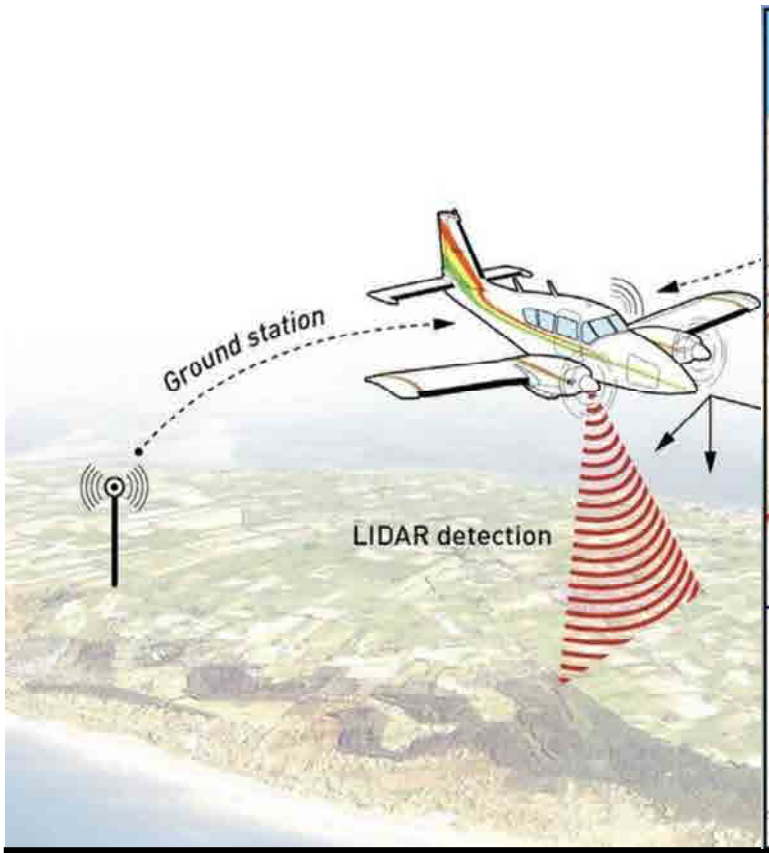
Chapter 1 Introduction

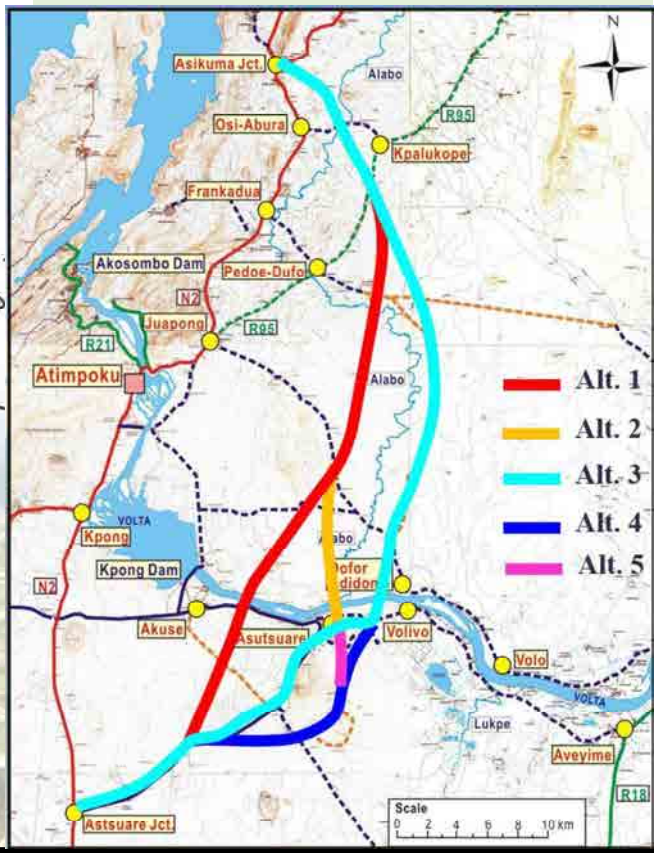
Chapter 2 Road Classification

Chapter 3 Road Design and Corridor Selection

Chapter 4 Road Survey Procedure and Requirements

Chapter 5 Road Safety, Design Control and Criteria





GHANA ROAD DESIGN GUIDE 2023

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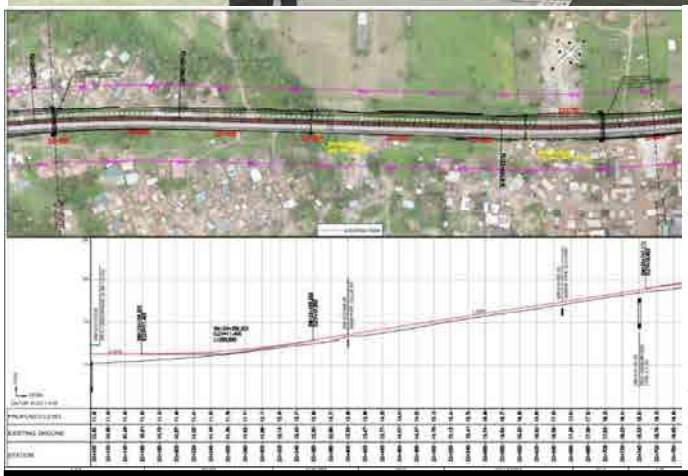
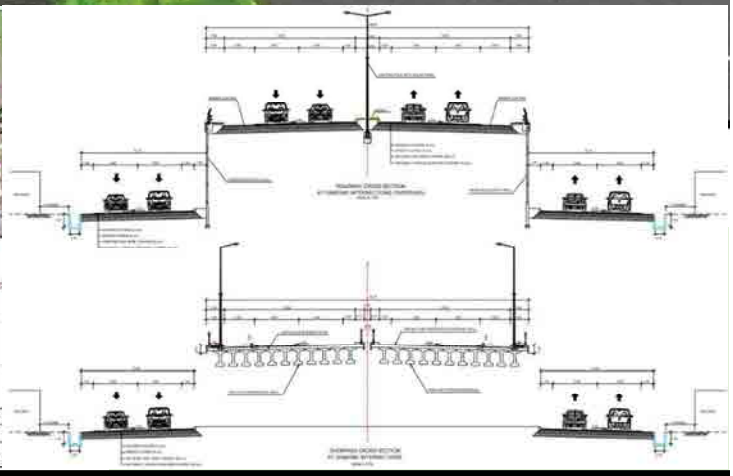
Volume II

Chapter 6 Cross Section Elements

Chapter 7 Elements of Design





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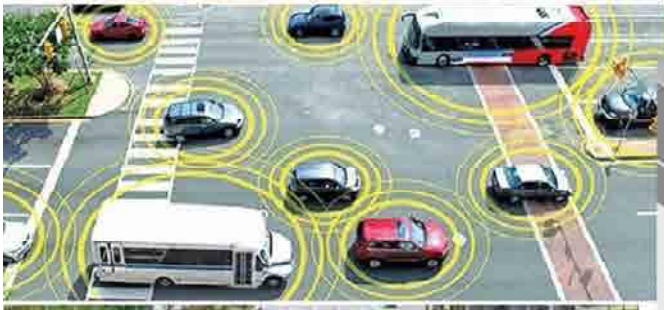

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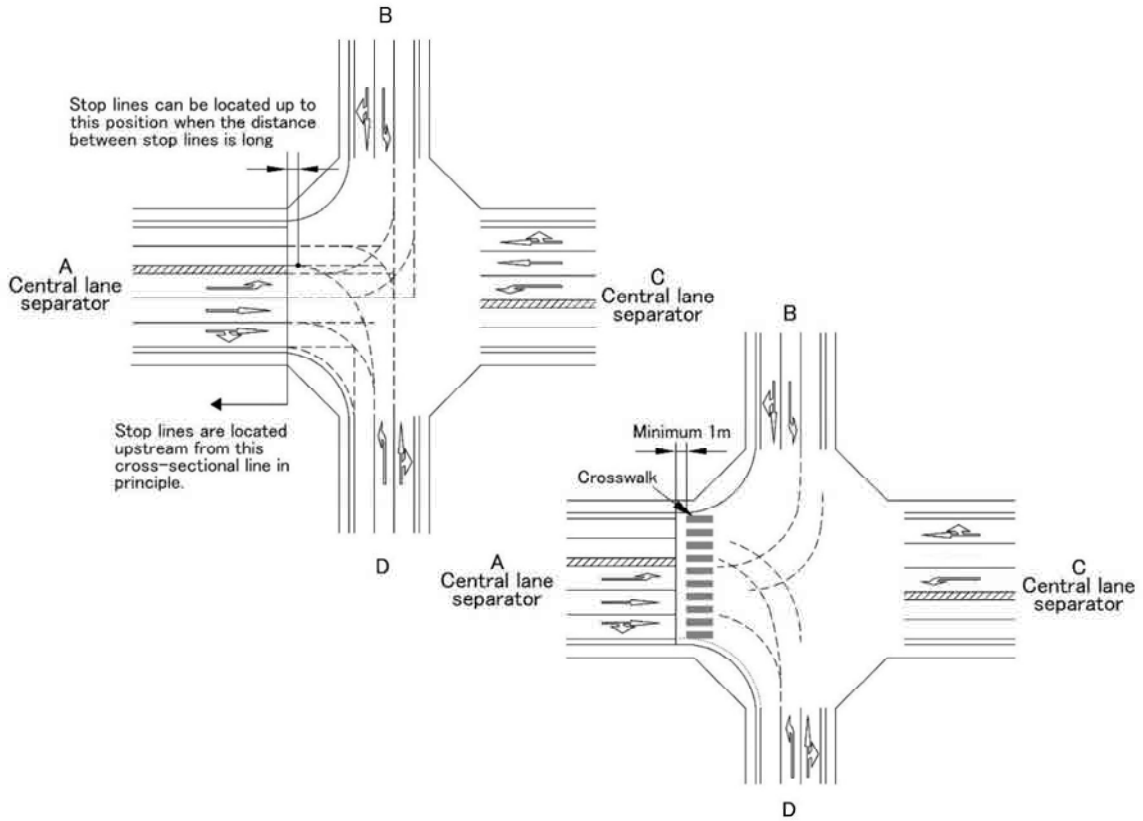

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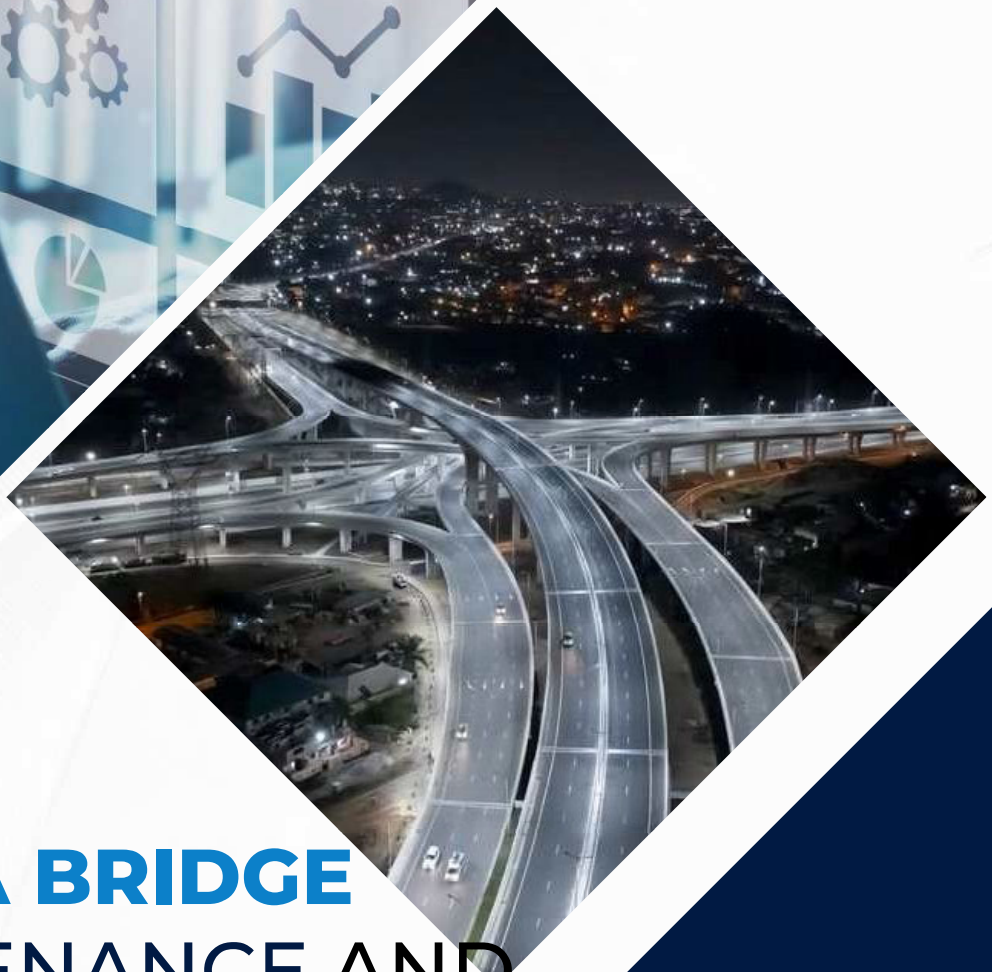

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MINISTRY OF ROADS AND HIGHWAYS (MRH)

GHANA HIGHWAY AUTHORITY (GHA)

DEPARTMENT OF URBAN ROADS (DUR)

DEPARTMENT OF FEEDER ROADS (DFR)

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

BMS USER MANUAL 2023

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Annex-3 Amendment record of the PDM

2019 April: Original PDM

2020 December: 1st Amendment

2021 October: 2nd Amendment

2022 December: 3rd Amendment

[Original PDM]

Project Design Matrix (PDM)

Version No. 0
Date: 8th Apr. 2019

Project Title: Project on Capacity Building for Road and Bridge Management
Project Period: 4 years from Feb. 2019 to Feb. 2023
Target Areas: Ghana Nationwide
Target Group: Ministry of Road Highway (MRH) and Ghana Highway Authority (GHA), Department of Urban Roads (DUR), Department of Feeder Roads (DFR)
Implementation Agency: MRH and GHA, DUR, DFR

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Roads including bridges in Ghana are appropriately maintained.	1. The road length which are maintained according to the Manuals is increased from X to Y. 2. The number of preventive-maintained bridges is increased from X to Y.	・ Reports of MRH, GHA, DUR and DFR ・ Interviews with MRH, GHA, DUR, and DFR	
Project Purpose Capacity of MRH and its Agencies in road and bridge management is improved.	1. X% of projects are monitored and evaluated with the Handbook 2. RMM (including PMMP) is applied to actual maintenance works 3. BMS is utilized to select repair works	1. Project Completion Report 2. Project Completion Report 3. Project Completion Report	
Outputs 1 The road and bridge project management (including monitoring & evaluation) capacity of MRH and its Agencies is enhanced. 2 The road maintenance capacity of MRH and its Agencies is enhanced. 3 The bridge maintenance capacity of MRH and its Agencies is enhanced.	1-1 The Handbook is officially approved by MRH 1-2 The Handbook is understood by X% of seminar participants 2-1 Road maintenance Manual is officially approved by MRH 2-2 Road maintenance works for which the Manual is applied are increased from XX% to YY % 2-3 Quality of the road maintenance works are improved. 3-1 The Bridge Maintenance Manual is officially approved by MRH 3-2 Established BMS is functioned 3-3 XX % of seminar participants scores more than XX points.	1-1 Official endorsement by MRH 1-2 Questionnaire to participants 2-1 Official endorsement by MRH 2-2 Monitoring Sheet 2-3 Monitoring Sheet 3-1 Official endorsement by MRH 3-2 Monitoring Sheet 3-3 Examination to participants	
Activities 1-1 To identify the current status, issues and challenges of road and bridge project management (including monitoring & evaluation) 1-2 To agree with the Counterpart (C/P) the basic concept and major items of trainings	**Inputs:** (1) Japanese side ・Experts ➢ Project Leader/Road Design & Maintenance ➢ Deputy		・ Budgets and human resources are appropriately secured.

	related to the road and bridge project management (including monitoring & evaluation)	Project leader/Bridge Design & Maintenance ➢ Road Administration ➢ Pavement Inspection ➢ Concrete Bridge ➢ Steel Bridge ➢ Bridge Management System ➢ Monitoring and Evaluation	
1-3	To prepare a handbook related road and bridge project management (including monitoring & evaluation)	・C/P training in Japan ・Necessary equipment for the project activities	
1-4	To conduct lectures with the Handbook and apply the handbook to the project management works	(2) Ghana side ・Counterpart Personnel ・Office space, furniture, internet. etc ・Expenses for the project such as C/P personnel expenses and pilot minor repair works, if any ・Annual maintenance works	
2-1	To identify the current status, issues and challenges of road maintenance (including design issues)		
2-2	To agree with the C/P the basic concept and major items of the RMM and PMMP to be improved through workshops		
2-3	To revise the Road Maintenance Manual (RMM)		
2-4	To revise the Pavement Maintenance Management Programme (PMMP)		
2-5	To prepare the training materials of the RMM and PMMP		
2-6	To support the C/P to apply the Road Maintenance Manual and verify its effectiveness on the actual maintenance works		
2-7	To conduct seminars related to the RMM and PMMP		
3-1	To identify the current status, issues and challenges of bridge maintenance (including design issues)		
3-2	To agree with the C/P the basic concept and major items to be improved through workshops		
3-3	To review and update the Bridge Maintenance Manual		
3-4	To review and update the Bridge Management System (BMS) and BMS Manual		
3-5	To support the C/P to apply the Bridge Maintenance Manual for the model bridges and to store the inspection data to BMS		**Pre-condition** ・ Safety in Ghana is ensured.
3-6	To select and implement minor repair works based on the BMS		
3-7	To input the repair records into the BMS		
3-8	To prepare templates of contacts and technical specifications required for routine maintenance outsourcing		
3-9	To prepare templates of contracts and technical specifications required for periodic maintenance contracts		
3-10	To conduct seminars related to the Bridge Maintenance Manual and BMS Manual		

[Amendment from PDM_0 to PDM_1（2020,December）]

Components of the PDM		Corrections
Narrative Summary	**Output 1**	From the discussions with C/P, it was found that the current road design guide did not cover some design issues. When road engineers face with the issues, they take action based on their own experiences, which is inconsistent with road design standard in Ghana. As updating the road design guide contributes to the improvement of road projects in Ghana, the Output 1 is amended in the following way. **Before**: The road and bridge project management capacity of MRH and its Agencies is enhanced. **After**: The capacity on road planning and design of MRH and its Agencies is enhanced.
	Activities Activity 1-1 Activity 1-2 Activity 1-3 Activity 1-4	The Activities (from 1-1 to 1-4) are amended according to the revised Output 1 as mentioned above. **Before**: Identify the current status, issues and challenges of road and bridge project management. **After**: Identify the current status, issues and challenges of road planning and design. **Before**: Agree with the Counterpart (C/P) the basic concept and major items of trainings related to the road and bridge project management. **After**: Agree with the Counterpart (C/P) the basic concept and major items of trainings related to road planning and design. **Before**: Prepare a handbook related road and bridge project management. **After**: Prepare an updated road design manual of the existing GHA road design guide. **Before**: Conduct lectures with the Handbook and apply the Handbook to the project management works. **After**: Conduct lectures and seminars with the updated road design manual and apply it on an actual project management works.
Indicators	**Project Purpose** Indicator 1	Based on the modification of the Output 1, the Handbook is changed into road design manual. **Before**: X% of projects are monitored and evaluated with the Handbook. **After**: X% of projects are planned and designed with the updated road design manual.
	Output 1 Indicator 1-1 Indicator 1-2	Due to the change in the Output 1, the corresponding indicators are also adjusted as follows. **Before**: The Handbook is officially approved by MRH. **After**: The updated road design manual is officially approved by MRH. **Before**: The Handbook is understood by X% of seminar participants. **After**: The road design manual is understood by X% of seminar participants.

Components of the PDM		Corrections
Means of Verification (MOV)	**Output 1** MOV 1-1	As MRH is able to endorse the updated manual under its jurisdiction, the updated manual, *per se*, is regarded as MOV. **Before**: Official endorsement by MRH **After**: The updated road design manual

[Amendment from PDM_1 to PDM_2（2021,October）]

Components of the PDM		Corrections
Basic Info.	**Target Group**	The capacity of Koforidua Training Centre (KTC) for road and bridge management is also enhanced through the project activities. Thus, KTC is added to the Target Group.
Narrative Summary	**Activities** Activity 1-3&1-4	"Road design manual" is modified to "road design guide" because of using the official title. * The indicator 1-1 is also modified from "manual" to "guide."
	Activity 2-4, 2-5, 2-7	PMMP is amended to the iDRIMS supported by JICA because PMMP is transferred to TSIP. **Before**: PMMP **After**: iDRIMS (User Manual)
	Activity 3-3, 3-4, 3-5, and 3-10	The following titles are changed as follows because of using the official title. **Before**: (1) Bridge Maintenance Manual (2) BMS Manual **After**: (1) Bridge Maintenance and Management Manual (2) BMS User Manual * The indicator 3-1 is also amended as shown in (1) above.
Indicators	**Overall Goal** Indicator 1	As the Project focuses on road inspection, the road maintenance is modified to the road inspection. "Manuals" is specified into "road maintenance manual (RMM)." Also, target values are established separately by each agency, *i.e.*, GHA, DUR, and DFR. **The indicator modified:** The length of roads inspected by using the road maintenance manual (RMM) reaches more than XX/YY/ZZ km across the country under the supervision of GHA, DUR, and DFR respectively.
	Indicator 2	As the Project focuses on bridge inspection, the preventive maintenance of bridges is modified to the bridge inspection. Also, the target values are established separately by each agency in the same way as mentioned above. **The indicator modified:** The number of bridges inspected by using the Bridge Maintenance and Management Manual attains to more than XX/YY/ZZ across the country under the supervision of GHA, DUR, and DFR respectively.
	Indicator 3	A new indicator for road maintenance plan is established to conduce to the road maintenance through the results of road inspection. **The indicator modified:** The Road Maintenance Plans are formulated by GHA, DUR, and DFR respectively according to the RMM.
	Project Purpose	

Components of the PDM		Corrections
	Indicator 1	Target values of the projects planned and designed are established separately by each agency with the actual number, not the percentage (%). **The indicator modified:** More than 82/445/500 projects are planned and designed with the updated road design guide under the supervision of GHA, DUR, and DFR respectively.
	Indicator 2	This indicator is changed from road maintenance works into the length of road inspection in Eastern, Central, and Greater Accra Regions. **The indicator modified:** The length of roads inspected by using the RMM reaches more than 1,529/587/4,246 km in Eastern Region, 1,294/1,280/3,387 km in Central Region, and 357/8,036/1,320 km in Greater Accra Region under the supervision of GHA, DUR, and DFR respectively.
	Indicator 3	As the Project focuses on the bridge inspection, the selection of repair works for bridges is modified to the inspection of 30 bridges. **The indicator modified:** 30 bridges prioritized by the Project are inspected according to the Bridge Maintenance and Management Manual.
	Output 1 Indicator 1-2	The expression is amended as shown below. Also, the target value is established in 70% in consultation with C/P. **The indicator modified:** The level of understanding of seminar participants on the road design guide exceeds 70% on average.
	Output 2 Indicator 2-2	In consistency with the Output 1 and Output 3, the Project confirms how much seminar participants understand the road maintenance on behalf of the rate of increase in road maintenance works. **The indicator modified:** The level of understanding of seminar participants on the road maintenance exceeds 70% on average.
	Indicator 2-3	As the Project focuses on road inspection, the quality of the road maintenance works is deleted.
	Output 3 Indicator 3-2	Since it is difficult to confirm whether or not BMS is functional, this indicator is modified as “bridge specialists utilize the BMS.” **The indicator modified:** 2/2/3 bridge specialists of GHA, DUR, and DFR become able to utilize the BMS.

Components of the PDM		Corrections
	Indicator 3-3	Data collection method is changed from the examination to questionnaire survey in consultation with C/P. Thus, questionnaire survey to seminar participants is carried out on behalf of the examination to participants. Also, the target value is established in 70% through the discussion with C/P. **The indicator modified:** The level of understanding of seminar participants on the bridge maintenance exceeds 70% on average.
Means of Verification (MOV)	**Overall Goal**	As MOVs were composed of reports and interview of each agency, those MOVs are properly amended as follows. **The indicator modified:** (1) Road inspection form attached to the RMM (2) Bridge Management System (BMS) (3) Road Maintenance Plans formulated by GHA, DUR, and DFR
	Project Purpose	As MOVs were composed of "Project Completion Report," those MOVs are properly amended as follows. **The indicator modified:** (1) Checklist attached to the updated road design guide (2) Road inspection form attached to the RMM (3) BMS
	Outputs MOV 1-1, 2-1, 3-1	The MOV for approval of guide and manuals is revised as follows. "Approval letter of MRH"
	MOV 1-2, 2-2, 3-3	The figure in each indicator is collected through the questionnaire survey to seminar participants, and its result is explained in the Seminar Evaluation Report. Also, the Report is attached to the Project Monitoring Sheet (PMS) which is a JICA reporting form. Thus, the MOV is modified in the following way. "Seminar Evaluation Report, Project Monitoring Sheet (PMS)"
	MOV 2-3	As mentioned above, this MOV is deleted because of the elimination of the corresponding indicator.
	MOV 3-2	The MOV is modified as "interview to bridge specialists" because the corresponding indicator is amended.
Inputs	**Japanese side**	The titles of JICA experts are modified as follows based on the actual project activities and the demarcation with the other expert. **Before**: (1) Project Leader / Road Design and Maintenance (2) Deputy Project Leader / Bridge Design and Maintenance **After**: (1) Project Leader / Road Maintenance (2) Deputy Project Leader / Bridge Maintenance

[Amendment from PDM_2 to $PDM_{2\text{-}1}$]

Components of the PDM		Corrections
Basic Info.	**Project Period**	Project period was extended for three (3) months from February to May 2023 due to the late start of the Stage-2 of the Project.
Indicators	**Overall Goal** Indicator 1	The target values achieved by 2025 are fulfilled in the indicator as shown below. **The indicator modified:** The length of roads inspected by using the road maintenance manual (RMM) reaches more than **15,548/28,480/48,357** km across the country under the supervision of GHA, DUR, and DFR respectively.
	Indicator 2	The target values achieved by 2025 are fulfilled in the indicator as shown below. **The indicator modified:** The number of bridges inspected by using the Bridge Maintenance and Management Manual attains to more than **200/103/98** across the country under the supervision of GHA, DUR, and DFR respectively.

Annex-4 Record of Discussion and JCC Minutes

[Record of Discussion]

Original 2018 September

1st Amendment 2020 December

2nd Amendment 2022 March

[JCC Minutes]

1st JCC 2019.04.08

2nd JCC 2019.09.25

3rd JCC 2021.02.12

4th JCC 2021.06.24

5th JCC 2021.10.27

6th JCC 2022.04.21

7th JCC 2022.12.13

8th JCC 2023.04.27

RECORD OF DISCUSSIONS

FOR

THE PROJECT ON CAPACITY BUILDING FOR ROAD AND BRIDGE MANAGEMENT

AGREED UPON BETWEEN

MINISTRY OF ROADS AND HIGHWAYS AND ITS AGENCIES

OF

THE REPUBLIC OF GHANA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

Accra, November 9, 2018

Based on the Minutes of Meetings on the Detailed Planning Survey for the Project on Capacity Building for Road and Bridge Management (hereinafter referred to as "the Project") signed on March 15th, 2017 between Ministry of Roads and Highways of the Republic of Ghana (hereinafter referred to as "the Counterpart") and the Japan International Cooperation Agency (hereinafter referred to as "JICA"), JICA held series of discussions with the Counterpart and relevant organizations to develop a detailed plan of the Project.

The purpose of this Record of Discussions (hereinafter referred to as "the R/D") is to establish a mutual agreement for its implementation by both parties and to agree on the detailed plan of the Project as described in the following and the Annexes, which will be implemented within the framework of the Note Verbales exchanged on 21st October 2016 between the Government of Japan and the Government of the Republic of Ghana.

The Counterpart will be responsible for the implementation of the Project in cooperation with JICA, coordinate with other relevant organizations and ensure that the self-reliant operation of the Project is sustained during and after the implementation period in order to contribute toward social and economic development of the Republic of Ghana.

Both parties also agreed that the Project will be implemented in accordance with the "Basic Principles for Technical Cooperation" published in December 2016 (hereinafter referred to as "the BP"), unless other arrangements are agreed in the R/D.

The R/D is delivered at Accra as of the day and year first above written. The R/D may be amended by a minutes of meetings between both parties, except the plan of operation to be modified in monitoring sheets. The Minutes of Meetings will be signed by authorized persons of each side who may be different from the signers of the R/D.

Hirofumi Hoshi
Chief Representative
JICA Ghana Office
Japan International Cooperation Agency

Edmund Offei-Annor
Chief Director
Ministry of Roads and Highways

Yvonne Quansah
Director, External Resource Mobilization, Bilateral Division
Ministry of Finance

Annex 1 Main Points Discussed
Annex 2 Project Design Matrix (PDM)
Annex 3 Plan of Operation (PO)
Annex 4 Implementation Structure
Annex 5 List of Proposed Members of Joint Coordinating Committee
Annex 6 Counterpart Personnel List

Annex 1

MAIN POINTS DISCUSSED

1. **Framework of the Project**
   Both sides, in principle, have agreed on the framework of the Project. The Project Design Matrix (hereinafter referred to as "PDM") and Plan of Operation (hereinafter referred to as "PO") attached to R/D as Annex 2 and 3 respectively shall be used as a monitoring and management tool of the Project. The PDM and PO will be reviewed and revised flexibly whenever the necessity arises.

2. **Title of the Project**
   Both sides have agreed that the title of the Project is "the Project on Capacity Building for Road and Bridge Management in the Republic of Ghana."

3. **Duration of the Project**
   Both sides have agreed that the duration of the Project is four (4) years from the date of the first arrival of the JICA experts to Ghana based on the framework of the Project. In the last year, the Project will focus on review and finalization of draft Manuals and Handbook by Counterpart (C/P) themselves with support of JICA experts.

4. **Joint Coordinating Committee (JCC)**
   Both sides have agreed that the Joint Coordinating Committee (hereinafter referred to as "JCC") comprising of the authorities concerned will be established and chaired by the Chief Director of Ministry of Roads and Highways (hereinafter referred to as "MRH"). The proposed members of the JCC are described in Annex 4 and Annex 5 of the R/D. The first JCC will be convened within six months of the commencement of the Project to approve the first version of the PDM and PO. JCC will meet basically twice a year and whenever the necessity arises.

5. **Counterpart Personnel**
   Both sides have agreed on the necessary counterpart personnel described in Annex 6.

6. **Self-reliant efforts of Technical Cooperation Project**
   Technical Cooperation Project refers to a systematic and comprehensive project implementation to attain certain outcomes within certain time period, in which input includes, but not limited to, the dispatch of members of JICA missions and/or JICA experts, the acceptance of training participant, and/or provision of equipment from JICA. Both sides have confirmed that self-reliant efforts by MRH and its Agencies as well as mutual cooperation of C/P and JICA experts are indispensable to attain outcomes of the Project.

7. **Provision of benefits and facilities**

Ghana side agrees to provide the following benefits and facilities to JICA experts:

(1) Office space in the building of MRH for the Project members with office furniture and utilities such as internet connection, electricity, air conditioner and so on;
(2) Necessary data and information for the Project;
(3) Permission of access to the project sites; and
(4) Identification cards if necessary.

Japan side agrees to provide following inputs to Ghana side.

(1) Experts
(2) C/P training in Japan
(3) Necessary equipment for the project activities.

8. **Local Travel and Accommodation Cost and Per Diem for C/P and seminar participants**

Both sides have agreed that local travel and accommodation cost and per diem shall be borne by Ghana side.

9. **Handbook for Road and Bridge Project Management**

Both sides have agreed that the Handbook will contain lessons learnt, which were extracted and summarized from the previous monitoring reports and/or records of accidents/ defects /problems of road projects.

The Handbook is expected to be utilized to detect typical risks which can occur during the project formations, implementations and operations.

10. **Environmental and Social Considerations**

With regard to the Section 10.1 of the "Basic Principles for Technical Cooperation" published in December 2016, the Project is likely to have minimal adverse impact on the environment and society under the 'JICA Guidelines for Environmental and Social Considerations (April 2010).

ANNEX 2

Project Design Matrix (PDM)

Version NO.0
Date: 15th March 2017

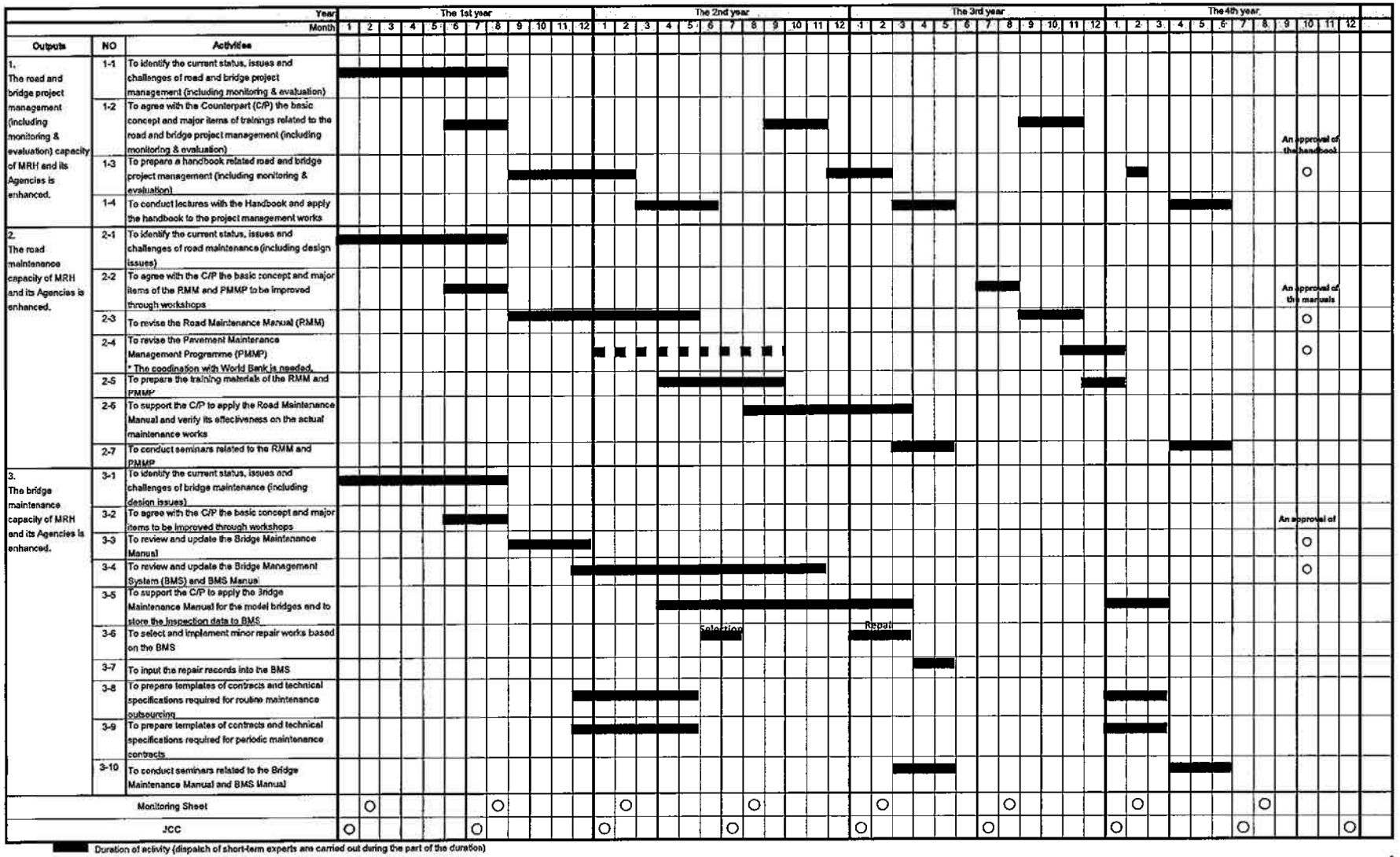
Project Title: Project on Capacity Building for Road and Bridge Management
Project Period: 4 years from XX 2019 to XX 2022
Target Areas: Ghana Nationwide
Target Group: Ministry of Roads and Highways (MRH), Ghana Highway Authority (GHA), Department of Urban Roads(DUR) and Department of Feeder Roads(DFR)
Implementation Agency: MRH and GHA , DUR, DFR

Narrative Summary	Objectively Verifiable Indicators	Means of Verifications	Important Assumptions
Overall Goal Roads including bridges in Ghana are appropriately maintained.	1. The road length which are maintained according to the Manuals is increased from X to Y. 2. The number of preventive-maintained bridges is increased from X to Y.	• Reports of MRH, GHA, DUR and DFR • Interviews with MRH, GHA, DUR, and DFR	
Project Purpose Capacity of MRH and its Agencies in road and bridge management is improved.	1. X% of projects are monitored and evaluated with the Handbook 2. RMM (including PMMP) is applied to actual maintenance works 3. BMS is utilized to select repair works	1. Project Completion Report 2. Project Completion Report 3. Project Completion Report	
Outputs 1 The road and bridge project management (including monitoring & evaluation) capacity of MRH and its Agencies is enhanced.	1-1 The Handbook is officially approved by MRH 1-2 The Handbook is understood by X% of seminar participants	1-1 Official endorsement by MRH 1-2 Questionnaire to participants	
2 The road maintenance capacity of MRH and its Agencies is enhanced.	2-1 Road maintenance Manual is officially approved by MRH 2-2 Road maintenance works for which the Manual is applied are increased from XX% to YY % 2-3 Quality of the road maintenance works are improved.	2-1 Official endorsement by MRH 2-2 Monitoring Sheet 2-3 Monitoring Sheet	
3 The bridge maintenance capacity of MRH and its Agencies is enhanced.	3-1 The Bridge Maintenance Manual is officially approved by MRH 3-2 Established BMS is functioned 3-3 XX % of seminar participants scores more than XX points.	3-1 Official endorsement by MRH 3-2 Monitoring Sheet 3-3 Examination to participants	

Activities		Inputs:	
1-1	To identify the current status, issues and challenges of road and bridge project management (including monitoring & evaluation)	(1) Japanese side ・Experts ➢ Project Leader/Road Design & Maintenance ➢ Deputy Project leader/Bridge Design & Maintenance ➢ Road Administration ➢ Pavement Inspection ➢ Concrete Bridge ➢ Steel Bridge ➢ Bridge Management System ➢ Monitoring and Evaluation ・C/P training in Japan ・Necessary equipment for the project activities (2) Ghana side ・Counterpart Personnel ・Office space, furniture, internet. etc ・Expenses for the project such as C/P personnel expenses and pilot minor repair works, if any ・Annual maintenance works	・Budgets and human resources are appropriately secured.
1-2	To agree with the Counterpart (C/P) the basic concept and major items of trainings related to the road and bridge project management (including monitoring & evaluation)		
1-3	To prepare a handbook related road and bridge project management (including monitoring & evaluation)		
1-4	To conduct lectures with the Handbook and apply the handbook to the project management works		
2-1	To identify the current status, issues and challenges of road maintenance (including design issues)		
2-2	To agree with the C/P the basic concept and major items of the RMM and PMMP to be improved through workshops		
2-3	To revise the Road Maintenance Manual (RMM)		
2-4	To revise the Pavement Maintenance Management Programme (PMMP)		
2-5	To prepare the training materials of the RMM and PMMP		
2-6	To support the C/P to apply the Road Maintenance Manual and verify its effectiveness on the actual maintenance works		
2-7	To conduct seminars related to the RMM and PMMP		
3-1	To identify the current status, issues and challenges of bridge maintenance (including design issues)		**Pre-condition** ・Safety in Ghana is ensured.
3-2	To agree with the C/P the basic concept and major items to be improved through workshops		
3-3	To review and update the Bridge Maintenance Manual		
3-4	To review and update the Bridge Management System (BMS) and BMS Manual		
3-5	To support the C/P to apply the Bridge Maintenance Manual for the model bridges and to store the inspection data to BMS		
3-6	To select and implement minor repair works based on the BMS		
3-7	To input the repair records into the BMS		
3-8	To prepare templates of contracts and technical specifications required for routine maintenance outsourcing		
3-9	To prepare templates of contracts and technical specifications required for periodic maintenance contracts		
3-10	To conduct seminars related to the Bridge Maintenance Manual and BMS Manual		

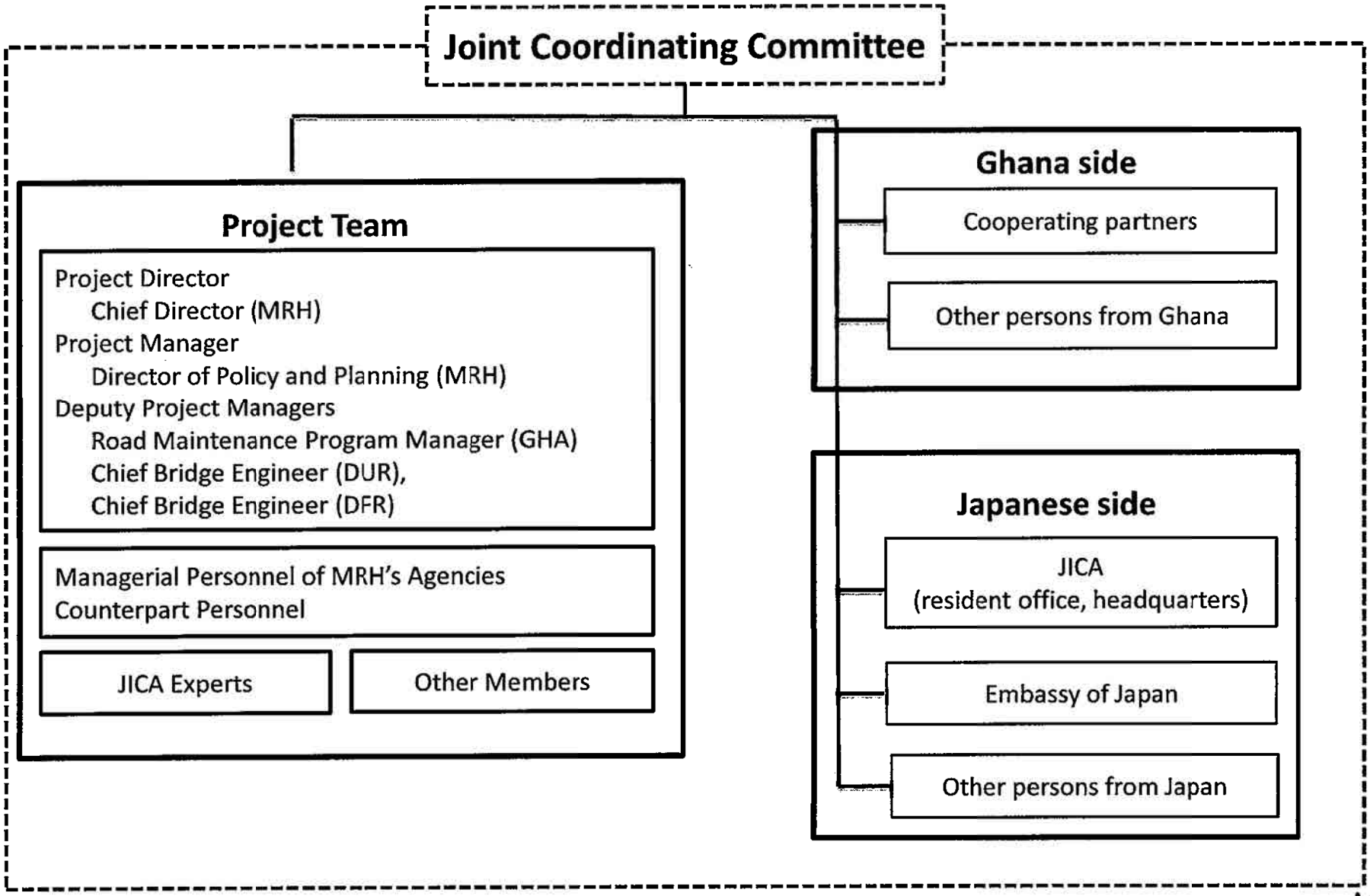
ANNEX 3
Version NO.0
Date: 15th March 2017

PLAN OF OPERATION (PO)



Annex-133

Implementation Structure



Annex 5

List of Proposed Members of Joint Coordination Committee

(1) Project Team
1) Project Director (Chairperson of JCC)
   Chief Director (MRH)
2) Project Manager
   Director of Policy and Planning (MRH)
3) Deputy Project Managers
   Road Maintenance Program Manager (GHA)
   Chief Bridge Engineer (DUR)
   Chief Bridge Engineer (DFR)
4) Managerial Personnel of MRH's Agencies
   GHA
   Director of Bridges
   Director of Contracts
   Director of Road Maintenance
   Director of Planning
   Director of Survey and Design
   DUR
   Deputy Director for Maintenance
   Chief Engineer Maintenance
   DFR
   Deputy Director, Planning
   Deputy Director, Maintenance
5) Counterpart Personnel
6) Ministry of Finance
7) JICA Experts
8) Others who are to be agreed by the Counterpart and JICA

(2) Other members from Ghana side
1) Cooperation partners
2) Other persons that Ghana side considers necessary

(3) Other members from Japanese side
1) Chief Representative and other staff of JICA Ghana Office
2) Staff from JICA Headquarters
3) Staff from the Embassy of Japan
4) Other persons that Japanese side considers necessary

[Note]
GHA: Ghana Highway Authority
DUR: Department of Urban Roads
DFR: Department of Feeder Roads

Annex 6

Counterpart Personnel List
(as of 17th August 2018)

<GHA (Bridge)>
Victor Baah
Roland Neequaye

<GHA (Road maintenance)>
Mark Okyere
Eric Odosu

<DUR>
Nimatu Sani
Shadrach Nartey
Carlos Mensah
Jeffery Darkwah

<DFR>
K. N. Akosah-Koduah
Don Kuubertezie
Nathan Odjao
Frank Amofa

<KTC>
Charles Afetornu

<MRH>
James Atiemo – Monitoring & Evaluation
Efua Effah– Policy & Planning

[Note]
GHA: Ghana Highway Authority
DUR: Department of Urban Roads
DFR: Department of Feeder Roads
KTC: Koforidua Training Centre

MINUTES OF MEETING
BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
MINISTRY OF ROADS AND HIGHWAYS AND ITS AGENCIES
OF
THE REPUBLIC OF GHANA
FOR
THE FIRST AMENDMENT OF THE RECORD OF DISCUSSIONS
OF
THE PROJECT ON CAPACITY BUILDING FOR ROAD AND BRIDGE MANAGEMENT

The Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Ministry of Roads and Highways and its Agencies of the Republic of Ghana (hereinafter referred to as "the Counterparts) hereby agree to amend the Record of Discussions of the Project on Capacity Building for Road and Bridge Management (hereinafter referred to as "the Project") signed on November 9, 2018. Based on the request by the Ministry of Roads and Highways (hereinafter referred to as "MRH") dated November 11, 2019 to modify Output 1 and upon series of discussions among related stakeholders, both sides had a conclusion meeting held on February 27, 2020 on the said modification. The parties hereby agree to amend the Record of Discussions as follows:

1. Project Design Matrix (PDM)

(1) Project Purpose

Original	Amended
Verifiable Indicators	
1. X% of projects are monitored and evaluated with the Handbook.	1. X% of projects are planned and designed with the updated road design manual.
Reasons: The Project Purpose is amended in accordance with the revised Output-1 (i.e. Handbook to Road Design Manual).	

(2) Outputs

Original	Amended
Outputs	
Outputs 1. The road and bridge project management (including monitoring & evaluation)	Outputs 1. The capacity on road planning and design of MRH and its Agencies is enhanced.

capacity of MRH and its Agencies is enhanced.	
Reasons: From the discussions with the C/Ps, it was found that the contents of the current road design manual do not cover some design issues. As road engineers sometimes respond to the issues according to their own experiences, these results in inconsistencies in road designs in Ghana. Updating the current road design manual will contribute to improvement of road project delivery/outputs in Ghana.	
Verifiable Indicators	
1-1 The handbook is officially approved by MRH 1-2 The handbook is understood by X% of seminar participants.	1-1 The updated road design manual is officially approved by MRH. 1-2 The road design manual is understood by X% of seminar participants.
Reasons: Due to the change in Output 1, (i.e. Handbook to Road Design Manual), the corresponding Indicators also change accordingly.	
Means of Verification	
1-1 Official endorsement by MRH 1-2 Questionnaire to participants	1-1 The updated road design manual 1-2 Questionnaire to participants
Reasons: MRH has jurisdiction to make the necessary technical documents and build capacity of its agencies to improve, develop and maintain road infrastructure.	

(3) **Activities**

Original	Amended
Activities	
1-1 To identify the current status, issues and challenges of road and bridge project management (including monitoring & evaluation). 1-2 To agree with the counterpart (C/P) the basic concept and major items of training related to the road and bridge project management (including monitoring & evaluation) 1-3 To prepare a handbook related road and bridge project management (including monitoring and evaluation)	1-1 To identify the current status, issues and challenges of road planning and design. 1-2 To agree with the counterpart (C/P) the basic concept and major items of training related to road planning and design. 1-3 To prepare an updated road design manual of the existing GHA road design guide. 1-4 To conduct lectures and seminars with the updated road design manual and apply it on an actual project management works

1-4 To conduct lectures with the Handbook and apply the handbook to the project management works	
Reasons: The activity is amended in accordance with the revised Output-1.	

2. Plan of Operation (PO) will be amended as Annex-3.

This amendment will become effective as of 3rd December, 2020. For avoidance of doubt, all other provisions in the original Record of Discussions remain unchanged and effective.

Accra, 3rd December, 2020

Yasumichi ARAKI
Chief Representative
JICA Ghana Office
Japan International Cooperation Agency

Edmund OFFEI-ANNOR
Chief Director
Ministry of Roads & Highways

Yvonne QUANSAH
Director, Resource Mobilisation & Economic Relations Division
Ministry of Finance

Annex-1 Record of Discussions (signed on November 9, 2018)
Annex-2 Project Design Matrix (Amended)
Annex-3 Plan of Operation (Amended)

Project Design Matrix (PDM)

Version NO.1
Date: 3rd December 2020

Project Title: Project on Capacity Building for Road and Bridge Management
Project Period: 4 years from March 2019 to Feb. 2022
Target Areas: Ghana Nationwide
Target Group: Ministry of Roads and Highways (MRH), Ghana Highway Authority (GHA), Department of Urban Roads (DUR) and Department of Feeder Roads(DFR)
Implementation Agency: MRH and GHA , DUR, DFR

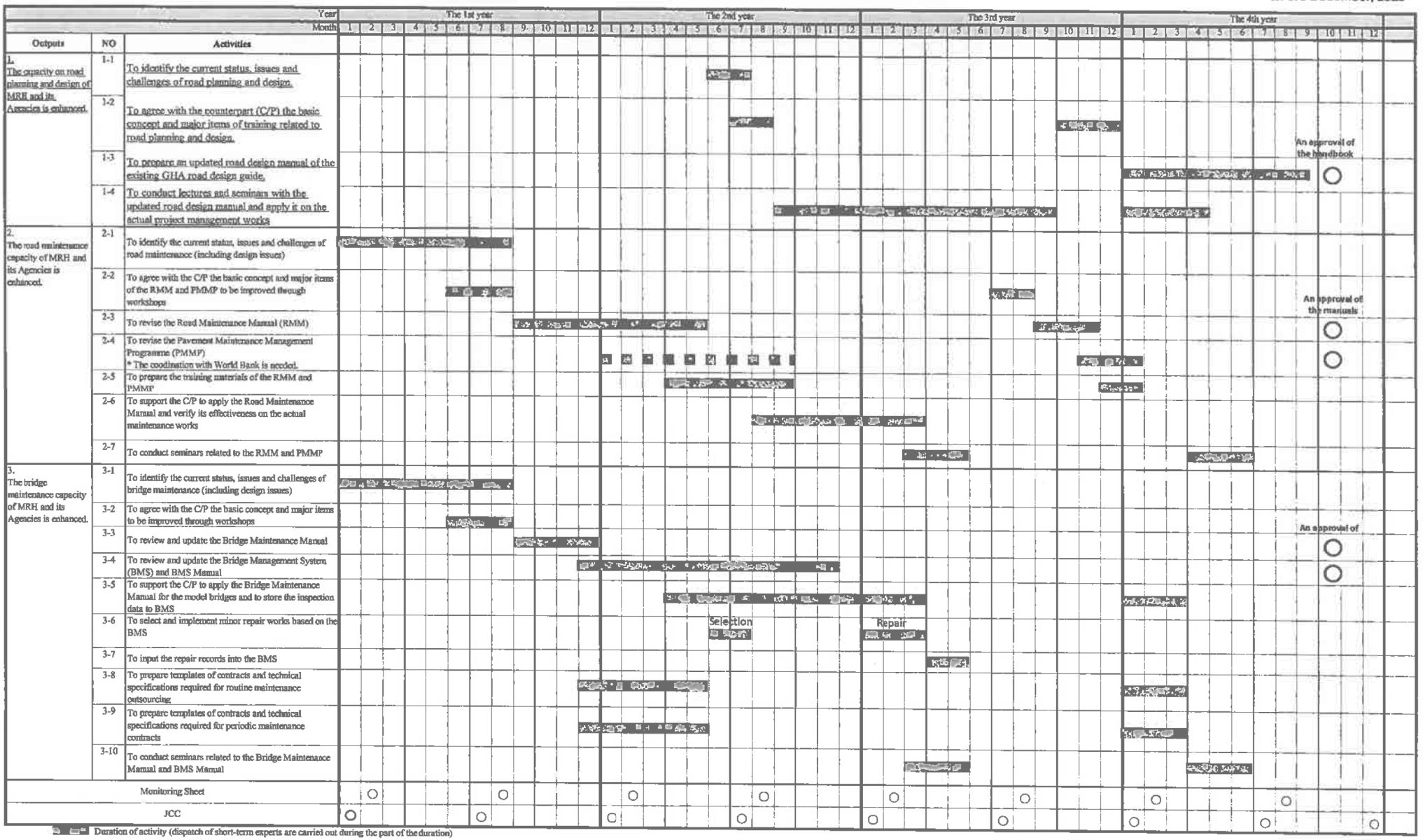
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Roads including bridges in Ghana are appropriately maintained.	1. The road length which are maintained according to the Manuals is increased from X to Y. 2. The number of preventive-maintained bridges is increased from X to Y.	・ Reports of MRH, GHA, DUR and DFR ・ Interviews with MRH, GHA, DUR, and DFR	
Project Purpose Capacity of MRH and its Agencies in road and bridge management is improved.	1. X% of projects are planned and designed with the updated road design manual. 2. RMM (including PMMP) is applied to actual maintenance works 3. BMS is utilized to select repair works	1. Project Completion Report 2. Project Completion Report 3. Project Completion Report	
Outputs 1 The capacity on road planning and design of MRH and its Agencies is enhanced.	1-1 The updated road design manual is officially approved by MRH. 1-2 The road design manual is understood by X% of seminar participants.	1-1 The updated road design manual 1-2 Questionnaire to Participants	
2 The road maintenance capacity of MRH and its Agencies is enhanced.	2-1 Road maintenance Manual is officially approved by MRH 2-2 Road maintenance works for which the Manual is applied are increased from XX% to YY % 2-3 Quality of the road maintenance works are improved.	2-1 Certificate from MRH 2-2 Monitoring Sheet 2-3 Monitoring Sheet	
3 The bridge maintenance capacity of MRH and its Agencies is enhanced.	3-1 The Bridge Maintenance Manual is officially approved by MRH 3-2 Established BMS is functioned 3-3 XX % of seminar participants scores more than XX points.	3-1 Certificate from MRH 3-2 Monitoring Sheet 3-3 Examination to participants	
Activities 1-1 To identify the current status, issues and challenges of road planning and	**Inputs:** (1) Japanese side		・ Budgets and human

	design.	• Experts ➢ Project Leader/Road Design & Maintenance ➢ Deputy Project leader/Bridge Design & Maintenance ➢ Road Administration ➢ Pavement Inspection ➢ Concrete Bridge ➢ Steel Bridge ➢ Bridge Management System ➢ Monitoring and Evaluation • C/P training in Japan • Necessary equipment for the project activities (2) Ghana side • Counterpart Personnel • Office space, furniture, internet. etc • Expenses for the project such as C/P personnel expenses and pilot minor repair works, if any • Annual maintenance works	resources are appropriately secured.
1-2	To agree with the counterpart (C/P) the basic concept and major items of training related to road planning and design.		
1-3	To prepare an updated road design manual of the existing GHA road design guide.		
1-4	To conduct lectures and seminars with the updated road design manual and apply it on an actual project management works.		
2-1	To identify the current status, issues and challenges of road maintenance (including design issues)		
2-2	To agree with the C/P the basic concept and major items of the RMM and PMMP to be improved through workshops		
2-3	To revise the Road Maintenance Manual (RMM)		
2-4	To revise the Pavement Maintenance Management Programme (PMMP)		
2-5	To prepare the training materials of the RMM and PMMP		
2-6	To support the C/P to apply the Road Maintenance Manual and verify its effectiveness on the actual maintenance works		
2-7	To conduct seminars related to the RMM and PMMP		
3-1	To identify the current status, issues and challenges of bridge maintenance (including design issues)		**Pre-condition** • Safety in Ghana is ensured.
3-2	To agree with the C/P the basic concept and major items to be improved through workshops		
3-3	To review and update the Bridge Maintenance Manual		
3-4	To review and update the Bridge Management System (BMS) and BMS Manual		
3-5	To support the C/P to apply the Bridge Maintenance Manual for the model bridges and to store the inspection data to BMS		
3-6	To select and implement minor repair works based on the BMS		
3-7	To input the repair records into the BMS		
3-8	To prepare templates of contracts and technical specifications required for routine maintenance outsourcing		
3-9	To prepare templates of contracts and technical specifications required for periodic maintenance contracts		
3-10	To conduct seminars related to the Bridge Maintenance Manual and BMS Manual		

PLAN OF OPERATION (PO)

Version NO.1
te: 3rd December, 2020

Outputs	NO	Activities
1. The capacity on road planning and design of MRH and its Agencies is enhanced.	1-1	To identify the current status, issues and challenges of road planning and design.
	1-2	To agree with the counterpart (C/P) the basic concept and major items of training related to road planning and design.
	1-3	To prepare an updated road design manual of the existing GHA road design guide.
	1-4	To conduct lectures and seminars with the updated road design manual and apply it on the actual project management works
2. The road maintenance capacity of MRH and its Agencies is enhanced.	2-1	To identify the current status, issues and challenges of road maintenance (including design issues)
	2-2	To agree with the C/P the basic concept and major items of the RMM and PMMP to be improved through workshops
	2-3	To revise the Road Maintenance Manual (RMM)
	2-4	To revise the Pavement Maintenance Management Programme (PMMP) * The coodination with World Bank is needed.
	2-5	To prepare the training materials of the RMM and PMMP
	2-6	To support the C/P to apply the Road Maintenance Manual and verify its effectiveness on the actual maintenance works
	2-7	To conduct seminars related to the RMM and PMMP
3. The bridge maintenance capacity of MRH and its Agencies is enhanced.	3-1	To identify the current status, issues and challenges of bridge maintenance (including design issues)
	3-2	To agree with the C/P the basic concept and major items to be improved through workshops
	3-3	To review and update the Bridge Maintenance Manual
	3-4	To review and update the Bridge Management System (BMS) and BMS Manual
	3-5	To support the C/P to apply the Bridge Maintenance Manual for the model bridges and to store the inspection data to BMS
	3-6	To select and implement minor repair works based on the BMS
	3-7	To input the repair records into the BMS
	3-8	To prepare templates of contracts and technical specifications required for routine maintenance outsourcing
	3-9	To prepare templates of contracts and technical specifications required for periodic maintenance contracts
	3-10	To conduct seminars related to the Bridge Maintenance Manual and BMS Manual
Monitoring Sheet		
JCC		



Duration of activity (dispatch of short-term experts are carried out during the part of the duration)

Annex-142

In case of reply the number and the date of this letter should be quoted
Tel: No. 233-0302-671328,
Fax No. 233-0302-688759
Url:www.mrt.gov.gh
Email:info@mrt.gov.gh

REPUBLIC OF GHANA

MINISTRY OF ROADS & HIGHWAYS
P. O. BOX M.57
ACCRA
GHANA

My Ref No. MRH/PB.232/323/015

11th NOVEMBER, 2019

Your Ref. No.....

CAPACITY BUILDING IN ROAD AND BRIDGE MAINTENANCE

REVIEW OF CURRENT MANUALS FOR THE ROAD SECTOR

Reference to your submissions and the comments raised at the recent JCC on the above subject.

We have reviewed the suggested list of Manuals which is made up of both existing and newly proposed Manuals. We acknowledge your efforts in compiling these documents and making them comprehensive to suit the various activities for the road sector whiles making them as concise as possible.

Please note the following comments;

1. Include all existing road and bridge maintenance manuals in the series unless the Consultant has adequate justification for the non-relevance of any existing manual
2. All existing manuals are to be reviewed under the project on the first instance. It is expected that all existing manuals that are relevant will be revised. Manuals that are reviewed even with the slightest modification should be reprinted and given a current date.
3. New manuals that have been proposed to be developed under the project will be developed as the second priority to the revision of the current manuals

Attached is specific comments on the series of manuals.

Counting on your usual cooperation.

EDMUND OFFEI-ANNOR
CHIEF DIRECTOR
FOR: HON. MINISTER

THE CONSULTANT
CBRBM
ROOM G10, MRH
ACCRA

cc: Director Policy & Planning – MRH
The Country Director, JICA

LIST OF MANUALS TO BE REVIEWED OR DEVELOPED UNDER THE CBRBM PROJECT

	MANUAL TO BE PREPARED	EXISTING MANUAL	RECOMMENDED ACTION BY CONSULTANT	MRH RECOMMENDATION
1	Institutional Guideline for Road and Bridge maintenance and management Handbook	Moms Activities/ Organisational structure	New Proposed manual	This is not a priority. It can be considered after the existing manuals have been completed
2	Road Classification and numbering of routes	MoM Road Condition Survey Manual	No Action	Review and update existing manual
3	Bridge maintenance and Management Manual		New	This is wrongly compared to the Standard Specifications for roads and bridges. How different is this from the bridge maintenance manual?
4	Data Collection and inventory manual	MoM Road Condition Survey Manual	No Action	No action
5	Data Collection and road monitoring survey using IDRIMS	MoM Road Condition Survey Manual	New	New, recommended
6	Bridge Inspection and data collection manual	Bridge Inspector's Manual	Update existing manual	Review and update existing manual
7	Prediction of pavement deterioration and preventive maintenance using IRI	PMMP user manual	Update existing manual	Review and update existing manual
8	Bridge condition analysis, BMS manual		NEW	This is has been listed as Bridge Maintenance management manual. This is recommended.
9	Mid-long term maintenance plan and prioritization	PMMP planning and budgeting tool	No action	No action, HWM IV will be used
10	Road design manual	Road design manual guide	No action	Review and update existing manual
11	Design manual for Bridge repair	Guide for repairs and maintenance of bridges	No action	Review and update existing manual
12	Cost Survey guidelines for PBC contracts		No action	No action

	MANUAL TO BE PREPARED	EXISTING MANUAL	RECOMMENDED ACTION BY CONSULTANT	MRH RECOMMENDATION
13	Standard Drawings	Standards drawings	No action	Review and update existing manual
14	Works Procurement	MoM Procurement vol, 1,2,3	No action	No action
15	Contractor's Performance Manual		No action	New, Recommended to be developed under the project
16	Activities of the supervisor	MoM Road maintenance works supervision	No action	Review and update this manual
17	Monitoring and Evaluation		No action	New, recommended to be developed under the project

RECORD OF DISCUSSIONS

FOR

THE PROJECT ON CAPACITY BUILDING FOR ROAD AND BRIDGE MANAGEMENT

AGREED UPON BETWEEN

MINISTRY OF ROADS AND HIGHWAYS AND ITS AGENCIES

OF

THE REPUBLIC OF GHANA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

Accra, November 9, 2018

Annex 1 Main Points Discussed
Annex 2 Project Design Matrix (PDM)
Annex 3 Plan of Operation (PO)
Annex 4 Implementation Structure
Annex 5 List of Proposed Members of Joint Coordinating Committee
Annex 6 Counterpart Personnel List

7. **Provision of benefits and facilities**

Ghana side agrees to provide the following benefits and facilities to JICA experts:

(1) Office space in the building of MRH for the Project members with office furniture and utilities such as internet connection, electricity, air conditioner and so on;
(2) Necessary data and information for the Project;
(3) Permission of access to the project sites; and
(4) Identification cards if necessary.

Japan side agrees to provide following inputs to Ghana side.

(1) Experts
(2) C/P training in Japan
(3) Necessary equipment for the project activities.

8. **Local Travel and Accommodation Cost and Per Diem for C/P and seminar participants**

Both sides have agreed that local travel and accommodation cost and per diem shall be borne by Ghana side.

9. **Handbook for Road and Bridge Project Management**

Both sides have agreed that the Handbook will contain lessons learnt, which were extracted and summarized from the previous monitoring reports and/or records of accidents/ defects /problems of road projects.

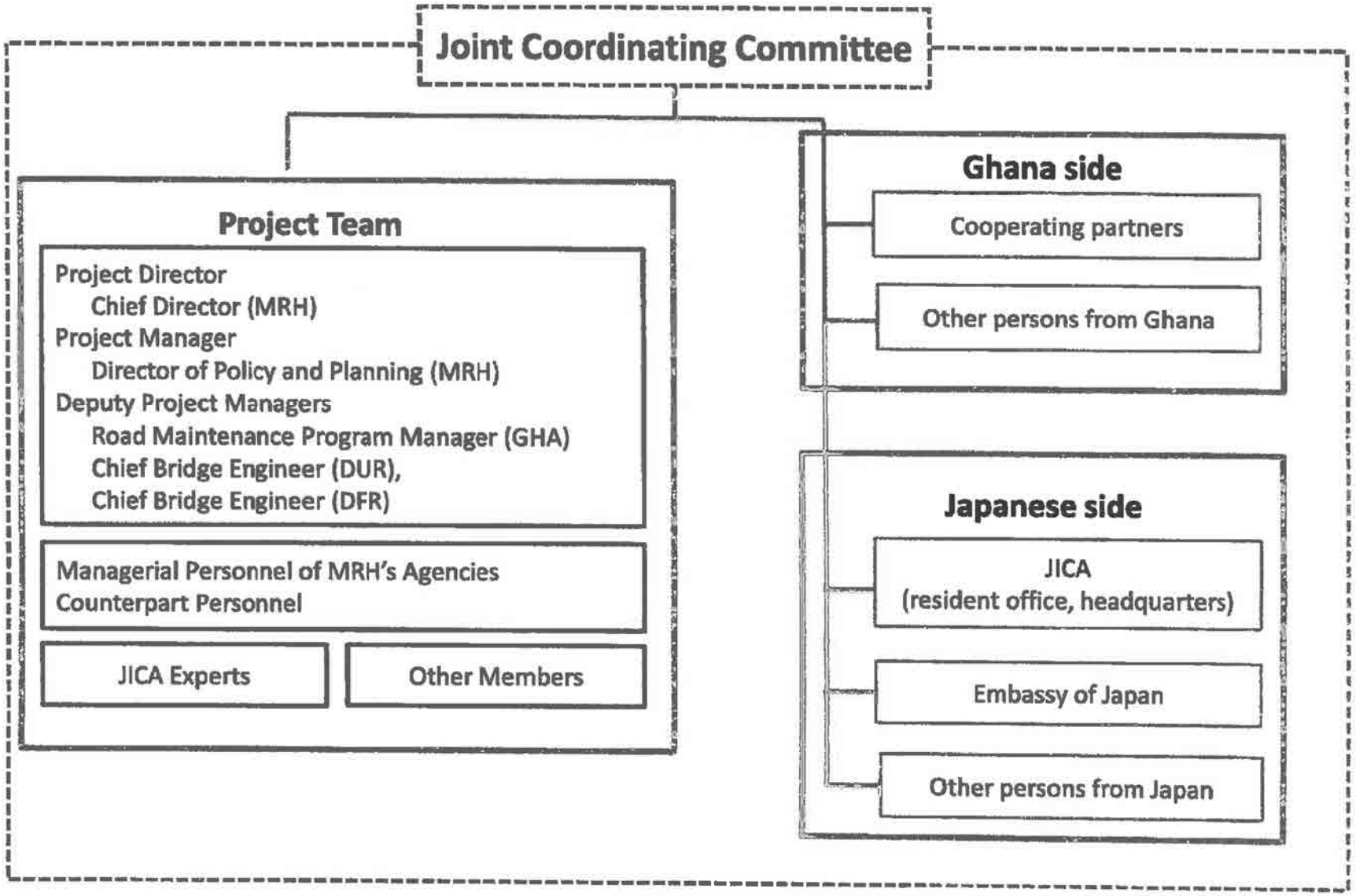
The Handbook is expected to be utilized to detect typical risks which can occur during the project formations, implementations and operations.

10. **Environmental and Social Considerations**

With regard to the Section 10.1 of the "Basic Principles for Technical Cooperation" published in December 2016, the Project is likely to have minimal adverse impact on the environment and society under the 'JICA Guidelines for Environmental and Social Considerations (April 2010).

Activities		Inputs:	
1-1	To identify the current status, issues and challenges of road and bridge project management (including monitoring & evaluation)	(1) Japanese side ・Experts ➢ Project Leader/Road Design & Maintenance ➢ Deputy Project leader/Bridge Design & Maintenance ➢ Road Administration ➢ Pavement Inspection ➢ Concrete Bridge ➢ Steel Bridge ➢ Bridge Management System ➢ Monitoring and Evaluation ・C/P training in Japan ・Necessary equipment for the project activities (2) Ghana side ・Counterpart Personnel ・Office space, furniture, internet. etc ・Expenses for the project such as C/P personnel expenses and pilot minor repair works, if any ・Annual maintenance works	・Budgets and human resources are appropriately secured.
1-2	To agree with the Counterpart (C/P) the basic concept and major items of trainings related to the road and bridge project management (including monitoring & evaluation)		
1-3	To prepare a handbook related road and bridge project management (including monitoring & evaluation)		
1-4	To conduct lectures with the Handbook and apply the handbook to the project management works		
2-1	To identify the current status, issues and challenges of road maintenance (including design issues)		
2-2	To agree with the C/P the basic concept and major items of the RMM and PMMP to be improved through workshops		
2-3	To revise the Road Maintenance Manual (RMM)		
2-4	To revise the Pavement Maintenance Management Programme (PMMP)		
2-5	To prepare the training materials of the RMM and PMMP		
2-6	To support the C/P to apply the Road Maintenance Manual and verify its effectiveness on the actual maintenance works		
2-7	To conduct seminars related to the RMM and PMMP		
3-1	To identify the current status, issues and challenges of bridge maintenance (including design issues)		**Pre-condition** ・Safety in Ghana is ensured.
3-2	To agree with the C/P the basic concept and major items to be improved through workshops		
3-3	To review and update the Bridge Maintenance Manual		
3-4	To review and update the Bridge Management System (BMS) and BMS Manual		
3-5	To support the C/P to apply the Bridge Maintenance Manual for the model bridges and to store the inspection data to BMS		
3-6	To select and implement minor repair works based on the BMS		
3-7	To input the repair records into the BMS		
3-8	To prepare templates of contracts and technical specifications required for routine maintenance outsourcing		
3-9	To prepare templates of contracts and technical specifications required for periodic maintenance contracts		
3-10	To conduct seminars related to the Bridge Maintenance Manual and BMS Manual		

Implementation Structure



Annex 6

Counterpart Personnel List
(as of 17th August 2018)

<GHA (Bridge)>
Victor Baah
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Mark Okyere
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<KTC>
Charles Afetomu

<MRH>
James Atiemo – Monitoring & Evaluation
Efua Effah– Policy & Planning

[Note]
GHA: Ghana Highway Authority
DUR: Department of Urban Roads
DFR: Department of Feeder Roads
KTC: Koforidua Training Centre

MINUTES OF MEETING
BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
MINISTRY OF ROADS AND HIGHWAYS AND ITS AGENCIES
OF
THE REPUBLIC OF GHANA
FOR
THE SECOND AMENDMENT OF THE RECORD OF DISCUSSIONS
OF
THE PROJECT ON CAPACITY BUILDING FOR ROAD AND BRIDGE MANAGEMENT

The Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Ministry of Roads and Highways and its Agencies of the Republic of Ghana (hereinafter referred to as "the Counterparts) hereby agree to the second amendment of the Record of Discussions of the Project on Capacity Building for Road and Bridge Management (hereinafter referred to as "the Project") where the original signed made on November 9th, 2018 and the first amendment made on December 3rd 2020 .

Based on the discussion between JICA and the Ministry of Roads and Highways (hereinafter referred to as "MRH") to modify the Project Period, Verifiable Indicators and Means of Verification of Output-1 and Output-2 and Activities of Ouput-1 and Output-2 upon series of discussions among related stakeholders, both sides had a conclusion meeting held on October 27, 2021 on the said modification. The parties hereby agree to amend the Record of Discussions as follows:

1. Project Design Matrix (PDM)

(1) Project Period

Before	Amended Version
Project Period: 4 years from Feb. 2019 to Feb. 2023	Project Period: 4 years and 3 months from Feb. 2019 to May 2023
Reasons: The Project Period is amended due to COVID-19, the completion of Stage-1 has been extended by three months.	

(2) Project Purpose

Before	Amended Version
Verifiable Indicators	
1. X% of projects are planned and designed	1. More than 82/445/500 projects are planned

with the updated road design manual 2. RMM (including PMMP) is applied to actual maintenance works 3. BMS is utilized to select repair works	and designed with the updated read design guide under the supervision of GHA, DUR and DFR respectively. 2. The length of road inspected by using RMM reaches more than 1,529/587/4,246 km in Eastern Region, 1,294/1,280/3,387 km in Central Region, 357/8,036/1,320 km in Greater Accra Region under the supervision of GHA, DUR and DFR respectively. 3. Bridges prioritized by the Project are inspected according to the Bridge Maintenance and Management Manual
Reasons: Verifiable indicators is amended since the specific target values for the Project have been agreed in consultation with the C/P.	

(3) Outputs

Before	Amended Version
Output-1	
The capacity on road planning and design of MRH and its Agencies is enhanced	(No Change)
Reason N/A	
Verifiable Indicators	
1-1 The updated road design manual is officially approved by MRH 1-2 The road design manual is understood by X% of seminar participants	1-1 (No Change) 1-2 The level of understanding of seminar participants on the road design guide exceeds 70% on average
Reason Verifiable indicators is amended since the specific targets for the Project have been agreed in consultation with the C/P.	
Means of Verification	
1. The updated road design manual 2. Questionnaire to participants	1. Approval letter of MRH 2. Seminar Evaluation Report, Project Monitoring Sheet (PMS)
Reason Means of Verification is amended since the specific means have been agreed in consultation with the C/P.	

Output-2	
1. The road maintenance capacity of MRH and its Agencies is enhanced	(No Change)
Reasons: N/A	
Verifiable Indicators	
2-1 RMM is officially approved by MRH 2-2 Road maintenance works for which the Manual is applied are increased XX% to YY%. 2-3 Quality of the road maintenance works are improved	2-1 (No change) 2-2 The level of understanding of seminar participants on the road maintenance exceeds 70% on average.
Reasons: Verifiable indicators is amended since the specific target values for the Project have been agreed in consultation with the C/P.	
Means of Verification	
2-1 Certificate from MRH 2-2 Monitoring Sheet	2-1 Approval letter of MRH 2-2 Seminar evaluation report, Project Monitoring Sheet
Reasons: Means of Verification is amended since the specific means have been agreed in consultation with the C/P.	
Output-3	
3. The bridge maintenance capacity of MRH and its Agencies is enhanced.	(No Change)
Reasons: N/A	
Verifiable Indicators	
1. The Bridge Maintenance Manual is officially approved by MRH 2. Established BMS is functioned 3. XX% of seminar participants scores more than XX points	1. The Bridge Maintenance and Management manual is officially approved by MRH 2. More than 2/2/3 bridge specialists of GHA, DUR and DFR respectively be able to utilize the BMS 3. The level of understanding of seminar participants on the bridge maintenance exceeds 70% on average
Reasons: Means of Verification is amended since the specific means have been agreed in consultation with the C/P.	

Means of Verification	
1. Certificate from MRH 2. Monitoring Sheet 3. Examination to participants	1. Approval letter to MRH 2. Interview to bridge specialists 3. Seminar Evaluation Report, Project Monitoring Report (PMS)
Reasons: Means of Verification is amended since the specific means have been agreed in consultation with the C/P.	

(4) Activities

Before	Amended Version
Activities	
2-1 To identify the current status, issues and challenges of road maintenance (including design issues) 2-2 To agree with the counterpart (C/P) the basic concept and major items of the RMM and PMMP to be improved through workshops 2-3 To revise the Road Maintenance Manual (RMM) 2-4 To revise the Pavement Maintenance Management Programme (PMMP) 2-5 To prepare training materials of the RMM and PMMP 2-6 To support the C/P to apply the Road Maintenance Manual and verify its effectiveness on the actual maintenance works 2-7 To conduct seminars related to the RMM and PMMP	2-1 (No change) 2-2 To agree with the C/P the basic concept and major items of the RMM to be improved 2-3 (No change) 2-4 To develop the i-Dynamic Response Monitoring System (iDRIMS) 2-5 To prepare the training materials of the RMM and iDRIMS 2-6 (No change) 2-7 Conduct seminars related to the RMM and iDRIMS User Manual
Reasons: The activity is revised to replace PMMP to iDRIMS in consultation with the C/P	

2. Plan of Operation (PO) will be amended as Annex-4.

This amendment will become effective as of November, 2021. For avoidance of doubt, all other provisions in the original Record of Discussions remain unchanged and effective.

Accra, Feb 25, 2022

Yasumichi ARAKI
Chief Representative
JICA Ghana Office
Japan International Cooperation Agency

Abass M. AWOLU
Chief Director
Ministry of Roads & Highways

Yvonne QUANSAH
Director, External Resource Mobilisation
& Economic Relations Division
Ministry of Finance

Annex-1 Record of Discussions (signed on November 9th, 2018)
Annex-2 Record of Discussion (signed on December 3rd, 2020)
Annex-3 Project Design Matrix (Amended)
Annex-4 Plan of Operation (Amended)

Project Design Matrix (PDM)

Version NO.2
Date: 27th October 2021

Project Design Matrix (PDM_2)

Project Title: Project on Capacity Building for Road and Bridge Management in the Republic of Ghana **Project Period:** March, 2019 – May, 2023 (four (4) years and 3 months)
Target Groups: Ministry of Roads and Highways (MRH), Ghana Highway Authority (GHA), Department of Urban Roads (DUR), Department of Feeder Roads (DFR), and Koforidua Training Centre (KTC)
Target Areas: Ghana nationwide **Implementation Agency in Ghana:** MRH, GHA, DUR, and DFR

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions	Achievements	Remarks
Overall Goal Roads including bridges in Ghana are appropriately maintained.	1. The length of roads inspected by using the road maintenance manual (RMM) reaches more than XX/YY/ZZ km across the country under the supervision of GHA, DUR, and DFR respectively. 2. The number of bridges inspected by using the Bridge Maintenance and Management Manual attains to more than XX/YY/ZZ across the country under the supervision of GHA, DUR, and DFR respectively. 3. The Road Maintenance Plans are formulated by GHA, DUR, and DFR respectively according to the RMM.	1. Road inspection form attached to the RMM 2. Bridge Management System (BMS) 3. Road Maintenance Plans formulated by GHA, DUR, and DFR			
Project Purpose Capacity of MRH and its Agencies in road and bridge management is improved.	1. More than 82/445/500 projects are planned and designed with the updated road design guide under the supervision of GHA, DUR, and DFR respectively. 2. The length of roads inspected by using the RMM reaches more than 1,529/587/4,246 km in Eastern Region, 1,294/1,280/3,387 km in Central Region, and 357/8,036/1,320 km in Greater Accra Region under the supervision of GHA, DUR, and DFR respectively. 3. 30 bridges prioritized by the Project are inspected according to the Bridge Maintenance and Management Manual.	1. Checklist attached to the updated road design guide 2. Road inspection form attached to the RMM 3. BMS			
Outputs 1. The capacity on road planning and design of MRH and its Agencies is enhanced. 2. The road maintenance capacity of MRH and its Agencies is enhanced. 3. The bridge maintenance capacity of MRH and its Agencies is enhanced.	1-1. The updated road design guide is officially approved by MRH. 1-2. The level of understanding of seminar participants on the road design guide exceeds 70% on average. 2-1. RMM is officially approved by MRH. 2-2. The level of understanding of seminar participants on the road maintenance exceeds 70% on average. 3-1. The Bridge Maintenance and Management Manual is officially approved by MRH. 3-2. More than 2/2/3 bridge specialists of GHA, DUR, and DFR respectively be able to utilize the BMS. 3-3. The level of understanding of seminar participants on the bridge maintenance	1-1. Approval letter of MRH 1-2. Seminar Evaluation Report, Project Monitoring Sheet (PMS) 2-1. Approval letter of MRH 2-2. Seminar Evaluation Report, PMS 3-1. Approval letter of MRH 3-2. Interview to bridge specialists 3-3. Seminar Evaluation			

	exceeds 70% on average.	Report, PMS			

Activities

1-1 Identify the current status, issues and challenges of road planning and design.
1-2 Agree with the Counterpart (C/P) the basic concept and major items of trainings related to road planning and design.
1-3 Prepare an updated road design guide of the existing GHA road design guide.
1-4 Conduct lectures and seminars with the updated road design guide and apply it on an actual project management works.

2-1 Identify the current status, issues and challenges of road maintenance (including design issues).
2-2 Agree with the C/P the basic concept and major items of the RMM to be improved through workshops.
2-3 Revise the Road Maintenance Manual (RMM).
2-4 Develop the i-Dynamic Response Intelligent Monitoring System (iDRIMS).
2-5 Prepare the training materials of the RMM and iDRIMS.
2-6 Support the C/P to apply the Road Maintenance Manual and verify its effectiveness on the actual maintenance works.
2-7 Conduct seminars related to the RMM and iDRIMS User Manual.

3-1 Identify the current status, issues and challenges of bridge maintenance (including design issues).
3-2 Agree with the C/P the basic concept and major items to be improved through workshops.
3-3 Review and update the Bridge Maintenance and Management Manual.
3-4 Review and update the Bridge Management System (BMS) and BMS User Manual.
3-5 Support the C/P to apply the Bridge Maintenance and Management Manual for the model bridges and to store the inspection data to BMS.
3-6 Select and implement minor repair works based on the BMS.
3-7 Input the repair records into the BMS.
3-8 Prepare templates of contacts and technical specifications required for routine maintenance outsourcing.
3-9 Prepare templates of contracts and technical specifications required for periodic maintenance contracts.
3-10 Conduct seminars related to the Bridge Maintenance and Management Manual and BMS User Manual.

Inputs

Japanese side

1. Experts
   - Project Leader / Road Maintenance
   - Deputy Project leader / Bridge Maintenance
   - Road Administration
   - Pavement Inspection
   - Concrete Bridge
   - Steel Bridge
   - Bridge Management System
   - Monitoring and Evaluation
2. Provision of machinery and equipment necessary for the project activities
3. Counterpart training in Japan

Ghanaian side

1. Personnel
   - Project Director (Chief Director of MRH)
   - Project Manager (Director of Policy and Planning Department, MRH)
   - Counterpart (C/P) Personnel
2. Office space, furniture, internet, etc.
3. Expenses necessary for the project activities, such as C/P personnel expenses and pilot minor repair works, if any
4. Annual maintenance works

Budget and human resources are appropriately secured.

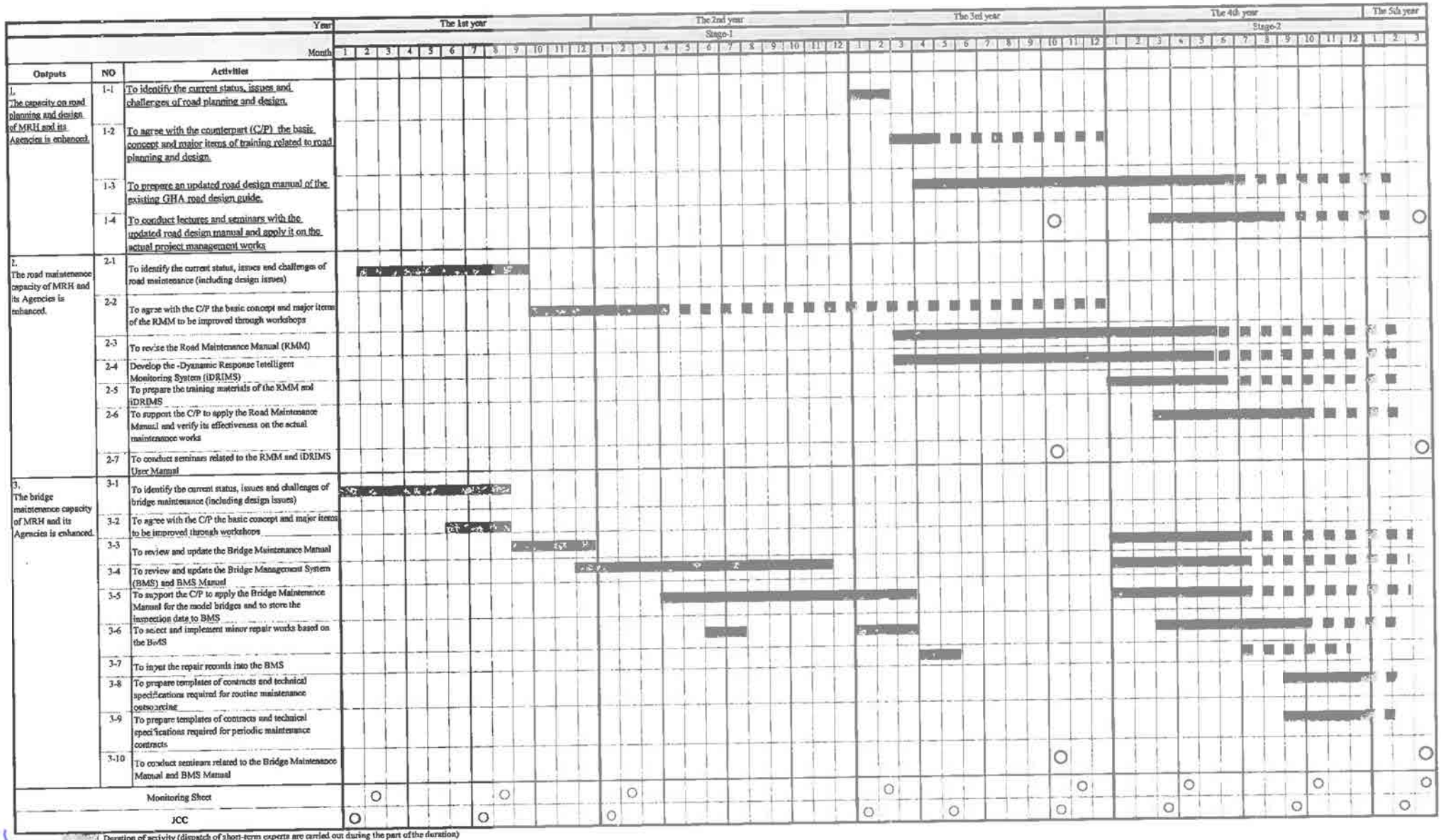
Pre-condition

Safety in Ghana is ensured.

<Issues and Countermeasures>

PLAN OF OPERATION (PO)

Version NO.2
Date: Dec 2021



Duration of activity (dispatch of short-term experts are carried out during the part of the duration)

MINUTES OF MEETING
BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
MINISTRY OF ROADS AND HIGHWAYS AND ITS AGENCIES
OF
THE REPUBLIC OF GHANA
FOR
THE FIRST AMENDMENT OF THE RECORD OF DISCUSSIONS
OF
THE PROJECT ON CAPACITY BUILDING FOR ROAD AND BRIDGE MANAGEMENT

The Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Ministry of Roads and Highways and its Agencies of the Republic of Ghana (hereinafter referred to as "the Counterparts) hereby agree to amend the Record of Discussions of the Project on Capacity Building for Road and Bridge Management (hereinafter referred to as "the Project") signed on November 9, 2018. Based on the request by the Ministry of Roads and Highways (hereinafter referred to as "MRH") dated November 11, 2019 to modify Output 1 and upon series of discussions among related stakeholders, both sides had a conclusion meeting held on February 27, 2020 on the said modification. The parties hereby agree to amend the Record of Discussions as follows:

1. Project Design Matrix (PDM)

(1) Project Purpose

Original	Amended
Verifiable Indicators	
1. X% of projects are monitored and evaluated with the Handbook.	1. X% of projects are planned and designed with the updated road design manual.
Reasons: The Project Purpose is amended in accordance with the revised Output-1 (i.e. Handbook to Road Design Manual).	

(2) Outputs

Original	Amended
Outputs	
Outputs 1. The road and bridge project management (including monitoring & evaluation)	**Outputs** 1. The capacity on road planning and design of MRH and its Agencies is enhanced.

capacity of MRH and its Agencies is enhanced.	
Reasons: From the discussions with the C/Ps, it was found that the contents of the current road design manual do not cover some design issues. As road engineers sometimes respond to the issues according to their own experiences, these results in inconsistencies in road designs in Ghana. Updating the current road design manual will contribute to improvement of road project delivery/outputs in Ghana.	
Verifiable Indicators	
1-1 The handbook is officially approved by MRH 1-2 The handbook is understood by X% of seminar participants.	1-1 The updated road design manual is officially approved by MRH. 1-2 The road design manual is understood by X% of seminar participants.
Reasons: Due to the change in Output 1, (i.e. Handbook to Road Design Manual), the corresponding Indicators also change accordingly.	
Means of Verification	
1-1 Official endorsement by MRH 1-2 Questionnaire to participants	1-1 The updated road design manual 1-2 Questionnaire to participants
Reasons: MRH has jurisdiction to make the necessary technical documents and build capacity of its agencies to improve, develop and maintain road infrastructure.	

(3) Activities

Original	Amended
Activities	
1-1 To identify the current status, issues and challenges of road and bridge project management (including monitoring & evaluation). 1-2 To agree with the counterpart (C/P) the basic concept and major items of training related to the road and bridge project management (including monitoring & evaluation) 1-3 To prepare a handbook related road and bridge project management (including monitoring and evaluation)	1-1 To identify the current status, issues and challenges of road planning and design. 1-2 To agree with the counterpart (C/P) the basic concept and major items of training related to road planning and design. 1-3 To prepare an updated road design manual of the existing GHA road design guide. 1-4 To conduct lectures and seminars with the updated road design manual and apply it on an actual project management works

1-4 To conduct lectures with the Handbook and apply the handbook to the project management works	
Reasons: The activity is amended in accordance with the revised Output-1.	

2. Plan of Operation (PO) will be amended as Annex-3.

This amendment will become effective as of 3rd December, 2020. For avoidance of doubt, all other provisions in the original Record of Discussions remain unchanged and effective.

Accra, 3rd December, 2020

Yasumichi ARAKI
Chief Representative
JICA Ghana Office
Japan International Cooperation Agency

Edmund OFFEI-ANNOR
Chief Director
Ministry of Roads & Highways

Yvonne QUANSAH
Director, Resource Mobilisation & Economic Relations Division
Ministry of Finance

Annex-1 Record of Discussions (signed on November 9, 2018)
Annex-2 Project Design Matrix (Amended)
Annex-3 Plan of Operation (Amended)

Project Design Matrix (PDM)

Version NO.1
Date: 3rd December 2020

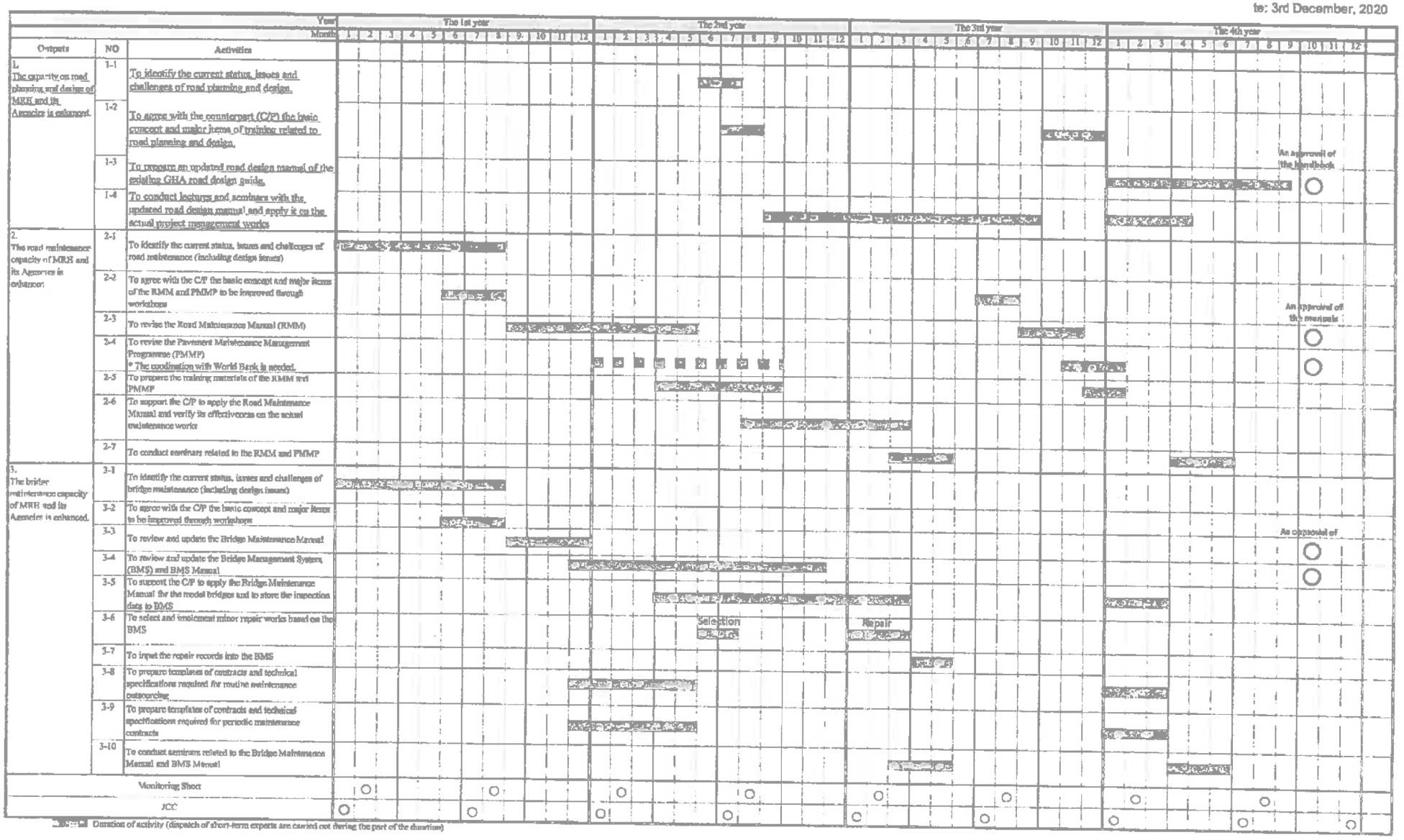
Project Title: Project on Capacity Building for Road and Bridge Management
Project Period: 4 years from March 2019 to Feb. 2022
Target Areas: Ghana Nationwide
Target Group: Ministry of Roads and Highways (MRH), Ghana Highway Authority (GHA), Department of Urban Roads (DUR) and Department of Feeder Roads(DFR)
Implementation Agency: MRH and GHA , DUR, DFR

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Roads including bridges in Ghana are appropriately maintained.	1. The road length which are maintained according to the Manuals is increased from X to Y. 2. The number of preventive-maintained bridges is increased from X to Y.	· Reports of MRH, GHA, DUR and DFR · Interviews with MRH, GHA, DUR, and DFR	
Project Purpose Capacity of MRH and its Agencies in road and bridge management is improved.	1. X% of projects are planned and designed with the updated road design manual. 2. RMM (including PMMP) is applied to actual maintenance works 3. BMS is utilized to select repair works	1. Project Completion Report 2. Project Completion Report 3. Project Completion Report	
Outputs 1 The capacity on road planning and design of MRH and its Agencies is enhanced.	1-1 The updated road design manual is officially approved by MRH. 1-2 The road design manual is understood by X% of seminar participants.	1-1 The updated road design manual 1-2 Questionnaire to Participants	
2 The road maintenance capacity of MRH and its Agencies is enhanced.	2-1 Road maintenance Manual is officially approved by MRH 2-2 Road maintenance works for which the Manual is applied are increased from XX% to YY % 2-3 Quality of the road maintenance works are improved.	2-1 Certificate from MRH 2-2 Monitoring Sheet 2-3 Monitoring Sheet	
3 The bridge maintenance capacity of MRH and its Agencies is enhanced.	3-1 The Bridge Maintenance Manual is officially approved by MRH 3-2 Established BMS is functioned 3-3 XX % of seminar participants scores more than XX points.	3-1 Certificate from MRH 3-2 Monitoring Sheet **3-3** Examination to participants	
Activities 1-1 To identify the current status, issues and challenges of road planning and	**Inputs:** (1) Japanese side		· Budgets and human

	design.	▪ Experts ➢ Project Leader/Road Design & Maintenance ➢ Deputy Project leader/Bridge Design & Maintenance ➢ Road Administration ➢ Pavement Inspection ➢ Concrete Bridge ➢ Steel Bridge ➢ Bridge Management System ➢ Monitoring and Evaluation ▪ C/P training in Japan ▪ Necessary equipment for the project activities (2) Ghana side ▪ Counterpart Personnel ▪ Office space, furniture, internet. etc ▪ Expenses for the project such as C/P personnel expenses and pilot minor repair works, if any ▪ Annual maintenance works	resources are appropriately secured.
1-2	To agree with the counterpart (C/P) the basic concept and major items of training related to road planning and design.		
1-3	To prepare an updated road design manual of the existing GHA road design guide.		
1-4	To conduct lectures and seminars with the updated road design manual and apply it on an actual project management works.		
2-1	To identify the current status, issues and challenges of road maintenance (including design issues)		
2-2	To agree with the C/P the basic concept and major items of the RMM and PMMP to be improved through workshops		
2-3	To revise the Road Maintenance Manual (RMM)		
2-4	To revise the Pavement Maintenance Management Programme (PMMP)		
2-5	To prepare the training materials of the RMM and PMMP		
2-6	To support the C/P to apply the Road Maintenance Manual and verify its effectiveness on the actual maintenance works		
2-7	To conduct seminars related to the RMM and PMMP		
3-1	To identify the current status, issues and challenges of bridge maintenance (including design issues)		**Pre-condition** ▪ Safety in Ghana is ensured.
3-2	To agree with the C/P the basic concept and major items to be improved through workshops		
3-3	To review and update the Bridge Maintenance Manual		
3-4	To review and update the Bridge Management System (BMS) and BMS Manual		
3-5	To support the C/P to apply the Bridge Maintenance Manual for the model bridges and to store the inspection data to BMS		
3-6	To select and implement minor repair works based on the BMS		
3-7	To input the repair records into the BMS		
3-8	To prepare templates of contracts and technical specifications required for routine maintenance outsourcing		
3-9	To prepare templates of contracts and technical specifications required for periodic maintenance contracts		
3-10	To conduct seminars related to the Bridge Maintenance Manual and BMS Manual		

PLAN OF OPERATION (PO)

Version NO.1
to: 3rd December, 2020



In case of reply the number and the date of this letter should be quoted
Tel: No. 233-0302-671328,
Fax No. 233-0302-688759
Url:www.mrt.gov.gh
Email:info@mrt.gov.gh

REPUBLIC OF GHANA

MINISTRY OF ROADS
& HIGHWAYS
P. O. BOX M.57
ACCRA
GHANA

My Ref No. MRH/PB 232/323/01/B

Your Ref. No.....

11th NOVEMBER, 2019

CAPACITY BUILDING IN ROAD AND BRIDGE MAINTENANCE

REVIEW OF CURRENT MANUALS FOR THE ROAD SECTOR

Reference to your submissions and the comments raised at the recent JCC on the above subject.

We have reviewed the suggested list of Manuals which is made up of both existing and newly proposed Manuals. We acknowledge your efforts in compiling these documents and making them comprehensive to suit the various activities for the road sector whiles making them as concise as possible.

Please note the following comments;

1. Include all existing road and bridge maintenance manuals in the series unless the Consultant has adequate justification for the non-relevance of any existing manual
2. All existing manuals are to be reviewed under the project on the first instance. It is expected that all existing manuals that are relevant will be revised. Manuals that are reviewed even with the slightest modification should be reprinted and given a current date.
3. New manuals that have been proposed to be developed under the project will be developed as the second priority to the revision of the current manuals

Attached is specific comments on the series of manuals.

Counting on your usual cooperation.

EDMUND OFFEI-ANNOR
CHIEF DIRECTOR
FOR: HON. MINISTER

THE CONSULTANT
CBRBM
ROOM G10, MRH
ACCRA

cc: Director Policy & Planning – MRH
The Country Director, JICA

Annex-167

LIST OF MANUALS TO BE REVIEWED OR DEVELOPED UNDER THE CBRBM PROJECT

	MANUAL TO BE PREPARED	EXISTING MANUAL	RECOMMENDED ACTION BY CONSULTANT	MRH RECOMMENDATION
1	Institutional Guideline for Road and Bridge maintenance and management Handbook	Moms Activities/ Organisational structure	New Proposed manual	This is not a priority. It can be considered after the existing manuals have been completed
2	Road Classification and numbering of routes	MoM Road Condition Survey Manual	No Action	Review and update existing manual
3	Bridge maintenance and Management Manual		New	This is wrongly compared to the Standard Specifications for roads and bridges. How different is this from the bridge maintenance manual?
4	Data Collection and inventory manual	MoM Road Condition Survey Manual	No Action	No action
5	Data Collection and road monitoring survey using IDRIMS	MoM Road Condition Survey Manual	New	New, recommended
6	Bridge Inspection and data collection manual	Bridge Inspector's Manual	Update existing manual	Review and update existing manual
7	Prediction of pavement deterioration and preventive maintenance using IRI	PMMP user manual	Update existing manual	Review and update existing manual
8	Bridge condition analysis, BMS manual		NEW	This is has been listed as Bridge Maintenance management manual. This is recommended.
9	Mid-long term maintenance plan and prioritization	PMMP planning and budgeting tool	No action	No action, HWM IV will be used
10	Road design manual	Road design manual guide	No action	Review and update existing manual
11	Design manual for Bridge repair	Guide for repairs and maintenance of bridges	No action	Review and update existing manual
12	Cost Survey guidelines for PBC contracts		No action	No action

	MANUAL TO BE PREPARED	EXISTING MANUAL	RECOMMENDED ACTION BY CONSULTANT	MRH RECOMMENDATION
13	Standard Drawings	Standards drawings	No action	Review and update existing manual
14	Works Procurement	MoM Procurement vol, 1,2,3	No action	No action
15	Contractor's Performance Manual		No action	New, Recommended to be developed under the project
16	Activities of the supervisor	MoM Road maintenance works supervision	No action	Review and update this manual
17	Monitoring and Evaluation		No action	New, recommended to be developed under the project

RECORD OF DISCUSSIONS

FOR

THE PROJECT ON CAPACITY BUILDING FOR ROAD AND BRIDGE MANAGEMENT

AGREED UPON BETWEEN

MINISTRY OF ROADS AND HIGHWAYS AND ITS AGENCIES

OF

THE REPUBLIC OF GHANA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

Accra, November 9, 2018

Annex 1 Main Points Discussed
Annex 2 Project Design Matrix (PDM)
Annex 3 Plan of Operation (PO)
Annex 4 Implementation Structure
Annex 5 List of Proposed Members of Joint Coordinating Committee
Annex 6 Counterpart Personnel List

7. **Provision of benefits and facilities**

Ghana side agrees to provide the following benefits and facilities to JICA experts:

(1) Office space in the building of MRH for the Project members with office furniture and utilities such as internet connection, electricity, air conditioner and so on;
(2) Necessary data and information for the Project;
(3) Permission of access to the project sites; and
(4) Identification cards if necessary.

Japan side agrees to provide following inputs to Ghana side.

(1) Experts
(2) C/P training in Japan
(3) Necessary equipment for the project activities.

8. **Local Travel and Accommodation Cost and Per Diem for C/P and seminar participants**

Both sides have agreed that local travel and accommodation cost and per diem shall be borne by Ghana side.

9. **Handbook for Road and Bridge Project Management**

Both sides have agreed that the Handbook will contain lessons learnt, which were extracted and summarized from the previous monitoring reports and/or records of accidents/ defects /problems of road projects.

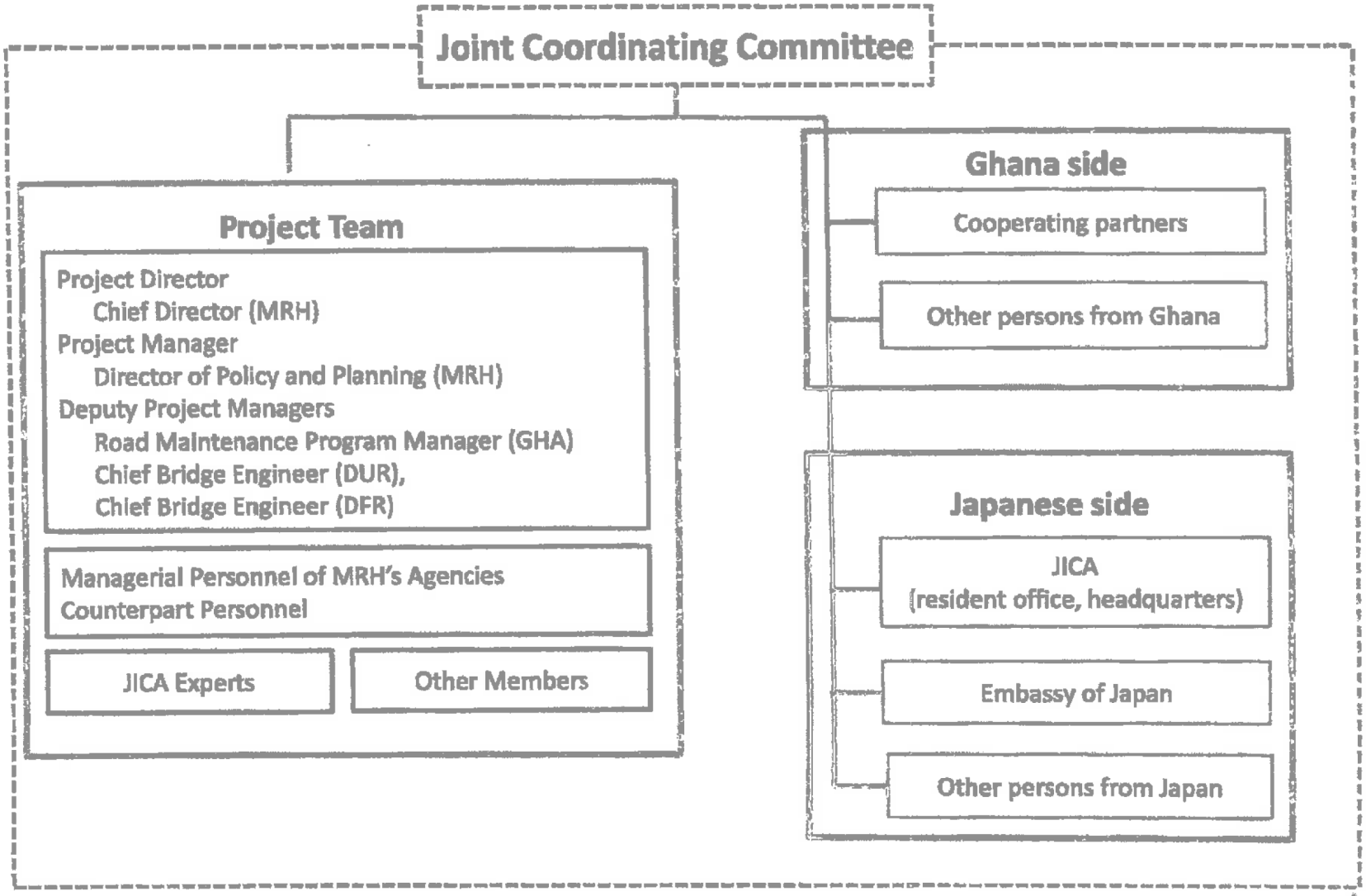
The Handbook is expected to be utilized to detect typical risks which can occur during the project formations, implementations and operations.

10. **Environmental and Social Considerations**

With regard to the Section 10.1 of the "Basic Principles for Technical Cooperation" published in December 2016, the Project is likely to have minimal adverse impact on the environment and society under the 'JICA Guidelines for Environmental and Social Considerations (April 2010).

Activities	Inputs:	
1-1 To identify the current status, issues and challenges of road and bridge project management (including monitoring & evaluation) 1-2 To agree with the Counterpart (C/P) the basic concept and major items of trainings related to the road and bridge project management (including monitoring & evaluation) 1-3 To prepare a handbook related road and bridge project management (including monitoring & evaluation) 1-4 To conduct lectures with the Handbook and apply the handbook to the project management works 2-1 To identify the current status, issues and challenges of road maintenance (including design issues) 2-2 To agree with the C/P the basic concept and major items of the RMM and PMMP to be improved through workshops 2-3 To revise the Road Maintenance Manual (RMM) 2-4 To revise the Pavement Maintenance Management Programme (PMMP) 2-5 To prepare the training materials of the RMM and PMMP 2-6 To support the C/P to apply the Road Maintenance Manual and verify its effectiveness on the actual maintenance works 2-7 To conduct seminars related to the RMM and PMMP 3-1 To identify the current status, issues and challenges of bridge maintenance (including design issues) 3-2 To agree with the C/P the basic concept and major items to be improved through workshops 3-3 To review and update the Bridge Maintenance Manual 3-4 To review and update the Bridge Management System (BMS) and BMS Manual 3-5 To support the C/P to apply the Bridge Maintenance Manual for the model bridges and to store the inspection data to BMS 3-6 To select and implement minor repair works based on the BMS 3-7 To input the repair records into the BMS 3-8 To prepare templates of contracts and technical specifications required for routine maintenance outsourcing 3-9 To prepare templates of contracts and technical specifications required for periodic maintenance contracts 3-10 To conduct seminars related to the Bridge Maintenance Manual and BMS Manual	(1) Japanese side ・Experts ➢ Project Leader/Road Design & Maintenance ➢ Deputy Project leader/Bridge Design & Maintenance ➢ Road Administration ➢ Pavement Inspection ➢ Concrete Bridge ➢ Steel Bridge ➢ Bridge Management System ➢ Monitoring and Evaluation ・C/P training in Japan ・Necessary equipment for the project activities (2) Ghana side ・Counterpart Personnel ・Office space, furniture, internet. etc ・Expenses for the project such as C/P personnel expenses and pilot minor repair works, if any ・Annual maintenance works	・Budgets and human resources are appropriately secured. **Pre-condition** ・Safety in Ghana is ensured.

Implementation Structure



Annex 6

Counterpart Personnel List
(as of 17th August 2018)

<GHA (Bridge)>
Victor Baah
Roland Neequaye

<GHA (Road maintenance)>
Mark Okyere
Eric Odosu

<DUR>
Nimatu Sani
Shadrach Nartey
Carlos Mensah
Jeffery Darkwah

<DFR>
K. N. Akosah-Koduah
Don Kuubertezie
Nathan Odjao
Frank Amofa

<KTC>
Charles Afetomu

<MRH>
James Atiemo – Monitoring & Evaluation
Efua Effah– Policy & Planning

[Note]
GHA: Ghana Highway Authority
DUR: Department of Urban Roads
DFR: Department of Feeder Roads
KTC: Koforidua Training Centre

RECORD OF DISCUSSIONS

FOR

THE PROJECT ON CAPACITY BUILDING FOR ROAD AND BRIDGE MANAGEMENT

AGREED UPON BETWEEN

MINISTRY OF ROADS AND HIGHWAYS AND ITS AGENCIES

OF

THE REPUBLIC OF GHANA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

Accra, November 9, 2018

Based on the Minutes of Meetings on the Detailed Planning Survey for the Project on Capacity Building for Road and Bridge Management (hereinafter referred to as "the Project") signed on March 15th, 2017 between Ministry of Roads and Highways of the Republic of Ghana (hereinafter referred to as "the Counterpart") and the Japan International Cooperation Agency (hereinafter referred to as "JICA"), JICA held series of discussions with the Counterpart and relevant organizations to develop a detailed plan of the Project.

The purpose of this Record of Discussions (hereinafter referred to as "the R/D") is to establish a mutual agreement for its implementation by both parties and to agree on the detailed plan of the Project as described in the following and the Annexes, which will be implemented within the framework of the Note Verbales exchanged on 21st October 2016 between the Government of Japan and the Government of the Republic of Ghana.

The Counterpart will be responsible for the implementation of the Project in cooperation with JICA, coordinate with other relevant organizations and ensure that the self-reliant operation of the Project is sustained during and after the implementation period in order to contribute toward social and economic development of the Republic of Ghana.

Both parties also agreed that the Project will be implemented in accordance with the "Basic Principles for Technical Cooperation" published in December 2016 (hereinafter referred to as "the BP"), unless other arrangements are agreed in the R/D.

The R/D is delivered at Accra as of the day and year first above written. The R/D may be amended by a minutes of meetings between both parties, except the plan of operation to be modified in monitoring sheets. The Minutes of Meetings will be signed by authorized persons of each side who may be different from the signers of the R/D.

Hirofumi Hoshi
Chief Representative
JICA Ghana Office
Japan International Cooperation Agency

Edmund Offei-Annor
Chief Director
Ministry of Roads and Highways

Yvonne Quansah
Director, External Resource Mobilization, Bilateral Division
Ministry of Finance