Appendix

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ANNEX 1: Results of the Project

1. List of Expert

Table A1.1 JICA Experts

No.	Position / Responsiblity	Name	Oarganisation
1	Leader / Road Maintenance Plan	Mr. Nobuharu SHIMIZU	Ingérosec Corporation
2	Depty Leader / Road Maintenance Plan 2	Mr. Mitsuhide SAITO	Ingérosec Corporation
3	Raod Inspection	Mr. Hiroaki TAKAHASHI	Eight Japan Engineering Consultants Inc.
4	Pavement Repair	Mr. Fumihiko SHISHIDO	Ingérosec Corporation
5	Raod Inspection (Database)	Mr. Kohei SAKAI	Katahira & Engineers International (Renfort)
6	Raod Inspection (Database 2)	Mr. Chikakuni MAEDA	Katahira & Engineers International (Renfort)
7	Pavement Repair (Construction Supervison)	Mr. Kiyoshi MUKAI	Katahira & Engineers International
8	Coordinator / Assistant of Road Maintenance Plan	Mr. Mitsuya YAMAGISHI	Ingérosec Corporation (Renfort)
9	Coordinator / Assistant of Road Maintenance Plan 2	Mrs. Haruka SAITO	Ingérosec Corporation
10	Monitoring and Evaluation	Mrs. Junko TAGUCHI	Katahira & Engineers International
11	Training Plan	Mrs. Jin Lin	Ingérosec Corporation

Source : JICA Experts

2. List of Counterparts

Table A1.2 Chairperson, Coordination Secretary

No.	Position / Responsiblity	Name	Oarganisation
1	Advisor to the Minister of MIPWR in charge of Roads	Mr. Pius NGOIE	Ministère des Infrastructures, Travaux Publics et Reconstruction (MITPR)
2	Coordonnateur	Mr. Théopphile NTELA LUNGUMBA	Cellule Infrastructures (CI)
3	Technical Director	Mr. Robert LENDO LENDO	Fonds National d'Entretien Routier (FONER)

Source : JICA Experts

Table A1.3 Counterparts of Working Group 1 (WG1)

No.	Position / Responsiblity	Name	Oarganisation
1	Chief of Road Section	Mr. Jean-Pierre MUTAMBA NENE *1	CI
2	Coordinator	Mr. Balayi KADIMA *1	OR
3	Director of Training	Mr. Sangana MALONDA *1	OR
4	Head of Research Dept. /	Mr. Joshua MUTIA	OR
5	Chief of Brigade 901 / Kinshasa	Mr. Pierre WANET MUTUMOSI	OR
6	Chef de la Base de Données	Mr. Jean Paul MAVUNGU SOKANA	OR

No.	Position / Responsiblity	Name	Oarganisation
7	Logistic Director	Mr. Richard MATANDA MWAMB *1	OVD
8	Chief of Section of Monitoring and Evaluation	Mr. Leon MUTOMBO *1	OVD
9	Technical Director / DPK	Mr. Timothée SUMAHILI	OVD
10	Studies & Analysis	Mr. Pela WASAMA C.	OVD
11	Studies & Analysis	Mr. Jimmy NKULA	OVD
12	Studies & Analysis	Mr. Zico NSIALA MPUNGI	OVD
13	Provincial Director	Mr. Pascal BULONGO *1	FONER
14	Chief of Division	Mr. Patou MWA ILUNGA	BTC
15	Chief of Division	Mr. Willy MONDA TONA	BTC
16	Chief of Service	Mr. Fils ZENGA MBALA	BTC
17	Chief of Road Section	Mr. Michel DINGANGA	ACGT

Note : people marked with *1 are main counterparts

Source : JICA Experts

Table A1.4 Counterparts of Working Group 2 (WG2)

No.	Position / Responsiblity	Name	Oarganisation
1	Chief of Road Section	Mr. Jean-Pierre MUTAMBA NENE	Cellule Infrastructures (CI)
2	Coordinator	Mr. Balayi KADIMA	OR
3	Director of Training	Mr. Sangana MALONDA	OR
4	Database Chief	Mr. Jean Paul MAVUNGU SOKANA	OR
5	Chief of Brigade 901 / Kinshasa	Mr. Pierre WANET MUTUMOSI	OR
6	Site Chief	Mr. Jonathan MAYAMBA UMBI	OR Kinshasa Provincial Office (DPK Brigade)
7	Site Chief	Mr. Albert MUINDILE MUTSHIPAYI	OR Kinshasa Provincial Office (DPK Brigade)
8	Site Chief	Mr. Guylain LUZOLO TUKITALO	OVD Kinshasa Provincial Office (DPK Brigade)
9	Site Chief	Mr. Victor KALONDA Ka KALONDA	OVD Kinshasa Provincial Office (DPK Brigade)
10	Logistic Director	Mr. Richard MATANDA MWAMB	OVD
11	Evaluation Chief of Service	Mr. Leon MUTOMBO	OVD
12	Study and Project Section	Mr. Lobo LOBO MPUMFA	OVD
13	Road Section	Mr. Christ NSIMBULU MASAMBA	OVD
14	Technical Director / DPK	Mr. Timothée SUMAHILI	OVD
15	Chief of Service	Mr. Dominique NZUZI MASSAMBA	BTC
16	Chief of Division	Mr. Willy MONDA TONA	BTC

No.	Position / Responsiblity	Name	Oarganisation
17	Provincial Director	Mr. Pascal BULONGO	FONER
18	Chief of Monitoring, Works, and Equipment Section	Mr. Joseph MASISA	FONER
19	Chief of Service	Mr. Mao NTUMBA MULUME	ACGT
20	Chief of Road Section	Mr. Michel DINGANGA	ACGT

Source : JICA Experts

3. Trainee

Table A1.5 Trainee of Asphalt paved Road Inspection and Repair

No.	Asphalt paved Road Inspection		Asphalt paved Road Repair	
	Name	Oarganisation	Name	Oarganisation
1	Christ NSIMBULU MASAMBA	OVD	Rose BUKAWU KALUBI (Female)	OVD
2	Pierre WANET MUTUMOSI	OR	Hélène SEKO MFUNDU (F)	OR
3	Jonathan MAYAMBA	OR	Déogratias NTAMBI KALULO	OR
4	Albert MUINDILE MUTSHIPAYI	OR	Kady OLEKONYA KADIMA	OR
5	Guylain LUZOLO TUKITALO	OVD	BWABWA MUKENDI	OR
6	Victor KALONDA KAKALONDA	OVD	LOMBOMBE NSUNDJU (F)	OR
7	Chiristophe TSHIDIBI TSIMBOMBO	OR(LNTP)	Zacharie LANDAMO MADIATA	OR
8	Eric DIOMBA PAMBU	OR(LNTP)	Olivier MITSHABU KADIMA	OVD
9	Michel DINGANGA	ACGT	Jean-Jacques KAWE LUMUMBA	OVD
10	Pascal BULONGO PYANA	FONER	NKUNGA MANSIANTIMA	OVD
11	Dominique NZUZI MASSAMBA	BTC	Didier FATAKI KASONGO	OR(LNTP)
12	Timothe SUMALI	OVD	DAKWA BEMBA	OR
13	FIMPADIO MAMPUYA	OVD	Géorges MAKANDA TRIKASE	OR
14	AGIGBA ZONO	OVD	Kevin BABAKA LELO	ACGT
15	EWMBE NANDO	OVD	Andy MPUTU ISSANZA	OR
16	IMBOTO MABILA	OVD	Olga BANZA NGOIE (F)	OR
17	MVUEZOLO TOLOMBA	OVD	Eddy BONGONGO SOZANE	OVD
18	MUKUDI KAZADI	OR	KYUNGU NTAMBI	OR
19	MURHULA GWA KASHEMWA	OR	Jean BAWILI KAZINGUVU	OR
20	MAKANDA TRIKASE	OR	LOSHA KAZADI	OVD
21	BUKASA MUKENDI	OR	MBOMA MAKASI	BTC
22	MOIKA NGBOLIKO	OR	Jorluquin SANGI NKANZA	OVD
23	NKENDA MATONDO	OR	KHONDE MAKAYA	OVD
24	Patrick MBILA ESONG	BTC	Narra KIMVULA MUDIMUNANGA	OVD
25	Corneille MADIMBA MADIMBA	BTC		
26	ESRHER MATUTALA	OR(LNTP)		

Source : JICA Experts

ANNEX 2: List of Products

Table A2.1 List of Products

No.	Products	Products Storage Location
1	Technical Guidelines on Asphalt paved Maintenance	ANNEX 6 01
2	Training Materials	ANNEX 6 02
	Asphalt paved Road Inspection	
	Asphalt paved Road Inspection (Database)	
	Asphalt paved Road Repair	
	Supervision	
3	Activity Report of the Inspection and Data Base Team	ANNEX 6 03
4	Specification for Continuation of the Activities of the PRCMR Project : Strategies to be Implemented	ANNEX 6 04
5	Report of Training in Japan	ANNEX 6 05

ANNEX 3: PDM (All versions of PDM)

Project Monitoring Sheet I (Revision of Project Design Matrix)
Version 1 - July 6, 2016

Project Monitoring Sheet I （Revision of Project Design Matrix）

Project Title: The Project for Capacity Development of Road Maintenance Management
Implementing Agency: Office des Routes (OR) and Office des Voiries et Drainage (OVD)
Target Group:Technical staffs of headquarters and Kinshasa provincial offices of OR and OVD
Period of Project: June 2016 - October 2018
Project Site: Kinshasa city and the surrounding area

Version 1
Dated month July 6, 2016

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption	**Achievement**	**Remarks**
Overall Goal					
Maintenance condition of the asphalt-paved (AP) roads is improved in the capital city, Kinshasa, and it's suburb	The proportion of the roads that meet the national standard of the road condition becomes XX %	Annual reports of OR and OVD			
Project Purpose					
AP road maintenance capacity of OR and OVD in the project sites is developed	1. More than XX % of the AP roads are inspected based on the AP road maintenance plan FY2018	1. AP road inspection report, Japanese experts' evaluation results of AP road inspection report, and database information	-Any significant changes are not made in AP road maintenace policies		
	2.More than XX % of the officials concerned** consider the condition of AP road maintenance of OR and OVD has improved compared to that of before the commencement of the project	2. Interview (questionnaire) to the officials concerned 3. APm repair works report, Japanese experts' evaluation results of APm repair works report, database information			
	3. More than XX % of the APm repair works plan is implemented based on the AP road maintenance plan FY2018	4. Interview (questionnaire) to the officials concerned	-Necessary budget and staffs for AP road maintenance are allocated annualy		
	4. More than XX % of the officials concerned** consider the condition of APm repair works of OR and OVD has improved compared to that of before the commencement of the project **JCC members and Kinshasa provincial officials		-Abnormal rainfall does not occur		
Outputs					
1. AP road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites	1-1. Traffic volume survey is conducted on XX sections by XX for one time throughout the project period	1-1. Traffic volume survey report	-Principal counterpart personnel do not resign, or are not transferred		
	1-2. AP road maintenance plan FY2018 is developed by OR and OVD	1-2. AP road maintenance plan document FY2018			
	1-3. Budget request document FY2018 for AP road maintenance is submitted by OR and OVD.	1-3. Budget request document FY2018 for AP road maintenance			
2. Technical guidelines on AP road maintenance are developed	2-1. Technical guidelines on AP road maintenance are drafted by month, year	2-1. Drafted technical guidelines			
	2-2. Database of AP road inspection is developed by month, year	2-2. Database of AP road inspection which developed by OR and OVD			
	2-3. Technical guidelines on AP road maintenance are finalized by month, year	2-3. Finalized technical guidelines			
	2-4. Formalities for official approval of the finalized technical guidelines on AP road maintenance are submitted	2-4. Formalities			
3. AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites	3-1. Training plan is developed by month, year	3-1. Training plan document			
	3-2. XX times of lectures on AP road inspection are conducted	3-2. Lectures report (AP road inspection)			
	3-3. XX times of OJTs on AP road inspection are conducted	3-3. OJTs report (AP road inspection)			
	3-4. A percentage of correct answers of the endline survey on AP road inspection is increased by XX % compared to that of the baseline survey*	3-4. Project report on the comparison between the baseline & endline surveys on AP road inspection			
	3-5. XX times of trial AP road inspection are conducted	3-5. AP road inspection report			
	3-6. XX times of lectures on APm repair works are conducted	3-6. Lectures reprot (APm repair works)			
	3-7. XX times of OJTs on APm repair works are conducted	3-7. OJTs report (APm repair works)			
	3-8. A percentage of correct answeres of the endline survey on APm repair works is increased by XX % compared to that of the baseline survey*	3-8. Project report on the comparison between the baseline & endline surveys on APm repair works			
	3-9. XX times of trial APm repair works are conducted	3-9. APm repair works report			

Activities	Inputs		Important Assumption
1-1. Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites	The Japanese Side	DRC Side	
1-2. Identify the most appropriate roles, responsibilities and work proedures for AP road maintenance of OR and OVD in the project sites 1-3. Define the road network to be covered by the project 1-4. Conduct traffic volume survey on some sections of the defined road network 1-5. Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites 1-6. Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request	1.Experts -Leader / Road Maintenance Plan -Road Inspection -Road Inspection (Database) -Pavement Repair (Construction Supervison) -Coordinator -Monitoring and Evaluation -Other experts, if necessary	1. Counterparts -Project Directors -Project Managers -Project Members 2. Equipment and Facilities -Office spaces in the building of OR for the Project with office furniture and utilities such as internet connection, electricity, air conditioner, etc.	-DRC and other neighboring countries do not fall into conflict or turmoil due to social, economic, political reasons or famine
2-1. Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites 2-2. Collect and review the existing AP road maintenance manuals and technical guidelines 2-3. Establish the Joint Working Group for developing technical guidelines on AP road maintenance 2-4. Develop and draft technical guidelines on AP road maintenance	2. Machinery and Equipment -PC and Software for Database -Other machinery and equipment, if necessary 3. Trainings in Japan -2 times thorought the project period	3. Local Cost Borned by DRC side -Local expenses necessary for the implementation of the Project including travel expenses and allowance for the counterparts, JCC members, WG members, TAG members and Training participants	
2-5. Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group meetings etc. and revise the drafted technical guidelines			Pre-Conditions
2-6. Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection 2-7. Develop a database for accumulating the AP road inspection results 2-8. Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works 2-9. Finalize the technical guidelines 2-10. Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations 2-11. Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW <u>3-1.Training plan for AP road inspection and APm repair works</u> 3-1-1. Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works 3-1-2. Plan the trainings on AP road inspection and APm repair works 3-1-3. Select condidate sites for the trainings on AP road inspection and APm repair works <u>3-2. Trainings on AP Road Inspection</u> 3-2-1. Conduct baseline survey on the training participants' skills and knowledge of AP road inspection 3-2-2. Conduct lecutures on AP road inspeciton 3-2-3. Conduct OJTs on AP road inspection at the selected sites in the project sites 3-2-4. Conduct endline survey on the training participants' skills and knowledge of AP road inspection 3-2-5. Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines <u>3-3. Training on APm Repair Works</u> 3-3-1. Conduct baseline survey on the training participants' skills and knowledge of APm repair works 3-3-2. Conduct lectures on APm repair works 3-3-3. Conduct OJTs on APm repair works at the selected sites in the project sites 3-3-4. Conduct endline survey on the training participants' skills and knowledge of APm repair works 3-3-5. Conduct APm repair works through trial implementation of the drafted technical guildelines by the training participants and evaluate the procedure and outcomes for revising the guidelines			<Issues and countermesures>

*[month, year] / xx / * to be determined and defined within six (6) months after the commencement of the Project*

Project Monitoring Sheet I (Revision of Project Design Matrix)
Version 2 - November 8, 2016

Project Monitoring Sheet I （Revision of Project Design Matrix）

Project Title: The Project for Capacity Development of Road Maintenance Management
Implementing Agency: Office des Routes (OR) and Office des Voiries et Drainage (OVD)
Target Group:Technical staffs of headquarters and Kinshasa provincial offices of OR and OVD
Period of Project: June 2016 - October 2018
Project Site: Kinshasa city and the surrounding area

Version 2
Dated month November 8, 2016

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption	**Achievement**	**Remarks**
Overall Goal					
Maintenance condition of the asphalt-paved (AP) roads is improved in the capital city, Kinshasa, and it's suburb	The proportion of the roads that meet the national standard of the road condition becomes XX %	Annual reports of OR and OVD			
Project Purpose					
AP road maintenance capacity of OR and OVD in the project sites is developed	1. More than XX % of the AP roads are inspected based on the AP road maintenance plan FY2018	1. AP road inspection report, Japanese experts' evaluation results of AP road inspection report, and database information	-Any significant changes are not made in AP road maintenace policies		
	2.More than XX % of the officials concerned** consider the condition of AP road maintenance of OR and OVD has improved compared to that of before the commencement of the project	2. Interview (questionnaire) to the officials concerned 3. APm repair works report, Japanese experts' evaluation results of APm repair works report, database information			
	3. More than XX % of the APm repair works plan is implemented based on the AP road maintenance plan FY2018	4. Interview (questionnaire) to the officials concerned	-Necessary budget and staffs for AP road maintenance are allocated annualy		
	4. More than XX % of the officials concerned** consider the condition of APm repair works of OR and OVD has improved compared to that of before the commencement of the project				
	**JCC members and Kinshasa provincial officials		-Abnormal rainfall does not occur		
Outputs					
1. AP road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites	1-1. Traffic volume survey is conducted on XX sections by month, year for one time throughout the project period	1-1. Traffic volume survey report	-Principal counterpart personnel do not resign, or are not transferred		
	1-2. AP road maintenance plan FY2018 is developed by OR and OVD	1-2. AP road maintenance plan document FY2018			
	1-3. Budget request document FY2018 for AP road maintenance is submitted by OR and OVD.	1-3. Budget request document FY2018 for AP road maintenance			
2. Technical guidelines on AP road maintenance are developed	2-1. Technical guidelines on AP road maintenance are drafted by January, 2017.	2-1. Drafted technical guidelines			
	2-2. Database of AP road inspection is developed by July, 2018.	2-2. Database of AP road inspection which developed by OR and OVD			
	2-3. Technical guidelines on AP road maintenance are finalized by October, 2018.	2-3. Finalized technical guidelines			
	2-4. Formalities for official approval of the finalized technical guidelines on AP road maintenance are submitted	2-4. Formalities			
3. AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites	3-1. Training plan is developed by January, 2017.	3-1. Training plan document			
	3-2. 3 times of lectures on AP road inspection are conducted	3-2. Lectures report (AP road inspection)			
	3-3. 3 times of OJTs on AP road inspection are conducted	3-3. OJTs report (AP road inspection)			
	3-4. A percentage of correct answers of the endline survey on AP road inspection is increased by XX % compared to that of the baseline survey*	3-4. Project report on the comparison between the baseline & endline surveys on AP road inspection			
	3-5. 3 times of trial AP road inspection are conducted	3-5. AP road inspection report			
	3-6. 3 times of lectures on APm repair works are conducted	3-6. Lectures reprot (APm repair works)			
	3-7. 3 times of OJTs on APm repair works are conducted	3-7. OJTs report (APm repair works)			
	3-8. A percentage of correct answeres of the endline survey on APm repair works is increased by XX % compared to that of the baseline survey*	3-8. Project report on the comparison between the baseline & endline surveys on APm repair works			
	3-9. 3 times of trial APm repair works are conducted	3-9. APm repair works report			

Activities	Inputs		Important Assumption
	The Japanese Side	DRC Side	
1-1. Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites			
1-2. Identify the most appropriate roles, responsibilities and work proedures for AP road maintenance of OR and OVD in the project sites 1-3. Define the road network to be covered by the project 1-4. Conduct traffic volume survey on some sections of the defined road network 1-5. Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites 1-6. Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request	1.Experts -Leader / Road Maintenance Plan -Road Inspection -Road Inspection (Database) -Pavement Repair (Construction Supervison) -Coordinator -Monitoring and Evaluation -Other experts, if necessary	1. Counterparts -Project Directors -Project Managers -Project Members 2. Equipment and Facilities -Office spaces in the building of OR for the Project with office furniture and utilities such as internet connection, electricity, air conditioner, etc.	-DRC and other neighboring countries do not fall into conflict or turmoil due to social, economic, political reasons or famine
2-1. Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites 2-2. Collect and review the existing AP road maintenance manuals and technical guidelines 2-3. Establish the Joint Working Group for developing technical guidelines on AP road maintenance 2-4. Develop and draft technical guidelines on AP road maintenance	2. Machinery and Equipment -PC and Software for Database -Other machinery and equipment, if necessary 3. Trainings in Japan -2 times thorought the project period	3. Local Cost Borned by DRC side -Local expenses necessary for the implementation of the Project including travel expenses and allowance for the counterparts, JCC members, WG members, TAG members and Training participants	
2-5. Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group meetings etc. and revise the drafted technical guidelines			Pre-Conditions
2-6. Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection 2-7. Develop a database for accumulating the AP road inspection results 2-8. Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works 2-9. Finalize the technical guidelines 2-10. Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations 2-11. Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW <u>3-1.Training plan for AP road inspection and APm repair works</u> 3-1-1. Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works 3-1-2. Plan the trainings on AP road inspection and APm repair works 3-1-3. Select condidate sites for the trainings on AP road inspection and APm repair works <u>3-2. Trainings on AP Road Inspection</u> 3-2-1. Conduct baseline survey on the training participants' skills and knowledge of AP road inspection 3-2-2. Conduct lecutures on AP road inspeciton 3-2-3. Conduct OJTs on AP road inspection at the selected sites in the project sites 3-2-4. Conduct endline survey on the training participants' skills and knowledge of AP road inspection 3-2-5. Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines <u>3-3. Training on APm Repair Works</u> 3-3-1. Conduct baseline survey on the training participants' skills and knowledge of APm repair works 3-3-2. Conduct lectures on APm repair works 3-3-3. Conduct OJTs on APm repair works at the selected sites in the project sites 3-3-4. Conduct endline survey on the training participants' skills and knowledge of APm repair works 3-3-5. Conduct APm repair works through trial implementation of the drafted technical guildelines by the training participants and evaluate the procedure and outcomes for revising the guidelines			<Issues and countermesures>

*[month, year] / xx / * to be determined and defined within six (6) months after the commencement of the Project*

Project Monitoring Sheet I (Revision of Project Design Matrix)
Version 3 - May 25, 2017

Project Monitoring Sheet I （Revision of Project Design Matrix）

Project Title: The Project for Capacity Development of Road Maintenance Management
Implementing Agency: Office des Routes (OR) and Office des Voiries et Drainage (OVD)
Target Group: Technical staffs of headquarters and Kinshasa provincial offices of OR and OVD
Period of Project: June 2016 - October 2018
Project Site: Kinshasa city and the surrounding area

Version 3
25-May-17

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption	**Achievement**	**Remarks**
Overall Goal					
Maintenance condition of the asphalt-paved (AP) roads is improved in the capital city, Kinshasa, and it's suburb	The proportion of the roads that meet the national standard of the road condition becomes 31.9 %	Annual reports of OR and OVD			
Project Purpose					
AP road maintenance capacity of OR and OVD in the project sites is developed	1. More than 29.0 % of the AP roads are inspected based on the AP road maintenance plan FY2018 2.More than 60.0 % of the *people concerned*** consider the condition of AP road maintenance of OR and OVD has improved compared to that of before the commencement of the project 3. More than 70.0 % of the APm repair works plan is implemented based on the AP road maintenance plan FY2018 4. More than 60.0 % of the *people concerned*** consider the condition of APm repair works of OR and OVD has improved compared to that of before the commencement of the project **JCC members (selected), Kinshasa provincial officials and other relevant people listed in the attachment.	1. AP road inspection report, Japanese experts' evaluation results of AP road inspection report, and database information 2. Interview (questionnaire) to the officials concerned 3. APm repair works report, Japanese experts' evaluation results of APm repair works report, database information 4. Interview (questionnaire) to the officials concerned	-Any significant changes are not made in AP road maintenance policies -Necessary budget and staffs for AP road maintenance are allocated annually -Abnormal rainfall does not occur		
Outputs					
1. AP road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites	1-1. Traffic volume survey is conducted on 2 sections by July 2017 for one time throughout the project period 1-2. AP road maintenance plan FY2018 is developed by OR and OVD 1-3. Budget request document FY2018 for AP road maintenance is submitted by OR and OVD.	1-1. Traffic volume survey report 1-2. AP road maintenance plan document FY2018 1-3. Budget request document FY2018 for AP road maintenance	-Principal counterpart personnel do not resign, or are not transferred		
2. Technical guidelines on AP road maintenance are developed	2-1. Technical guidelines on AP road maintenance are drafted by April 2017. 2-2. Database of AP road inspection is developed by July 2018. 2-3. Technical guidelines on AP road maintenance are finalized by October 2018. 2-4. Formalities for official approval of the finalized technical guidelines on AP road maintenance are submitted	2-1. Drafted technical guidelines 2-2. Database of AP road inspection which developed by OR and OVD 2-3. Finalized technical guidelines 2-4. Formalities			
3. AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites	3-1. Training plan is developed by April, 2017. 3-2. 3 times of lectures on AP road inspection are conducted 3-3. 3 times of OJTs on AP road inspection are conducted 3-4. A percentage of correct answers of the end line survey on AP road inspection is increased by 60.0 % compared to that of the baseline survey* 3-5. 3 times of trial AP road inspection are conducted 3-6. 3 times of lectures on APm repair works are conducted 3-7. 3 times of OJTs on APm repair works are conducted 3-8. A percentage of correct answers of the end line survey on APm repair works is increased by 60.0 % compared to that of the baseline survey* 3-9. 3 times of trial APm repair works are conducted	3-1. Training plan document 3-2. Lectures report (AP road inspection) 3-3. OJTs report (AP road inspection) 3-4. Project report on the comparison between the baseline & end line surveys on AP road inspection 3-5. AP road inspection report 3-6. Lectures report (APm repair works) 3-7. OJTs report (APm repair works) 3-8. Project report on the comparison between the baseline & end line surveys on APm repair works 3-9. APm repair works report			

Project Monitoring Sheet I （Revision of Project Design Matrix）

Project Title: The Project for Capacity Development of Road Maintenance Management
Implementing Agency: Office des Routes (OR) and Office des Voiries et Drainage (OVD)
Target Group: Technical staffs of headquarters and Kinshasa provincial offices of OR and OVD
Period of Project: June 2016 - October 2018
Project Site: Kinshasa city and the surrounding area

Version 3
25-May-17

Activities	Inputs		Important Assumption
1-1. Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites	The Japanese Side	DRC Side	
1-2. Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites 1-3. Define the road network to be covered by the project 1-4. Conduct traffic volume survey on some sections of the defined road network 1-5. Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites 1-6. Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request	1.Experts -Leader / Road Maintenance Plan -Road Inspection -Road Inspection (Database) -Pavement Repair (Construction Supervision) -Coordinator -Monitoring and Evaluation -Other experts, if necessary	1. Counterparts -Project Directors -Project Managers -Project Members 2. Equipment and Facilities -Office spaces in the building of OR for the Project with office furniture and utilities such as internet connection, electricity, air conditioner, etc.	-DRC and other neighboring countries do not fall into conflict or turmoil due to social, economic, political reasons or famine
2-1. Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites 2-2. Collect and review the existing AP road maintenance manuals and technical guidelines 2-3. Establish the Joint Working Group for developing technical guidelines on AP road maintenance 2-4. Develop and draft technical guidelines on AP road maintenance 2-5. Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group meetings etc. and revise the drafted technical guidelines 2-6. Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection 2-7. Develop a database for accumulating the AP road inspection results 2-8. Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works 2-9. Finalize the technical guidelines 2-10. Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations 2-11. Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW	2. Machinery and Equipment -PC and Software for Database -Other machinery and equipment, if necessary 3. Trainings in Japan -2 times throughout the project period	3. Local Cost Burned by DRC side -Local expenses necessary for the implementation of the Project including travel expenses and allowance for the counterparts, JCC members, WG members, TAG members and Training participants	Pre-Conditions
<u>3-1.Training plan for AP road inspection and APm repair works</u> 3-1-1. Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works 3-1-2. Plan the trainings on AP road inspection and APm repair works 3-1-3. Select candidate sites for the trainings on AP road inspection and APm repair works <u>3-2. Trainings on AP Road Inspection</u> 3-2-1. Conduct baseline survey on the training participants' skills and knowledge of AP road inspection 3-2-2. Conduct lectures on AP road inspection 3-2-3. Conduct OJTs on AP road inspection at the selected sites in the project sites 3-2-4. Conduct end line survey on the training participants' skills and knowledge of AP road inspection 3-2-5. Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines <u>3-3. Training on APm Repair Works</u> 3-3-1. Conduct baseline survey on the training participants' skills and knowledge of APm repair works 3-3-2. Conduct lectures on APm repair works 3-3-3. Conduct OJTs on APm repair works at the selected sites in the project sites 3-3-4. Conduct end line survey on the training participants' skills and knowledge of APm repair works 3-3-5. Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines			<Issues and countermeasures>

*[month, year] / xx / * to be determined and defined within six (6) months after the commencement of the Project*

Project Monitoring Sheet I (Revision of Project Design Matrix)
Version 4 - June 5, 2018

Project Monitoring Sheet I （Revision of Project Design Matrix）

Project Title: The Project for Capacity Development of Road Maintenance Management
Implementing Agency: Office des Routes (OR) and Office des Voiries et Drainage (OVD)
Target Group: Technical staffs of headquarters and Kinshasa provincial offices of OR and OVD
Period of Project: June 2016 - Oct. 2018→Jan. 2019
Project Site: Kinshasa city and the surrounding area

Version 4
5-Jun-18

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptior	**Achievement**	**Remarks**
Overall Goal					
Maintenance condition of the asphalt-paved (AP) roads is improved in the capital city, Kinshasa, and it's suburb	The proportion of the roads that meet the national standard of the road condition becomes **31.9 %**	Annual reports of OR and OVD			
Project Purpose					
AP road maintenance capacity of OR and OVD in the project sites is developed	1. More than **29.0 %** of the AP roads are inspected based on the AP road maintenance plan FY2018	1. AP road inspection report, Japanese experts' evaluation results of AP road inspection report, and database information	-Any significant changes are not made in AP road maintenance policies		
	2.More than **60.0 %** of the *people concerned*** consider the condition of AP road maintenance of OR and OVD has improved compared to that of before the commencement of the project	2. Interview (questionnaire) to the officials concerned 3. APm repair works report, Japanese experts' evaluation results of APm repair works report, database information			2.Interview will be conducted in Oct. 2018.
	3. More than **70.0 %** of the APm repair works plan is implemented based on the AP road maintenance plan FY2018	4. Interview (questionnaire) to the officials concerned	-Necessary budget and staffs for AP road maintenance are allocated annually		
	4. More than **60.0 %** of the *people concerned*** consider the condition of APm repair works of OR and OVD has improved compared to that of before the commencement of the project				4.Interview will be conducted in Oct. 2018.
	**JCC members (selected), Kinshasa provincial officials and other relevant people listed in the attachment.		-Abnormal rainfall does not occur		
Outputs					
1. AP road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites	1-1. Traffic volume survey is conducted on 2 sections by July 2017 for one time throughout the project period	1-1. Traffic volume survey report	-Principal counterpart personnel do not resign, or are not transferred	1-1. Completed as targeted.	Ref. to 1.4, Monitoring Sheet (MS) II
	1-2. AP road maintenance plan FY2018 is developed by OR and OVD	1-2. AP road maintenance plan document FY2018		1-2. The Project could not achieve this because database has not been developed in a timely manner, on the other hand, budget allocation from FONER has been delayed. The Project is aiming to develop FY2019 AP road maintenance plan instead.	Ref. to 1.5, MS II
	1-3. Budget request document FY2018 for AP road maintenance is submitted by OR and OVD.	1-3. Budget request document FY2018 for AP road maintenance		1-3. The Project could not achieve this due to the same reason described above 1-2. However, the Project is aiming to submit a budget request document FY2019 for AP road maintenance instead.	Ref. to 1.6, MS II
2. Technical guidelines on AP road maintenance are developed	2-1. Technical guidelines on AP road maintenance are drafted by April 2017.	2-1. Drafted technical guidelines		2-1. Completed as targeted.	Ref. to 2.4, MS II.
	2-2. Database of AP road inspection is developed by **July 2018**.	2-2. Database of AP road inspection which developed by OR and OVD			2-2. OR: Most likely to be able to achieve this. OVD: Main road-most likely to be able to achieve this. Secondary road-As of end May 2018, only about 30% of database has been developed.
	2-3. Technical guidelines on AP road maintenance are finalized by **October 2018**.	2-3. Finalized technical guidelines			
	2-4. Formalities for official approval of the finalized technical guidelines on AP road maintenance are submitted	2-4. Formalities			
3. AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites	3-1. Training plan is developed by April, 2017.	3-1. Training plan document		3-1. Completed as targeted.	Ref. to 3.1.2, MS II.
	3-2. 3 times of lectures on AP road inspection are conducted	3-2. Lectures report (AP road inspection)			
	3-3. 3 times of OJTs on AP road inspection are conducted	3-3. OJTs report (AP road inspection)			
	3-4. A percentage of correct answers of the endline survey on AP road inspectionis increased by **60.0 %** compared to that of the baseline survey*	3-4. Project report on the comparison between the baseline & end line surveys on AP road inspection			3-4. Initial baseline/endline survey comparison (increase): WG2 (focal point): approx. 20%, Trainees: approx.30%
	3-5. 3 times of trial AP road inspection are conducted	3-5. AP road inspection report			
	3-6. 3 times of lectures on APm repair works are conducted	3-6. Lectures report (APm repair works)			
	3-7. 3 times of OJTs on APm repair works are conducted	3-7. OJTs report (APm repair works)			
	3-8. A percentage of correct answers of the endline survey on APm repair works is increased by **60.0 %** compared to that of the baseline survey*	3-8. Project report on the comparison between the baseline & end line surveys on APm repair works			
	3-9. 3 times of trial APm repair works are conducted	3-9. APm repair works report			

Activities	Inputs		Important Assumptior
1-1. Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites	The Japanese Side	DRC Side	
1-2. Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites 1-3. Define the road network to be covered by the project 1-4. Conduct traffic volume survey on some sections of the defined road network 1-5. Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites 1-6. Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request	1.Experts -Leader / Road Maintenance Plan -Road Inspection -Road Inspection (Database) -Pavement Repair (Construction Supervision) -Coordinator -Monitoring and Evaluation -Other experts, if necessary	1. Counterparts -Project Directors -Project Managers -Project Members 2. Equipment and Facilities -Office spaces in the building of OR for the Project with office furniture and utilities such as internet connection, electricity, air conditioner, etc.	-DRC and other neighboring countries do not fall into conflict or turmoil due to social, economic, political reasons or famine
2-1. Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites 2-2. Collect and review the existing AP road maintenance manuals and technical guidelines 2-3. Establish the Joint Working Group for developing technical guidelines on AP road maintenance 2-4. Develop and draft technical guidelines on AP road maintenance 2-5. Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group meetings etc. and revise the drafted technical guidelines 2-6. Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection 2-7. Develop a database for accumulating the AP road inspection results 2-8. Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works 2-9. Finalize the technical guidelines 2-10. Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations 2-11. Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW	2. Machinery and Equipment -PC and Software for Database -Other machinery and equipment, if necessary 3. Trainings in Japan -2 times throughout the project period	3. Local Cost Burned by DRC side -Local expenses necessary for the implementation of the Project including travel expenses and allowance for the counterparts, JCC members, WG members, TAG members and Training participants	Pre-Conditions
<u>3-1.Training plan for AP road inspection and APm repair works</u> 3-1-1. Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works 3-1-2. Plan the trainings on AP road inspection and APm repair works 3-1-3. Select candidate sites for the trainings on AP road inspection and APm repair works <u>3-2. Trainings on AP Road Inspection</u> 3-2-1. Conduct baseline survey on the training participants' skills and knowledge of AP road inspection 3-2-2. Conduct lectures on AP road inspection 3-2-3. Conduct OJTs on AP road inspection at the selected sites in the project sites 3-2-4. Conduct end line survey on the training participants' skills and knowledge of AP road inspection 3-2-5. Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines <u>3-3. Training on APm Repair Works</u> 3-3-1. Conduct baseline survey on the training participants' skills and knowledge of APm repair works 3-3-2. Conduct lectures on APm repair works 3-3-3. Conduct OJTs on APm repair works at the selected sites in the project sites 3-3-4. Conduct end line survey on the training participants' skills and knowledge of APm repair works 3-3-5. Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines			<Issues and countermeasures>

*[month, year] / xx / * to be determined and defined within six (6) months after the commencement of the Project*

Project Monitoring Sheet I (Revision of Project Design Matrix)
Version 5 - November 9, 2018

Project Monitoring Sheet I （Revision of Project Design Matrix）

Project Title: The Project for Capacity Development of Road Maintenance Management
Implementing Agency: Office des Routes (OR) and Office des Voiries et Drainage (OVD)
Target Group: Technical staffs of headquarters and Kinshasa provincial offices of OR and OVD
Period of Project: June 2016 - May 2019
Project Site: Kinshasa city and the surrounding area

Version 5
9-Nov-18

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption	Achievement	Remarks
Overall Goa					
Maintenance condition of the asphalt-paved (AP) roads is improved in the capital city, Kinshasa, and it's suburb	The proportion of the roads that meet the national standard of the road condition becomes **31.9 %**	Annual reports of OR and OVD			
Project Purpose					
AP road maintenance capacity of OR and OVD in the project sites is developed	1. More than **29.0 %** of the AP roads are inspected based on the AP road maintenance plan **FY2018**	1. AP road inspection report, Japanese experts' evaluation results of AP road inspection report, and database information	-Any significant changes are not made in AP road maintenance policies	1. In accordance with the existing OR/OVD AP road maintenance plan FY2018, this target has been achieved.	1.The target indicated in the said plan was 271.67 km. Joint efforts made by OR/OVD, inspection has been done for 551.34 km.
	2.More than **60.0 %** of the *people concerned*** consider the condition of AP road maintenance of OR and OVD has improved compared to that of before the commencement of the project	2. Interview (questionnaire) to the officials concerned 3. APm repair works report, Japanese experts' evaluation results of asphalt pavement (APm) repair works report, database information		2. Positive answer marked 61 %, which exceeded the target.	2. The followings are some of the contents of the questions; acquired knowledge on assessment of AP road condition, acquired skills after introduction of inspecition equipment, etc.
	3. More than **70.0 %** of the APm repair works plan is implemented based on the AP road maintenance plan **FY2018**	4. Interview (questionnaire) to the officials concerned	-Necessary budget and staffs for AP road maintenance are allocated annually	3. OR: Approximately 21 % OVD: Approximately 95 % has been implemented. In average, 58 % of APm repair works has been done against the plan FY2018.	3. OR: Planned budget-USD 3,299,905.96, actual: USD 688,742. OVD: Planned budget: USD 5,732,921.31, actual: USD 5,439,851.65. Since the allocated budget was far below than required, priority wasgiven to the area of inside city roads, which OVD is in charge.
	4. More than **60.0 %** of the *people concerned*** consider the condition of APm repair works of OR and OVD has improved compared to that of before the commencement of the project			4. Positive answer came out 57 % which slightly less than targeted. Given comments should be well taken notes by the concerned parties for their further improvements.	4. Some of the contents of the questionnaire are; condition of safety management, environmental precautions at construction site, ride comfortableness on AP road, acquired knowledge on repair works/safety management, , etc.
	**JCC members (selected), Kinshasa provincial officials and other relevant people listed in the attachment.		-Abnormal rainfall does not occur		
Outputs					
1. AP road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites	1-1. Traffic volume survey is conducted on 2 sections by July 2017 for one time throughout the project period	1-1. Traffic volume survey report	-Principal counterpart personnel do not resign, or are not transferred	1-1. Completed as targeted.	1-1. Ref. to 1.4, Monitoring Sheet (MS) II
	1-2. AP road maintenance plan FY2018→FY2019 is developed by OR and OVD	1-2. AP road maintenance plan document FY2018→FY2019		1-2. AP road maintenance plan FY2019 has been developed by both OR/OVD in accordance with the database developed under the Project.	1-2. Ref. to 1.5, MS II. Respective plans (OR/OVD) have been submitted to Infrastructure Unit on 28 Sep. 2018.
	1-3. Budget request document FY2018→FY2019 for AP road maintenance is submitted by OR and OVD.	1-3. Budget request document FY2018→FY2019 for AP road maintenance		1-3. In line with the above 1-2., budget request document FY2019 was prepared by OR/OVD, and submitted to Infrastructure Unit on 1 Oct. 2018.	1-3. Ref. to 1.6, MS II. Accoringly, road maintenance budget requests of OR/OVD will be submitted to FONER by Feb. 2019.
2. Technical guidelines on AP road maintenance are developed	2-1. Technical guidelines on AP road maintenance are drafted by April 2017.	2-1. Drafted technical guidelines		2-1. Completed as targeted.	2-1. Ref. to 2.4, MS II.
	2-2. Database of AP road inspection is developed by **July 2018**.	2-2. Database of AP road inspection which developed by OR and OVD		2-2. While OR has achieved this target, OVD could not do so due to several constraints. OVD has completed developing database at the end of Sep. 2018, which delayed 2 months from the target period.	2-2. Refer to 2.7, MS II. While OVD has more to cover, given time was the same for OR/OVD. Prohibition of weekend work, weather condition, availability of inspection vehicle, etc. prevented OVD to do the job in time.
	2-3. Technical guidelines on AP road maintenance are finalized by **October 2018**.	2-3. Finalized technical guidelines		2-3.1st edition of Guidelines were submitted to Infrastructure Unit on 28 Sep. 2018.	2-3. Refer to 2.9, MS II. After submission to Infra. Unit, further improvements were made and expected to be approved by the MIPWR Minister at the final JCC,
	2-4. Formalities for official approval of the finalized technical guidelines on AP road maintenance are submitted	2-4. Formalities		2-4. Technical guidelines were approved by the MIPWR at the final JCC.	2-4. Refer to 2.10, MS II. Afterwards, MIPWR Decree is expected to be issued.
3. AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites	3-1. Training plan is developed by April, 2017.	3-1. Training plan document		3-1. Completed as targeted.	3-1. Ref. to 3.1.2, MS II.
	3-2. 3 times of lectures on AP road inspection are conducted	3-2. Lectures report (AP road inspection)		3-2. Completed as targeted. Lectures were conducted as follows; 1) Aug. 2017, 2) Feb. 2018, 3) May-June 2018.	3-2. Refer to 3.2.2., MS II.
	3-3. 3 times of OJTs on AP road inspection are conducted	3-3. OJTs report (AP road inspection)		3-3. Completed as targeted. OJTs were conducted as follows; 1) Oct. 2017, 2) Feb. 2018, 3) June 2018.	3-3. Refer to 3.2.3., MS II.
	3-4. A percentage of correct answers of the endline survey on AP road inspection is increased by **60.0 %** compared to that of the baseline survey*.	3-4. Project report on the comparison between the baseline & end line surveys on AP road inspection		3-4. Literally not achieved as targeted ("60.0% increase"). However, majority of the participants' results showed improvements, marking about 18 % increase in average.	3-4. Refer to 3.2.4., MS II.
	3-5. 3 times of trial AP road inspection are conducted	3-5. AP road inspection report		3-5. Completed as targeted. Trial inspections were conducted as follows; 1) Feb. 2018, 3) May 2018, 3) July 2018.	3-5. Refer to 3.2.5., MS II.
	3-6. 3 times of lectures on APm repair works are conducted	3-6. Lectures report (APm repair works)		3-6. Completed as targeted. Lectures were conducted as follows; 1) Jul.-Sep.2017, 2) Feb.-Mar. 2018, 3) Jul.-Aug. 2018.	3-6. Refer to 3.3.2., MS II.
	3-7. 3 times of OJTs on APm repair works are conducted	3-7. OJTs report (APm repair works)		3-7. Completed as targeted. OJTs were conducted as follows; 1) Aug.-Oct. 2017, 2) Feb.-Mar. 2018, 3) Jul.-Aug. 2018.	3-7. Refer to 3.3.3., MS II.

	3-8. A percentage of correct answers of the endline survey on APm repair works is increased by **60.0 %** compared to that of the baseline survey*.	3-8. Project report on the comparison between the baseline & end line surveys on APm repair works		3-8. Result comparison of the final baseline/endline surveys marked positive against the Project target which was "60%".	3.8. Refer to 3.3.4., MS II. In average (1st/2nd/3rd), result comparison of baseline/endline surveys came out 38% increase. However, final result marked 74.4 % increase.
	3-9. 3 times of trial APm repair works are conducted	3-9. APm repair works report		3-9. Completed as targeted. Trial works were conducted as follows; 1) Feb. 2018, 2) Jul. 2018, 3) Sep. 2018.	3-9.Refer to 3.3.5., MS II.

Activities	Inputs		Important Assumption
	The Japanese Side	DRC Side	
1-1. Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites			
1-2. Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites 1-3. Define the road network to be covered by the project	1.Experts - Leader / Road Maintenance Plan -Road Inspection -Road Inspection (Database) -Pavement Repair (Construction Supervision) -Coordinator -Monitoring and Evaluation -Other experts, if necessary	1. Counterparts -Project Directors -Project Managers -Project Members	-DRC and other neighboring countries do not fall into conflict or turmoil due to social, economic, political reasons or famine
1-4. Conduct traffic volume survey on some sections of the defined road network 1-5. Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites 1-6. Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request		2. Equipment and Facilities -Office spaces in the building of OR for the Project with office furniture and utilities such as internet connection, electricity, air conditioner, etc.	
2-1. Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites 2-2. Collect and review the existing AP road maintenance manuals and technical guidelines 2-3. Establish the Joint Working Group for developing technical guidelines on AP road maintenance 2-4. Develop and draft technical guidelines on AP road maintenance	2. Machinery and Equipment -PC and Software for Database -Other machinery and equipment, if necessary 3. Trainings in Japan -2 times throughout the project period	3. Local Cost Burned by DRC side -Local expenses necessary for the implementation of the Project including travel expenses and allowance for the counterparts, JCC members, WG members, TAG members and Training participants	
2-5. Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group meetings etc. and revise the drafted technical guidelines			Pre-Conditions
2-6. Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection 2-7. Develop a database for accumulating the AP road inspection results 2-8. Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works 2-9. Finalize the technical guidelines 2-10. Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations 2-11. Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW			
3-1.Training plan for AP road inspection and APm repair works 3-1-1. Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works 3-1-2. Plan the trainings on AP road inspection and APm repair works 3-1-3. Select candidate sites for the trainings on AP road inspection and APm repair works			<Issues and countermeasures>
3-2. Trainings on AP Road Inspection 3-2-1. Conduct baseline survey on the training participants' skills and knowledge of AP road inspection 3-2-2. Conduct lectures on AP road inspection 3-2-3. Conduct OJTs on AP road inspection at the selected sites in the project sites 3-2-4. Conduct end line survey on the training participants' skills and knowledge of AP road inspection 3-2-5. Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines			
3-3. Training on APm Repair Works 3-3-1. Conduct baseline survey on the training participants' skills and knowledge of APm repair works 3-3-2. Conduct lectures on APm repair works 3-3-3. Conduct OJTs on APm repair works at the selected sites in the project sites 3-3-4. Conduct end line survey on the training participants' skills and knowledge of APm repair works 3-3-5. Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines			

*[month, year] / xx / * to be determined and defined within six (6) months after the commencement of the Project*

ANNEX 4: R/D, Minutes of JCC, M/M

01 R/D

RECORD OF DISCUSSIONS

ON

THE PROJECT FOR CAPACITY DEVELOPMENT OF ROAD MAINTENANCE MANAGEMENT

IN

THE DEMOCRATIC REPUBLIC OF THE CONGO

AGREED UPON BETWEEN

MINISTRY OF INFRASTRUCTURES AND PUBLIC WORKS

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

Kinshasa, the 30th December, 2015

Mr. Toshimichi AOKI

Chief Representative
The Democratic Republic of the Congo Office,
Japan International Cooperation Agency

Mr. Chrisostome ILA NGONGO MILAMBO

Assistant Office Director
Ministry of Infrastructures and Public Works
The Democratic Republic of the Congo

Based on the minutes of meetings on the Detailed Planning Survey on the Project for Improvement of the Road Management Capability (hereinafter referred to as "the Project") signed on the 5th August, 2015 between Ministry of Infrastructures and Public Works (hereinafter referred to as "MIPW") and the Japan International Cooperation Agency (hereinafter referred to as "JICA"), JICA held a series of discussions with MIPW and relevant organizations including Office des Routes (hereinafter referred to as "OR") and Office des Voiries et Drainage (hereinafter referred to as "OVD") to develop a detailed plan of the Project.

Both parties agreed the details of the Project and main points discussed as described in the Appendix 1 and the Appendix 2, respectively, and to request their respective governments to proceed with the necessary procedures for implementation of the Project.
Both parties also agreed that MIPW, the counterpart to JICA, 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 Democratic Republic of the Congo (hereinafter referred to as "DRC").

The Project will be implemented within the framework of the Note Verbales to be exchanged between the Government of Japan (hereinafter referred to as "GOJ") and the Government of DRC (hereinafter referred to as "GDRC").

Done in duplicate in the French and English languages, both are equally authentic. In case of any divergence of interpretation, the English text shall prevail.

Appendix 1: Project Description
Appendix 2: Main Points Discussed
Appendix 3: Minutes of Meetings on the Detailed Planning Survey on the Project for Improvement of the Road Management Capability

Appendix 1

PROJECT DESCRIPTION

Both parties confirmed that there is no change in the Project Description in the minutes of meetings for the Detailed Planning Survey on the Project signed on the 5th August, 2015 (Appendix 3).

I. BACKGROUND

DRC's road network is 153,209 km in length (FY2014), and this network is classified into three categories; "Arterial road (58,509 km)", "Inner city road (approx. 7,400 km)" and "Regional road / rural road (approx. 87,300 km)". Currently, under the overall control of MIPW, OR is responsible for the management and maintenance of "Arterial roads" and OVD is for "Inner city roads".

The transport infrastructure in DRC has much space for further development after the end of a long-lasting civil war. Since the insufficient development of transport infrastructure is one of the causes of stagnation in social and economic development, GDRC has decided the transport infrastructure development as a top priority policy in the "Second Growth and Poverty Strategy Document (Document de Statégie de Croissanceet de Réduction de la Pauvreté de Deuxième Génération: DSCRP2), October 2011" and "Five Year Action Plan (2012 - 2016)".

Furthermore, GDRC emphasizes the importance of rehabilitation of deteriorated transport infrastructures for smooth traffic and transportation. The condition of existing road network is comparatively bad, only 2% (3,000km) of which has pavement. To improve this situation, OR established "Road network improvement 5 years plan (2012 - 2016), whose targets are; expansion of road network and repair, rehabilitation and pavement of existing arterial roads. At the same time, GDRC acknowledges the importance of maintenance of paved roads for securing the minimum traffic and transport in the country.

Under such circumstances, GDRC requested to GOJ a technical cooperation project, "The Project for Improvement of the Road Management Capability" in August 2014. In response to the request, JICA held a series of discussions with the authorities concerned of DRC and determined the contents of the project for capacity development of asphalt-paved road maintenance management of OR and OVD.

II. OUTLINE OF THE PROJECT

Details of the Project are described in the Logical Framework (Project Design Matrix: PDM) (Annex 1) and the Plan of Operation (Annex 2)

1. Input

(1) Input by JICA

(a) Dispatch of Experts

- Leader / Road Maintenance Plan
- Road Inspection
- Road Inspection (Database)
- Pavement Repair
- Pavement Repair (Construction Supervision)
- Coordinator
- Monitoring and Evaluation
- Other experts, if necessary

(b) Training

- 2 times (1 time per year) in Japan

(c) Machinery and Equipment

- PC and Software for Database
- Other machinery and equipment, if necessary

In case of importation, the machinery, equipment and other materials under II-1 (1) (c) above will become the property of GDRC upon being delivered C.I.F. (cost, insurance and freight) to DRC authorities concerned at the ports and/or airports of disembarkation.

Input other than indicated above will be determined through mutual consultations between JICA and MIPW during the implementation of the Project, as necessary.

(2) Input by MIPW, OR and OVD

MIPW, OR and OVD will take necessary measures to provide at its own expense:

(a) Services of MIPW, OR and OVD's counterpart personnel and administrative personnel as referred to in II-2;
(b) Suitable office spaces in the building of OR with necessary equipment and utilities such as internet connection, electricity, air conditioner etc. (the location of the office spaces shall be informed to JICA DRC Office by the end of March 2016, before the commencement of the Project);
(c) Supply or replacement of machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than the equipment provided by JICA;
(d) Information as well as support in obtaining medical service;
(e) Credentials or identification cards;
(f) Available data (including maps and photographs) and information related to the Project;
(g) Running expenses necessary for the implementation of the Project;
(h) Expenses necessary for transportation within DRC of the equipment referred to in II-1 (1) (c) as well as for the installation, operation and

maintenance thereof;

(i) Necessary facilities to the JICA experts for the remittance as well as utilization of the funds introduced into DRC from Japan in connection with the implementation of the Project; and

(j) Measures to assure safety for the JICA experts during the Project.

2. Implementation Structure

The project organization chart is given in the Annex 3. The roles and assignments of relevant organizations are as follows:

(1) MIPW

(a) Chairperson

Adviser in charge of Roads and Bridges, MIPW will be assigned as Chairperson, and will be responsible for overall administration and implementation of JCC of the Project.

(b) Coordination Secretary / Responsible Agency

Coordinator of Cellule Infrastructures, MIPW, which is Responsible Agency of the Project will be assigned as Coordination Secretary, and will be responsible for smooth implementation of the Project and coordination among OR, OVD and relevant organizations.

(2) Fonds National d'Entretien Routier (hereinafter referred to as "FONER")

(a) Vice Chairperson

Technical Director, FONER will be assigned as Vice Chairperson, and will assist Chairperson for overall administration and implementation of JCC of the Project.

(3) OR and OVD

(a) Project Director

Director General of OR and OVD will be respectively assigned as Project Director, and will be responsible for overall administration and implementation of the Project.

(b) Project Manager

Control Engineer, Road Direction, Department of Bridges and Roads, General Direction of OR and Auditor of Machinery, General Direction of OVD will be assigned as Project Manager, and will be responsible for management and implementation of the Project. And these Project Managers from OR and OVD respectively shall be dedicated to the Project.

(c) Project Members

Relevant technical staffs from following departments and offices in OR and OVD will be responsible for the managerial and technical matters of the Project.

- General Direction of OR
- Training Direction of OR
- Mechanized Maintenance Division, Road Direction, Department of

Bridges and Roads of OR
- Kinshasa provincial office of OR
- Planning and Programme Division, OVD
- Machinery Management Division, OVD
- Kinshasa Provincial Office, OVD

(3) JICA Experts

The JICA experts will give necessary technical guidance, advice and recommendations to MIPW, OR and OVD on any matters pertaining to the implementation of the Project.

(4) Joint Coordinating Committee

Joint Coordinating Committee (hereinafter referred to as "JCC") will be established in order to facilitate inter-organizational coordination. JCC will be held at least once a year and whenever deems it necessary. JCC will review the progress, revise the overall plan when necessary, approve an annual work plan, conduct evaluation of the Project, and exchange opinions on major issues that arise during the implementation of the Project. A list of proposed members of JCC is shown in the Annex 4.

3. Project Site(s) and Beneficiaries

(1) Project Site

Kinshasa city and the surrounding area.

(2) Direct Beneficiaries

Technical Staffs of headquarters and Kinshasa provincial offices of OR and OVD.

(3) Indirect Beneficiaries

Asphalt-paved road users in Kinshasa city and the surrounding area.

4. Duration

2.5 years from the arrival of the first expert.

5. Reports

JICA experts will prepare and submit the following reports to MIPW, OR and OVD in French.

(1) Inception Report (Work Plan) at the commencement of the Project

MIPW, OR, OVD and JICA experts will jointly prepare the following reports in French.

(1) Monitoring Sheet on semiannual basis until the project completion.
(2) Project Completion Report at the time of the project completion.

6. Environmental and Social Considerations

MIPW, OR and OVD will abide by 'JICA Guidelines for Environmental and Social Considerations' in order to ensure that appropriate considerations will be made for the environmental and social impacts of the Project.

III. UNDERTAKINGS OF GDRC, MIPW, OR AND OVD

1. GDRC, MIPW, OR and OVD will take necessary measures to:

(1) ensure that the technologies and knowledge acquired by the DRC nationals as a result of Japanese technical cooperation contributes to the economic and social development of DRC, and that the knowledge and experience acquired by the personnel of DRC from technical training as well as the equipment provided by JICA will be utilized effectively in the implementation of the Project;
(2) grant privileges, exemptions and benefits to the JICA experts referred to in II-1 (1) (a) above and their families, which are no less favorable than those granted to experts and members of the missions and their families of third countries or international organizations performing similar missions in DRC;
(3) provide security-related information as well as measures to ensure the safety of the JICA experts;
(4) permit the JICA experts to enter, leave and sojourn in DRC for the duration of their assignments therein and exempt them from foreign registration requirements and consular fees.
(5) exempt the JICA experts from taxes and any other charges on the equipment, machinery and other material necessary for the implementation of the Project;
(6) exempt the JICA experts from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to them and/or remitted to them from abroad for their services in connection with the implementation of the Project; and
(7) meet taxes and any other charges on the equipment, machinery and other material, referred to in II-1 (1) (c) above, necessary for the implementation of the Project.

2. GDRC, MIPW, OR and OVD will bear claims, if any arises, against the JICA experts resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Project, except when such claims arise from gross negligence or willful misconduct on the part of the JICA experts.

IV. MONITORING AND EVALUATION

JICA, MIPW, OR and OVD will jointly and regularly monitor the progress of the Project through the Monitoring Sheets based on the Project Design Matrix (PDM) and Plan of Operation (PO). The Monitoring Sheets will be reviewed every six (6) months.
Also, Project Completion Report will be drawn up one (1) month before the termination of the Project.

JICA will conduct the following evaluations and surveys to verify sustainability and impact of the Project and draw lessons. The MIPW, OR and OVD are required to provide necessary support for them.

1. Ex-post evaluation three (3) years after the Project completion, in principle
2. Follow-up surveys on necessity basis

V. PROMOTION OF PUBLIC SUPPORT

For the purpose of promoting support for the Project, MIPW, OR and OVD will take appropriate measures to make the Project widely known to the people of DRC.

VI. MISCONDUCT

If JICA receives information related to suspected corrupt or fraudulent practices in the implementation of the Project, MIPW, OR, OVD and relevant organizations will provide JICA with such information as JICA may reasonably request, including information related to any concerned official of the government and/or public organizations of DRC.
MIPW, OR, OVD and relevant organizations will not, unfairly or unfavorably, treat the person and/or company which provided the information related to suspected corrupt or fraudulent practices in the implementation of the Project.

VII. MUTUAL CONSULTATION

JICA, MIPW, OR and OVD will consult each other whenever any major issues arise in the course of Project implementation.

VIII. AMENDMENTS

The record of discussions may be amended by the minutes of meetings between JICA and MIPW. However, PO may be amended in the Monitoring Sheets.
The minutes of meetings will be signed by authorized persons of each side who may be different from the signers of the record of discussions.

Annex 1 Logical Framework (Project Design Matrix: PDM)
Annex 2 Plan of Operation
Annex 3 Project Organization Chart
Annex 4 A List of Proposed Members of Joint Coordinating Committee

PROJECT DESIGN MATRIX (PDM)

Version 0 (August, 2015)

Project Title : The Project for Capacity Development of Road Maintenance Management
Period : [month] 2016 – [month] 2018
Implementation Organizations : Office des Routes (OR) and Office des Voiries et Drainage (OVD)
Project sites : Kinshasa city and the surrounding area
Target Groups : Technical staffs of headquarters and Kinshasa provincial offices of OR and OVD

Project Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Maintenance of the asphalt-paved (AP) roads is conducted in a continuous manner in the project sites	1. XX% of the AP roads are inspected by FY2021 2. XX% of the planned asphalt pavement (APm) repair works are implemented annually 3. AP road maintenance plan and budget are developed annually	1. AP road inspection report 2. APm repair works report 3-1. AP road maintenance plan document 3-2. Budget request document	
Project Purpose AP road maintenance capacity of OR and OVD in the project sites is developed	AP road maintenance activities FY2018 are properly conducted in accordance with the AP road maintenance plan	1. AP road inspection report 2. APm repair works report 3. Input-Output data of database 4. Japanese experts' evaluation results of AP road inspection report 5. Japanese experts' evaluation results of APm repair works report	- Any significant changes are not made in AP road maintenance policies - Necessary budget and staffs for AP road maintenance are allocated annually
Outputs 1. AP road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites	1-1. Traffic volume survey is conducted on XX sections 1-2. AP road maintenance plan FY2018 is developed by OR and OVD 1-3. Budget request document FY2018 for AP road maintenance is submitted by	1-1. Database 1-2. AP Road maintenance plan document FY2018 1-3. Budget request document FY2018 for AP road maintenance	- Principal counterpart personnel do not resign, or are not transferred

	OR and OVD		
2. Technical guidelines on AP road maintenance are developed	2-1. Technical guidelines on AP road maintenance are drafted by [month, year]	2-1. Drafted technical guidelines	
	2-2. Database of AP road inspection is developed by [month, year]	2-2. Database	
	2-3. Technical guidelines on AP road maintenance are finalized by [month, year]	2-3. Finalized technical guidelines	
	2-4. Formalities for official approval of the finalized technical guidelines on AP road maintenance are submitted	2-4. Formalities	
3. AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites.	3-1. Training plan is developed by [month, year]	3-1. Training plan document	
	3-2. XX times of lectures on AP road inspection are conducted	3-2. Lectures report (AP road inspection)	
	3-3. XX times of OJTs on AP road inspection are conducted	3-3. OJTs report (AP road inspection)	
	3-4. Training participants' skills and knowledge of AP road inspection are improved*	3-4. Comparison between baseline survey and endline survey	
	3-5. XX times of trial AP road inspection are conducted	3-5. AP road inspection report	
	3-6. XX times of lectures on APm repair works are conducted	3-6. Lectures report (APm repair works)	
	3-7. XX times of OJTs on APm repair works are conducted	3-7. OJTs report (APm repair works)	
	3-8. Training participants' skills and knowledge of APm repair works are improved*	3-8. Comparison between baseline survey and endline survey	
	3-9. XX times of trial APm repair works are conducted	3-9. APm repair works report	

Activities	Inputs		
	Japanese side	**DRC side**	
1-1. Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites 1-2. Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites 1-3. Define the road network to be covered by the project 1-4. Conduct traffic volume survey on some sections of the defined road network 1-5. Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites 1-6. Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request 2-1. Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites 2-2. Collect and review the existing AP road maintenance manuals and technical guidelines 2-3. Establish the Joint Working Group for developing technical guidelines on AP road maintenance 2-4. Develop and draft technical guidelines on AP road maintenance 2-5. Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group meetings etc. and revise the drafted technical guidelines 2-6. Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection 2-7. Develop a database for accumulating the AP road inspection results 2-8. Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works 2-9. Finalize the technical guidelines 2-10. Organize seminars and workshops for explaining and	1. Experts - Leader / Road Maintenance Plan - Road Inspection - Road Inspection (Databese) - Pavement Repair - Pavement Repair (Construction Supervision) - Coordinator - Monitoring and Evaluation - Other experts, if necessary 2. Machinery and Equipment - PC and Software for Database - Other machinery and equipment, if necessary 3. Trainings in Japan - 2 times (1time par year)	1. Counterparts - Project Directors - Project Managers - Project Members 2. Equipment and Facilities - Office spaces in the building of OR for the Project with office furniture and utilities such as internet connection, electricity, air conditioner, etc. - Office for the lectures conducted in the Project 3. Local Cost Borned by DRC side - Local expenses necessary for the implementation of the Project including travel expenses and allowance for the counterparts, JCC members, WG members, TAG members and Training participants.	- DRC and other neighboring countries do not fall into conflict or turmoil due to social, economic, political reasons or famine

distributing the finalized technical guidelines to relevant organizations 2-11. Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW <u>3.1. Training plan for AP road inspection and APm repair works</u> 3.1-1. Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works 3.1-2.Plan the trainings on AP road inspection and APm repair works 3.1-3.Select candidate sites for the trainings on AP road inspection and APm repair works <u>3.2. Trainings on AP Road Inspection</u> 3.2-1.Conduct baseline survey on the training participants' skills and knowledge of AP road inspection 3.2-2.Conduct lectures on AP road inspection 3.2-3.Conduct OJTs on AP road inspection at the selected sites in the project sites 3.2-4.Conduct endline survey on the training participants' skills and knowledge of AP road inspection 3.2-5.Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines <u>3.3. Training on APm Repair Works</u> 3.3-1.Conduct baseline survey on the training participants' skills and knowledge of APm repair works 3.3-2.Conduct lectures on APm repair works 3.3-3.Conduct OJTs on APm repair works at the selected sites in the project sites 3.3-4.Conduct endline survey on the training participants' skills and knowledge of APm repair works 3.3-5.Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines			

[month, year] / XX / * : to be determined and defined within six (6) months after the commencement of the Project

PLAN OF OPERATION

PROJECT TITLE : THE PROJECT FOR CAPACITY DEVELOPMENT OF ROAD MAINTENANCE MANAGEMENT

	ACTIVITIES	1st Year Year 2016												2nd Year Year 2017												3rd Year Year 2018											
		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
	Output 1 Asphalt-paved (AP) road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites.																																				
1-1	Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites																																				
1-2	Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites																																				
1-3	Define the road network to be covered by the project																																				
1-4	Conduct traffic volume survey on some sections of the defined road network																																				
1-5	Develop a AP road maintenance plan FY2018 of OR and OVD in the project sites																																				
1-6	Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request																																				
	Output 2 Technical guidelines on AP road maintenance are developed.																																				
2-1	Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites																																				
2-2	Collect and review the existing AP road maintenance manuals and technical guidelines																																				
2-3	Establish the Joint Working Group for developing technical guidelines on AP road maintenance																																				
2-4	Develop and draft technical guidelines on AP road maintenance																																				
2-5	Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group meetings etc. and revise the drafted technical guidelines																																				
2-6	Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection																																				
2-7	Develop a database for accumulating the AP road inspection results																																				
2-8	Conduct AP road maintenance and asphalt pavement (Apm) repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works																																				
2-9	Finalize the technical guidelines																																				
2-10	Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations																																				
2-11	Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW																																				

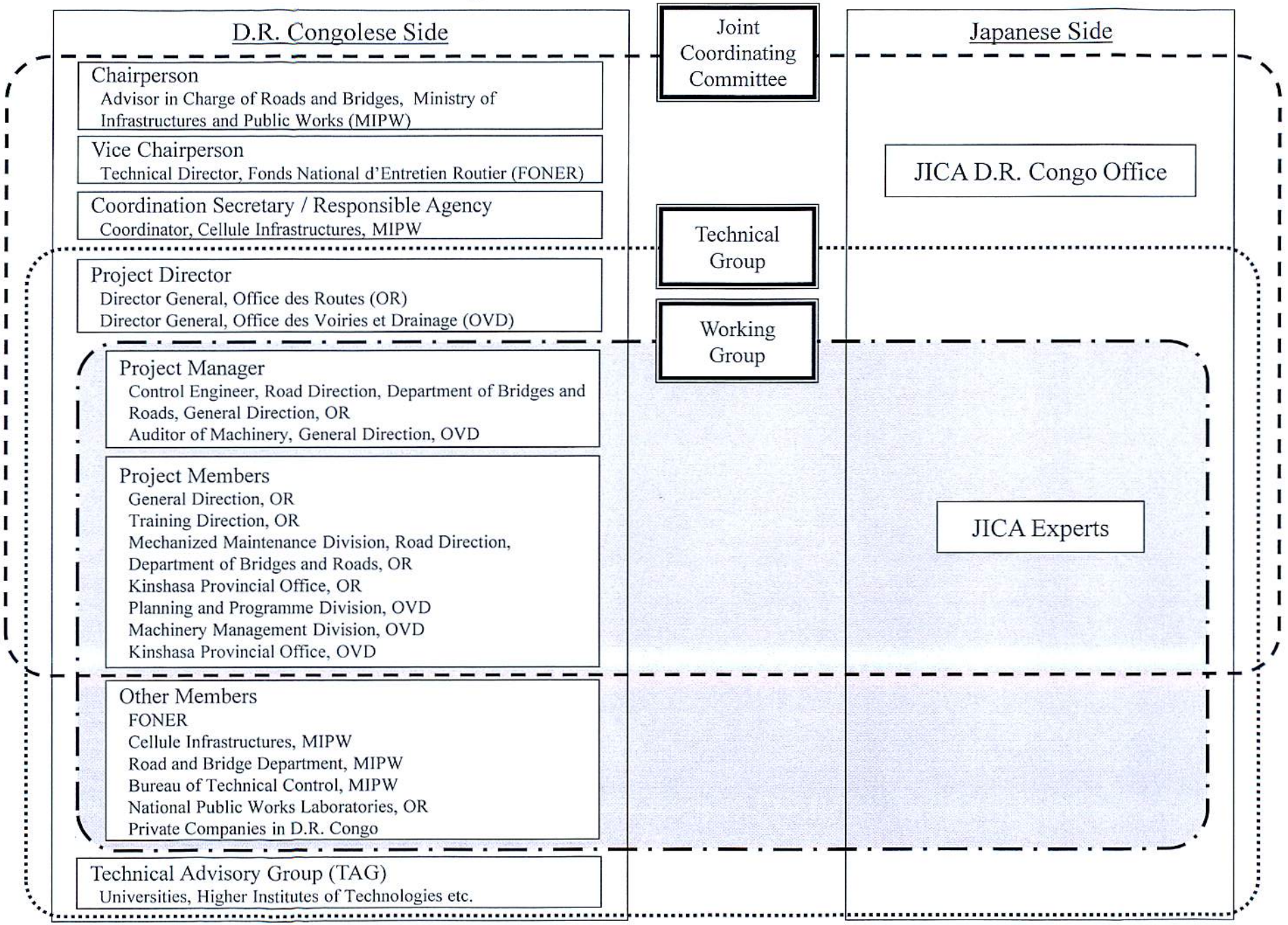
PLAN OF OPERATION

PROJECT TITLE : THE PROJECT FOR CAPACITY DEVELOPMENT OF ROAD MAINTENANCE MANAGEMENT

ACTIVITIES		1st Year Year 2016												2nd Year Year 2017												3rd Year Year 2018											
		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
Output 3 AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites.																																					
3.1	Training plan for AP road inspection and APm repair works																																				
3.1-1	Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works																																				
3.1-2	Plan the trainings on AP road inspection and APm repair works																																				
3.1-3	Select candidate sites for the trainings on AP road inspection and APm repair works																																				
3.2	Trainings on AP Road Inspection																																				
3.2-1	Conduct baseline survey on the training participants' skills and knowledge of AP road inspection																																				
3.2-2	Conduct lectures on AP road inspection																																				
3.2-3	Conduct OJTs on AP road inspection at the selected sites in the project sites																																				
3.2-4	Conduct endline survey on the training participants' skills and knowledge of AP road inspection																																				
3.2-5	Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines																																				
3.3	Training on APm Repair Works																																				
3.3-1	Conduct baseline survey on the training participants' skills and knowledge of APm repair works																																				
3.3-2	Conduct lectures on APm repair works																																				
3.3-3	Conduct OJTs on APm repair works at the selected sites in the project sites																																				
3.3-4	Conduct endline survey on the training participants' skills and knowledge of APm repair works																																				
3.3-5	Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines																																				
Monitor the progress of the above activities and attainment & application of the technical contents periodically and report the results to JCC.				▲					▲							▲					▲							▲					▲				

Organization chart of the Project

Annex 3



LIST OF PROPOSED MEMBERS OF JOINT COORDINATING COMMITTEE

Chairperson: Advisor in Charge of Roads and Bridges,
Ministry of Infrastructures and Public Works (MIPW)

Vice Chairperson: Technical Director, Fonds National d'Entretien Routier (FONER)

Coordination Secretary / Responsible Agency:
Coordinator, Cellule Infrastructures, MIPW

Members:

(1) D.R. Congolese Side

1) Project Director: Director General, Office des Routes (OR)
Director General, Office des Voiries et Drainage (OVD)

2) Project Manager: Control Engineer, Road Direction, Department of Bridges and Roads, General Direction, OR
Auditor of Machinery, General Direction, OVD

3) Project Members:
- General Direction, OR
- Training Direction, OR
- Mechanized Maintenance Division, Road Direction, Department of Bridges and Roads, OR
- Kinshasa Provincial Office, OR
- Planning and Programme Division, OVD
- Machinery Management Division, OVD
- Kinshasa Provincial Office, OVD

4) Relevant personnel accepted by the Chairperson, if necessary.

(2) Japanese Side

1) JICA D.R. Congo Office
- Chief Representative
- Representative
- Project Formulation Advisor in charge of the Project

2) JICA Experts
- Leader / Road Maintenance Plan
- Road Inspection
- Road Inspection (Database)
- Pavement Repair
- Pavement Repair (Construction Supervision)
- Coordinator
- Monitoring and Evaluation

3) Other personnel accepted by JICA, if necessary

JCC will be scheduled based on the maximum availability of the members listed above.

LIST OF PROPOSED MEMBERS FROM OR

(1) Project Director

Mr. HERMAN MUTIMA SAKRINI	Director General

(2) Project Manager (Permanent)

Mr. MAKENGO MAVELELA	Control Engineer, Road Direction, Department of Bridges and Roads, General Direction

(3) Project Members

Mr. ISSAC KAPANGA	Technical Assistant of General Director, General Direction
Mr. ENOCH SANGANA MALONGA	Director, Training Direction
Mr. NSHIMBA DIA NSAFU	Chief, Mechanized Maintenance Division, Road Direction, Department of Bridges and Roads
Mr. GILBERT BAGULANSHIMBA	Director, Kinshasa Provincial Office

LIST OF PROPOSED MEMBERS FROM OVD

(1) Project Director

Mr. BENJAMIN WENGA BASUBI	Director General

(2) Project Manager (Permanent)

Mr. RICHARD MATANDA MWEMBA	Auditor of Machinery, General Direction

(3) Project Members

Mr. LEON MUTOMBO KABEYA	Planning and Programme Division
Mr. JEANSMIN BATOKA-BEMBA	Material Management Division
Mr. TIMOTHE SUMAHILI-SANGWA	Kinshasa Provincial Office

(4) Working Group Members

1) Headquarter

Mr. MOÏSE BIELO-KONDE
Mr. THOMAS TOHADI-KALONDA
Mr. OSCAR KONDE-KONDE
Mr. KABANGU BAKANDAYI-Fidèle

2) Kinshasa Provincial Office

Mr. ANACLET BIPOPO-LUBOYA
Ms. ROSE BUKAWU-KALUBI
Mr. ANGE NKUNGA-MANSIANTIMA
Mr. GISLAIN-TRESOR
Mr. JIMMY KABILA-MPASI
Mr. FRANÇOIS KALONGELA-TSHIBANDI
Mr. GULAIN LUZOLO-TUKITAKA
Mr. AGIGBA-ZONO

Appendix 2

MAIN POINTS DISCUSSED

1. RECORD OF DISCUSSIONS

Both sides agreed that the Record of Discussions (R/D) determines the framework of the Project.

2. PROJECT DESIGN MATRIX (PDM)

Both sides agreed on the contents of the Logical Framework (Project Design Matrix: PDM) and the Plan of Operation (PO) as shown respectively in Annex 1 and 2 of the R/D. The PDM and PO are to be flexibly revised according to the progress and the achievement of the Project, through mutual agreement between MIPW and JICA by signing the minutes of meetings, referring to the R/D.

3. RESPONSIBLE AGENCY AND COUNTERPART AGENCIES

Both sides agreed that the responsible agency of the Project will be Cellule Infrastructures of MIPW, and the counterpart agencies of the Project will be Office des Routes (hereinafter referred to as "OR") and Office des Voiries et Drainage (hereinafter referred to as "OVD"), and JICA and these agencies will collaboratively implement a single project.

Both sides also confirmed that necessary counterparts as described in II.2 (1)(2)(3) and Annex-1 of the R/D have already been assigned and informed to JICA, and that the Project Manager respectively from OR and OVD shall be dedicated to the Project.

In addition, both sides agreed that the services of counterparts including the dedicated Project Managers shall be covered by DRC side.

4. MAIN CONTENTS OF THE PROJECT

Both sides agreed that the purpose of the Project is to be "Asphalt-paved road maintenance capacity of OR and OVD in the project sites is developed". The Project Purpose will be achieved through three (3) Outputs: 1) Asphalt-paved road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites; 2) Technical guidelines on asphalt-paved road maintenance are developed; and 3) Asphalt-paved road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites.

5. DURATION

Both sides agreed that the duration of the Project will be two and a half (2.5) years after the first dispatch of JICA experts to DRC.

6. IMPLEMENTAION STRUCTURE

Both sides agreed that Joint Coordinating Committee (JCC), Technical Group (TG), Working Group (WG), and Technical Advisory Group (TAG) will be established as described in II.2 (4) and shown in Annex 3 and 4 of the R/D for effective implementation of the Project. This structure will basically be

maintained till the end of the Project.

7. PROJECT OFFICES

Both sides confirmed that necessary office spaces with office furniture and utilities such as internet connection, electricity, air conditioner etc., as described in II.1 (2)(b) and Annex-1 of the R/D, shall be prepared by DRC side in the building OR. MIPW will inform the location of the office spaces to JICA DRC Office by the end of March 2016, before the commencement of the Project.

8. BUDGET FOR THE PROJECT

Both sides agreed that necessary budget for the implementation of the Project, described in II.1 (2) and Annex-1 of the R/D, such as local expenses including travel expenses, daily allowance for the counterparts, JCC members, TG members, WG members, TAG members and training participants shall be borne by OR and OVD in the framework of annual maintenance plan.

9. TRAINING PARTICIPANTS

Both sides agreed that technical staffs of the headquarters and Kinshasa provincial offices of OR and OVD are candidate participants to the trainings conducted in the Project, and technical staffs of other provincial offices can also be participated after the approval of and the budget allocation from General Directions of each agency (OR / OVD), if deemed necessary.

10. IMPREMENTATION OF ON-THE-JOB-TRAINING

Both sides agreed that on-the-job trainings of asphalt-paved road inspection and asphalt pavement repair works, which are selected from those to be implemented or outsourced by OR and OVD, will be carried out in the Project, and their schedule and sites will be decided through mutual consultation between DRC side and JICA considering the security and safety conditions.
And also both sides agreed that the budget for asphalt pavement repair works shall be allocated by DRC side.

11. WORKING GROUP

Both sides agreed that WG will be established at the commencement of the activities of the Output 2 and Output 3 as shown in Annex 1, Annex 3 and Annex 4 of the R/D for smooth implementation of the Project. Members of WG will be selected from relevant organizations such as Fonds National d' Entretien Routier, Cellule Infrastructures, Road and Bridge Department, Bureau of Technical Control of MIPW, National Public Works Laboratories of OR, private companies etc., and will be decided after commencement of the Project through mutual consultation between DRC side and JICA.

12. TECHNICAL ADVISORY GROUP (TAG)

Both sides agreed that TAG will be held regularly during the Project at least once a year for reporting the progress and technical findings of the Project to and for asking opinions from relevant organizations such as universities, higher institutes of technologies, etc.

13. SAFETY MEASURES

To avoid accidents on site during the implementation of the on-the-job trainings on asphalt pavement repair works, both sides agreed that JICA experts will provide technical advices to counterparts on safety measures, such as assurance of on-site safety, provision of safety information to the public, and arrangement of adequate safety personnel, based on "The Guidance for the Management of Safety for Construction Works in Japanese ODA Projects" which can be reached at the site below;
http://www.jica.go.jp/activities/schemes/oda_safety/ku57pq00001nz4eu-att/guidance_fr.pdf

14. MISCONDUCT

Both sides agreed if JICA receives information related to suspected corrupt or fraudulent practices in the implementation of the Project, DRC side and relevant organizations will provide JICA with such information as JICA may reasonably request, including information related to any concerned official of the government and/or public organizations of DRC.
DRC side and relevant organizations will not, unfairly or unfavorably, treat the person and/or company which provided the information related to suspected corrupt or fraudulent practices in the implementation of the Project.

15. TAX OR LEVY

The Team strongly requested to DRC side that, in case of the necessity to pay tax, levy or any other expenses for the receipt of equipment provided by Japanese side due to delay in procedures for tax exemption, Cellule Infrastructures shall bear these expenses for accelerating smooth implementation of the Project.
Cellule Infrastructures responded that it will surely accomplish the formalities of tax exemption of the equipment so that it is smoothly released. The Team showed its understanding.

MINUTES OF MEETING
BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
MINISTRY OF INFRASTRUCTURES AND PUBLIC WORKS
ON
JAPANESE TECHNICAL COOPERATION PROJECT
FOR
IMPROVEMENT OF THE ROAD MANAGEMENT CAPABILITY

In response to the official request of the Democratic Republic of the Congo (hereinafter referred to as "DRC"), the Detailed Planning Survey Team (hereinafter referred to as "the Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") headed by Mr. Tomoki Kanenawa, visited DRC from the 19th July to the 6th August, 2015 for the purpose of determining the details of the technical cooperation programme concerning "the Project for Improvement of the Road Management Capability" (hereinafter referred to as "the Project").

During its stay in DRC, the Team exchanged views and had a series of discussions for setting up the framework and contents of the Project with DRC's authorities concerned of the Ministry of Infrastructures and Public Works (hereinafter referred to as "MIPW").

As a result of the discussions, JICA and MIPW agreed upon the matters referred to in the document attached hereto.

Done in duplicate in the French and English languages, both are equally authentic. In case of any divergence of interpretation, the English text shall prevail.

Kinshasa, the 5th August, 2015

Mr. Tomoki Kanenawa	Mr. Chrisostome ILA NGONGO MILAMBO
Leader	Vice Director of Cabinet
Detailed Planning Survey Team,	Ministry of Infrastructures and Public Works
Japan International Cooperation Agency	The Democratic Republic of the Congo

MAIN POINTS DISCUSSED

1. PROJECT TITLE

Both sides agreed that the Project title in French shall be modified from "Projet pour le renforcement de capacité de maintenance des routes" to "Projet pour le renforcement de capacité de maintenance des routes asphaltées", and in English shall be modified from "The Project for Improvement of the Road Management Capability" to "The Project for Capacity Development of Asphalt Paved Road Maintenance Management".

2. RECORD OF DISCUSSIONS

Both sides agreed that the Record of Discussions (R/D), the draft of which is attached hereto, will determine the framework of the Project. The R/D will be signed after the formal approval by DRC side and JICA.

3. PROJECT DESIGN MATRIX (PDM)

Both sides agreed on the contents of the tentative Logical Framework (Project Design Matrix: PDM) and the tentative Plan of Operation (PO) as shown respectively in Annex 1 and 2 of the draft R/D. The PDM and PO are to be flexibly revised according to the progress and the achievement of the Project, through mutual agreement between MIPW and JICA by signing the minutes of meetings, referring to the draft R/D.

4. RESPONSIBLE AGENCY AND COUNTERPART AGENCIES

Both sides agreed that the responsible agency of the Project will be Cellule Infrastructures of MIPW, and the counterpart agencies of the Project will be Office des Routes (hereinafter referred to as "OR") and Office des Voiries et Drainage (hereinafter referred to as "OVD"), and JICA and these agencies will collaboratively implement a single project.

Both sides also agreed that necessary counterparts as described in II.2 (1)(2)(3) and Annex-1 of the draft R/D shall be assigned and informed to JICA before the signing of the R/D, and the Project Manager respectively from OR and OVD shall be dedicated to the Project.

In addition, both sides agreed that the services of counterparts including the dedicated Project Managers shall be covered by DRC side.

5. MAIN CONTENTS OF THE PROJECT

Both sides agreed that the purpose of the Project is to be "Asphalt-paved road

maintenance capacity of OR and OVD in the project sites is developed". The Project Purpose will be achieved through three (3) Outputs: 1) Asphalt-paved road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites; 2) Technical guidelines on asphalt-paved road maintenance are developed; and 3) Asphalt-paved road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites.

6. DURATION

Both sides agreed that the duration of the Project will be two and a half (2.5) years after the first dispatch of JICA experts to DRC.

7. IMPLEMENTAION STRUCTURE

Both sides agreed that Joint Coordinating Committee (JCC), Technical Group (TG), Working Group (WG), and Technical Advisory Group (TAG) will be established as described in II.2 (4) and shown in Annex 3 and 4 of the draft R/D for effective implementation of the Project. This structure will basically be maintained till the end of the Project.

8. PROJECT OFFICES

Both sides agreed that necessary office spaces with office furniture and utilities such as internet connection, electricity, air conditioner etc., as described in II.1 (2)(b) and Annex-1 of the draft R/D, shall be prepared by DRC side before the commencement of the Project. Furthermore, both sides agreed that the location of the office spaces shall be informed to JICA DRC Office before the signing of R/D.

9. BUDGET FOR THE PROJECT

Both sides agreed that necessary budget for the implementation of the Project, described in II.1 (2) and Annex-1 of the draft R/D, such as local expenses including travel expenses, daily allowance for the counterparts, JCC members, TG members, WG members, TAG members and training participants shall be borne by OR and OVD in the framework of annual maintenance plan.

10. TRAINING PARTICIPANTS

Both sides agreed that technical staffs of the headquarters and Kinshasa provincial offices of OR and OVD are candidate participants to the trainings conducted in the Project, and technical staffs of other provincial offices can also be participated after the

approval of and the budget allocation from General Directions of each agency (OR / OVD), if deemed necessary.

11. IMPREMENTATION OF ON-THE-JOB-TRAINING

Both sides agreed that on-the-job trainings of asphalt-paved road inspection and asphalt pavement repair works, which are selected from those to be implemented or outsourced by OR and OVD, will be carried out in the Project, and their schedule and sites will be decided through mutual consultation between DRC side and JICA considering the security and safety conditions.

And also both sides agreed that the budget for asphalt pavement repair works shall be allocated by DRC side.

12. WORKING GROUP

Both sides agreed that WG will be established at the commencement of the activities of the Output 2 and Output 3 as shown in Annex 1, Annex 3 and Annex 4 of the draft R/D for smooth implementation of the Project. Members of WG will be selected from relevant organizations such as Fonds National d'Entretien Routier, Cellule Infrastructures, Road and Bridge Department, Bureau of Technical Control of MIPW, National Public Works Laboratories of OR, private companies etc., and will be decided after commencement of the Project through mutual consultation between DRC side and JICA.

13. TECHNICAL ADVISORY GROUP (TAG)

Both sides agreed that TAG will be held regularly during the Project at least once a year for reporting the progress and technical findings of the Project to and for asking opinions from relevant organizations such as universities, higher institutes of technologies, etc.

14. SAFETY MEASURES

To avoid accidents on site during the implementation of the on-the-job trainings on asphalt pavement repair works, both sides agreed that JICA experts will provide technical advices to counterparts on safety measures, such as assurance of on-site safety, provision of safety information to the public, and arrangement of adequate safety personnel, based on "The Guidance for the Management of Safety for Construction Works in Japanese ODA Projects" which can be reached at the site below;

http://www.jica.go.jp/activities/schemes/oda_safety/ku57pq00001nz4eu-att/guidance_fr.pdf

15. MISCONDUCT

Both sides agreed if JICA receives information related to suspected corrupt or fraudulent practices in the implementation of the Project, DRC side and relevant organizations will provide JICA with such information as JICA may reasonably request, including information related to any concerned official of the government and/or public organizations of DRC.

DRC side and relevant organizations will not, unfairly or unfavorably, treat the person and/or company which provided the information related to suspected corrupt or fraudulent practices in the implementation of the Project.

16. TAX OR LEVY

The Team strongly requested to DRC side that, in case of the necessity to pay tax, levy or any other expenses for the receipt of equipment provided by Japanese side due to delay in procedures for tax exemption, Cellule Infrastructures shall bear these expenses for accelerating smooth implementation of the Project.

Cellule Infrastructures responded that it will surely accomplish the formalities of tax exemption of the equipment so that it is smoothly released. The Team showed its understanding.

Attachment Draft Record of Discussion

(DRAFT)

RECORD OF DISCUSSIONS

ON

THE PROJECT FOR CAPACITY DEVELOPMENT OF ASPHALT PAVED ROAD MAINTENANCE MANAGEMENT

IN

THE DEMOCRATIC REPUBLIC OF THE CONGO

AGREED UPON BETWEEN

MINISTRY OF INFRASTRUCTURES AND PUBLIC WORKS

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

Kinshasa, [date]

Mr. Toshimichi Aoki

Chief Representative
The Democratic Republic of the Congo Office,
Japan International Cooperation Agency

Mr. Fridolin Kasweshi Musoka

Minister
Ministry of Infrastructures and Public Works
The Democratic Republic of the Congo

Based on the minutes of meetings on the Detailed Planning Survey on the Project for Improvement of the Road Management Capability (hereinafter referred to as "the Project") signed on the 5th August, 2015 between Ministry of Infrastructures and Public Works (hereinafter referred to as "MIPW") and the Japan International Cooperation Agency (hereinafter referred to as "JICA"), JICA held a series of discussions with MIPW and relevant organizations including Office des Routes (hereinafter referred to as "OR") and Office des Voiries et Drainage (hereinafter referred to as "OVD") to develop a detailed plan of the Project.

Both parties agreed the details of the Project and main points discussed as described in the Appendix 1 and the Appendix 2, respectively, and to request their respective governments to proceed with the necessary procedures for implementation of the Project.
Both parties also agreed that MIPW, the counterpart to JICA, 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 Democratic Republic of the Congo (hereinafter referred to as "DRC").

The Project will be implemented within the framework of the Note Verbales to be exchanged between the Government of Japan (hereinafter referred to as "GOJ") and the Government of DRC (hereinafter referred to as "GDRC").

Done in duplicate in the French and English languages, both are equally authentic. In case of any divergence of interpretation, the English text shall prevail.

Appendix 1: Project Description
Appendix 2: Main Points Discussed
Appendix 3: Minutes of Meetings on the Detailed Planning Survey on the Project for Improvement of the Road Management Capability

Appendix 1

PROJECT DESCRIPTION

Both parties confirmed that there is no change in the Project Description in the minutes of meetings for the Detailed Planning Survey on the Project signed on the 5th August, 2015 (Appendix 3).

I. BACKGROUND

DRC's road network is 153,209 km in length (FY2014), and this network is classified into three categories; "Arterial road (58,509 km)", "Inner city road (approx. 7,400 km)" and "Regional road / rural road (approx. 87,300 km)". Currently, under the overall control of MIPW, OR is responsible for the management and maintenance of "Arterial roads" and OVD is for "Inner city roads".

The transport infrastructure in DRC has much space for further development after the end of a long-lasting civil war. Since the insufficient development of transport infrastructure is one of the causes of stagnation in social and economic development, GDRC has decided the transport infrastructure development as a top priority policy in the "Second Growth and Poverty Strategy Document (Document de Statégie de Croissanceet de Réduction de la Pauvreté de Deuxième Génération: DSCRP2), October 2011" and "Five Year Action Plan (2012 - 2016)".

Furthermore, GDRC emphasizes the importance of rehabilitation of deteriorated transport infrastructures for smooth traffic and transportation. The condition of existing road network is comparatively bad, only 2% (3,000km) of which has pavement. To improve this situation, OR established "Road network improvement 5 years plan (2012 - 2016), whose targets are; expansion of road network and repair, rehabilitation and pavement of existing arterial roads. At the same time, GDRC acknowledges the importance of maintenance of paved roads for securing the minimum traffic and transport in the country.

Under such circumstances, GDRC requested to GOJ a technical cooperation project, "The Project for Improvement of the Road Management Capability" in August 2014. In response to the request, JICA held a series of discussions with the authorities concerned of DRC and determined the contents of the project for capacity development of asphalt-paved road maintenance management of OR and OVD.

II. OUTLINE OF THE PROJECT

Details of the Project are described in the Logical Framework (Project Design Matrix: PDM) (Annex 1) and the Plan of Operation (Annex 2)

1. Input

(1) Input by JICA

(a) Dispatch of Experts

- Leader / Road Maintenance Plan
- Road Inspection
- Road Inspection (Database)
- Pavement Repair
- Pavement Repair (Construction Supervision)
- Coordinator
- Monitoring and Evaluation
- Other experts, if necessary

(b) Training

- 2 times (1 time per year) in Japan

(c) Machinery and Equipment

- PC and Software for Database
- Other machinery and equipment, if necessary

In case of importation, the machinery, equipment and other materials under II-1 (1) (c) above will become the property of GDRC upon being delivered C.I.F. (cost, insurance and freight) to DRC authorities concerned at the ports and/or airports of disembarkation.

Input other than indicated above will be determined through mutual consultations between JICA and MIPW during the implementation of the Project, as necessary.

(2) Input by MIPW, OR and OVD

MIPW, OR and OVD will take necessary measures to provide at its own expense:

(a) Services of MIPW, OR and OVD's counterpart personnel and administrative personnel as referred to in II-2;
(b) Suitable office spaces in the building of XX[Organization] with necessary equipment and utilities such as internet connection, electricity, air conditioner etc.;
(c) Supply or replacement of machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than the equipment provided by JICA;
(d) Information as well as support in obtaining medical service;
(e) Credentials or identification cards;
(f) Available data (including maps and photographs) and information related to the Project;
(g) Running expenses necessary for the implementation of the Project;
(h) Expenses necessary for transportation within DRC of the equipment referred to in II-1 (1) (c) as well as for the installation, operation and maintenance thereof;

(i) Necessary facilities to the JICA experts for the remittance as well as utilization of the funds introduced into DRC from Japan in connection with the implementation of the Project; and
(j) Measures to assure safety for the JICA experts during the Project.

2. Implementation Structure

The project organization chart is given in the Annex 3. The roles and assignments of relevant organizations are as follows:

(1) MIPW

(a) Chairperson

Adviser in charge of Roads and Bridges, MIPW will be assigned as Chairperson, and will be responsible for overall administration and implementation of JCC of the Project.

(b) Coordination Secretary / Responsible Agency

Coordinator of Cellule Infrastructures, MIPW, which is Responsible Agency of the Project will be assigned as Coordination Secretary, and will be responsible for smooth implementation of the Project and coordination among OR, OVD and relevant organizations.

(2) Fonds National d'Entretien Routier (hereinafter referred to as "FONER")

(a) Vice Chairperson

Technical Director, FONER will be assigned as Vice Chairperson, and will assist Chairperson for overall administration and implementation of JCC of the Project.

(3) OR and OVD

(a) Project Director

Director General of OR and OVD will be respectively assigned as Project Director, and will be responsible for overall administration and implementation of the Project.

(b) Project Manager

Control Engineer, Road Direction, Department of Bridges and Roads, General Direction of OR and Auditor of Machinery, General Direction of OVD will be assigned as Project Manager, and will be responsible for management and implementation of the Project. And these Project Managers from OR and OVD respectively shall be dedicated to the Project.

(c) Project Members

Relevant technical staffs from following departments and offices in OR and OVD will be responsible for the managerial and technical matters of the Project.

- General Direction of OR
- Training Direction of OR
- Mechanized Maintenance Division, Road Direction, Department of Bridges and Roads of OR

- Kinshasa provincial office of OR
- Planning and Programme Division, OVD
- Machinery Management Division, OVD
- Kinshasa Provincial Office, OVD

(3) JICA Experts

The JICA experts will give necessary technical guidance, advice and recommendations to MIPW, OR and OVD on any matters pertaining to the implementation of the Project.

(4) Joint Coordinating Committee

Joint Coordinating Committee (hereinafter referred to as "JCC") will be established in order to facilitate inter-organizational coordination. JCC will be held at least once a year and whenever deems it necessary. JCC will review the progress, revise the overall plan when necessary, approve an annual work plan, conduct evaluation of the Project, and exchange opinions on major issues that arise during the implementation of the Project. A list of proposed members of JCC is shown in the Annex 4.

3. Project Site(s) and Beneficiaries

(1) Project Site

Kinshasa city and the surrounding area.

(2) Direct Beneficiaries

Technical Staffs of headquarters and Kinshasa provincial offices of OR and OVD.

(3) Indirect Beneficiaries

Asphalt-paved road users in Kinshasa city and the surrounding area.

4. Duration

2.5 years from the arrival of the first expert.

5. Reports

JICA experts will prepare and submit the following reports to MIPW, OR and OVD in French.

(1) Inception Report (Work Plan) at the commencement of the Project

MIPW, OR, OVD and JICA experts will jointly prepare the following reports in French.

(1) Monitoring Sheet on semiannual basis until the project completion.
(2) Project Completion Report at the time of the project completion.

6. Environmental and Social Considerations

MIPW, OR and OVD will abide by 'JICA Guidelines for Environmental and Social

Considerations' in order to ensure that appropriate considerations will be made for the environmental and social impacts of the Project.

III. UNDERTAKINGS OF GDRC, MIPW, OR AND OVD

1. GDRC, MIPW, OR and OVD will take necessary measures to:

(1) ensure that the technologies and knowledge acquired by the DRC nationals as a result of Japanese technical cooperation contributes to the economic and social development of DRC, and that the knowledge and experience acquired by the personnel of DRC from technical training as well as the equipment provided by JICA will be utilized effectively in the implementation of the Project;
(2) grant privileges, exemptions and benefits to the JICA experts referred to in II-1 (1) (a) above and their families, which are no less favorable than those granted to experts and members of the missions and their families of third countries or international organizations performing similar missions in DRC;
(3) provide security-related information as well as measures to ensure the safety of the JICA experts;
(4) permit the JICA experts to enter, leave and sojourn in DRC for the duration of their assignments therein and exempt them from foreign registration requirements and consular fees.
(5) exempt the JICA experts from taxes and any other charges on the equipment, machinery and other material necessary for the implementation of the Project;
(6) exempt the JICA experts from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to them and/or remitted to them from abroad for their services in connection with the implementation of the Project; and
(7) meet taxes and any other charges on the equipment, machinery and other material, referred to in II-1 (1) (c) above, necessary for the implementation of the Project.

2. GDRC, MIPW, OR and OVD will bear claims, if any arises, against the JICA experts resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Project, except when such claims arise from gross negligence or willful misconduct on the part of the JICA experts.

IV. MONITORING AND EVALUATION

JICA, MIPW, OR and OVD will jointly and regularly monitor the progress of the Project through the Monitoring Sheets based on the Project Design Matrix (PDM) and Plan of Operation (PO). The Monitoring Sheets will be reviewed every six (6) months.
Also, Project Completion Report will be drawn up one (1) month before the termination of the Project.
JICA will conduct the following evaluations and surveys to verify sustainability

and impact of the Project and draw lessons. The MIPW, OR and OVD are required to provide necessary support for them.

1. Ex-post evaluation three (3) years after the Project completion, in principle
2. Follow-up surveys on necessity basis

V. PROMOTION OF PUBLIC SUPPORT

For the purpose of promoting support for the Project, MIPW, OR and OVD will take appropriate measures to make the Project widely known to the people of DRC.

VI. MISCONDUCT

If JICA receives information related to suspected corrupt or fraudulent practices in the implementation of the Project, MIPW, OR, OVD and relevant organizations will provide JICA with such information as JICA may reasonably request, including information related to any concerned official of the government and/or public organizations of DRC.
MIPW, OR, OVD and relevant organizations will not, unfairly or unfavorably, treat the person and/or company which provided the information related to suspected corrupt or fraudulent practices in the implementation of the Project.

VII. MUTUAL CONSULTATION

JICA, MIPW, OR and OVD will consult each other whenever any major issues arise in the course of Project implementation.

VIII. AMENDMENTS

The record of discussions may be amended by the minutes of meetings between JICA and MIPW. However, PO may be amended in the Monitoring Sheets.
The minutes of meetings will be signed by authorized persons of each side who may be different from the signers of the record of discussions.

Annex 1 Logical Framework (Project Design Matrix: PDM)
Annex 2 Tentative Plan of Operation
Annex 3 Project Organization Chart
Annex 4 A List of Proposed Members of Joint Coordinating Committee

PROJECT DESIGN MATRIX (PDM)

Version 0 (August, 2015)

Project Title : The Project for Capacity Development of Asphalt Paved Road Maintenance Management
Period : [month] 2016 – [month] 2018
Implementation Organizations : Office des Routes (OR) and Office des Voiries et Drainage (OVD)
Project sites : Kinshasa city and the surrounding area
Target Groups : Technical staffs of headquarters and Kinshasa provincial offices of OR and OVD

Project Summary	Objectivery Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Maintenance of the asphalt-paved (AP) roads is conducted in a continuous manner in the project sites	1. XX% of the AP roads are inspected by FY2021 2. XX% of the planned asphalt pavement (APm) repair works are implemented annually 3. AP road maintenance plan and budget are developed annually	1. AP road inspection report 2. APm repair works report 3-1. AP road maintenance plan document 3-2. Budget request document	
Project Purpose AP road maintenance capacity of OR and OVD in the project sites is developed	AP road maintenance activities FY2018 are properly conducted in accordance with the AP road maintenance plan	1. AP road inspection report 2. APm repair works report 3. Input-Output data of database 4. Japanese experts' evaluation results of AP road inspection report 5. Japanese experts' evaluation results of APm repair works report	- Any significant changes are not made in AP road maintenance policies - Necessary budget and staffs for AP road maintenance are allocated annually
Outputs 1. AP road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites	1-1. Traffic volume survey is conducted on XX sections 1-2. AP road maintenance plan FY2018 is developed by OR and OVD 1-3. Budget request document FY2018 for AP road maintenance is submitted by	1-1. Database 1-2. AP Road maintenance plan document FY2018 1-3. Budget request document FY2018 for AP road maintenance	- Principal counterpart personnel do not resign, or are not transferred

	OR and OVD		
2. Technical guidelines on AP road maintenance are developed	2-1. Technical guidelines on AP road maintenance are drafted by [month, year]	2-1. Drafted technical guidelines	
	2-2. Database of AP road inspection is developed by [month, year]	2-2. Database	
	2-3. Technical guidelines on AP road maintenance are finalized by [month, year]	2-3. Finalized technical guidelines	
	2-4. Formalities for official approval of the finalized technical guidelines on AP road maintenance are submitted	2-4. Formalities	
3. AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites.	3-1. Training plan is developed by [month, year]	3-1. Training plan document	
	3-2. XX times of lectures on AP road inspection are conducted	3-2. Lectures report (AP road inspection)	
	3-3. XX times of OJTs on AP road inspection are conducted	3-3. OJTs report (AP road inspection)	
	3-4. Training participants' skills and knowledge of AP road inspection are improved*	3-4. Comparison between baseline survey and endline survey	
	3-5. XX times of trial AP road inspection are conducted	3-5. AP road inspection report	
	3-6. XX times of lectures on APm repair works are conducted	3-6. Lectures report (APm repair works)	
	3-7. XX times of OJTs on APm repair works are conducted	3-7. OJTs report (APm repair works)	
	3-8. Training participants' skills and knowledge of APm repair works are improved*	3-8. Comparison between baseline survey and endline survey	
	3-9. XX times of trial APm repair works are conducted	3-9. APm repair works report	

Activities	Inputs		
	Japanese side	**DRC side**	- DRC and other neighboring countries do not fall into conflict or turmoil due to social, economic, political reasons or famine
1-1. Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites 1-2. Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites 1-3. Define the road network to be covered by the project 1-4. Conduct traffic volume survey on some sections of the defined road network 1-5. Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites 1-6. Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request 2-1. Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites 2-2. Collect and review the existing AP road maintenance manuals and technical guidelines 2-3. Establish the Joint Working Group for developing technical guidelines on AP road maintenance 2-4. Develop and draft technical guidelines on AP road maintenance 2-5. Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group meetings etc. and revise the drafted technical guidelines 2-6. Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection 2-7. Develop a database for accumulating the AP road inspection results 2-8. Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works 2-9. Finalize the technical guidelines 2-10. Organize seminars and workshops for explaining and	1. Experts - Leader / Road Maintenance Plan - Road Inspection - Road Inspection (Databese) - Pavement Repair - Pavement Repair (Construction Supervision) - Coordinator - Monitoring and Evaluation - Other experts, if necessary 2. Machinery and Equipment - PC and Software for Database - Other machinery and equipment, if necessary 3. Trainings in Japan - 2 times (1time par year)	1. Counterparts - Project Directors - Project Managers - Project Members 2. Equipment and Facilities - Office of X building for the Project with office furniture and utilities such as internet connection, electricity, air conditioner, etc. - Office for the lectures conducted in the Project 3. Local Cost Borned by DRC side - Local expenses necessary for the implementation of the Project including travel expenses and allowance for the counterparts, JCC members, WG members, TAG members and Training participants.	**Precondition** - Appropriate budget and counterpart personnel are allocated by DRC side

distributing the finalized technical guidelines to relevant organizations 2-11. Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW <u>3.1. Training plan for AP road inspection and APm repair works</u> 3.1-1. Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works 3.1-2.Plan the trainings on AP road inspection and APm repair works 3.1-3.Select candidate sites for the trainings on AP road inspection and APm repair works <u>3.2. Trainings on AP Road Inspection</u> 3.2-1.Conduct baseline survey on the training participants' skills and knowledge of AP road inspection 3.2-2.Conduct lectures on AP road inspection 3.2-3.Conduct OJTs on AP road inspection at the selected sites in the project sites 3.2-4.Conduct endline survey on the training participants' skills and knowledge of AP road inspection 3.2-5.Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines <u>3.3. Training on APm Repair Works</u> 3.3-1.Conduct baseline survey on the training participants' skills and knowledge of APm repair works 3.3-2.Conduct lectures on APm repair works 3.3-3.Conduct OJTs on APm repair works at the selected sites in the project sites 3.3-4.Conduct endline survey on the training participants' skills and knowledge of APm repair works 3.3-5.Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines			

X : to be determined and defined before the commencement of the Project
[month, year] / XX / * : to be determined and defined within six (6) months after the commencement of the Project

PLAN OF OPERATION (TENTATIVE)

PROJECT TITLE : THE PROJECT FOR CAPACITY DEVELOPMENT OF ASPHALT PAVED ROAD MAINTENANCE MANAGEMENT

	ACTIVITIES	1st Year Year 2016												2nd Year Year 2017												3rd Year Year 2018											
		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
Output 1	**Asphalt-paved (AP) road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites.**																																				
1-1	Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites																																				
1-2	Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites																																				
1-3	Define the road network to be covered by the project																																				
1-4	Conduct traffic volume survey on some sections of the defined road network																																				
1-5	Develop a AP road maintenance plan FY2018 of OR and OVD in the project sites																																				
1-6	Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request																																				
Output 2	**Technical guidelines on AP road maintenance are developed.**																																				
2-1	Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites																																				
2-2	Collect and review the existing AP road maintenance manuals and technical guidelines																																				
2-3	Establish the Joint Working Group for developing technical guidelines on AP road maintenance																																				
2-4	Develop and draft technical guidelines on AP road maintenance																																				
2-5	Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group meetings etc. and revise the drafted technical guidelines																																				
2-6	Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection																																				
2-7	Develop a database for accumulating the AP road inspection results																																				
2-8	Conduct AP road maintenance and asphalt pavement (Apm) repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works																																				
2-9	Finalize the technical guidelines																																				
2-10	Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations																																				
2-11	Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW																																				

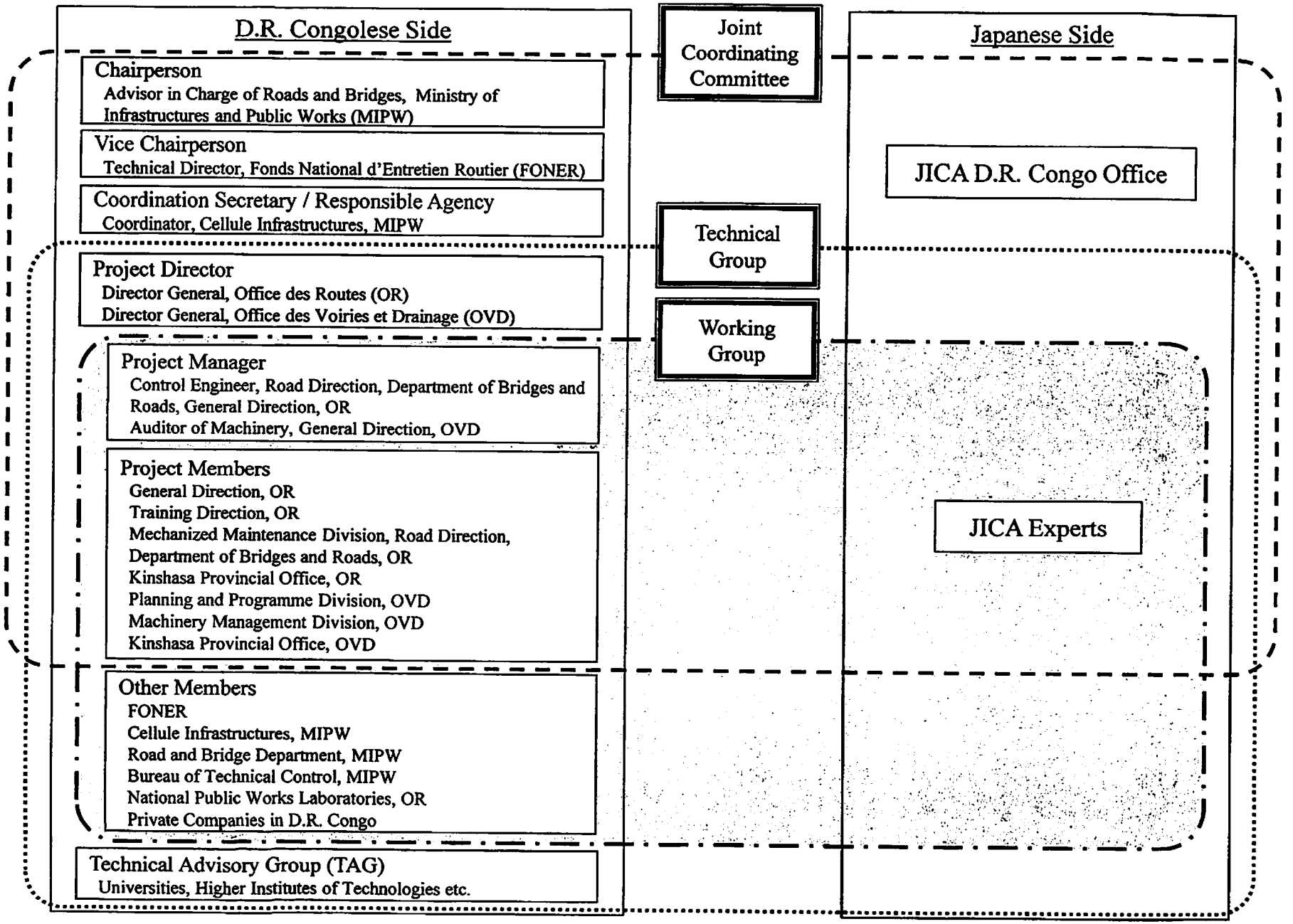
PLAN OF OPERATION (TENTATIVE)

PROJECT TITLE : THE PROJECT FOR CAPACITY DEVELOPMENT OF ASPHALT PAVED ROAD MAINTENANCE MANAGEMENT

	ACTIVITIES	1st Year Year 2016												2nd Year Year 2017												3rd Year Year 2018											
		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
Output 3	**AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites**																																				
3.1	Training plan for AP road inspection and APm repair works																																				
3.1-1	Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works																																				
3.1-2	Plan the trainings on AP road inspection and APm repair works																																				
3.1-3	Select candidate sites for the trainings on AP road inspection and APm repair works																																				
3.2	Trainings on AP Road Inspection																																				
3.2-1	Conduct baseline survey on the training participants' skills and knowledge of AP road inspection																																				
3.2-2	Conduct lectures on AP road inspection																																				
3.2-3	Conduct OJTs on AP road inspection at the selected sites in the project sites																																				
3.2-4	Conduct endline survey on the training participants' skills and knowledge of AP road inspection																																				
3.2-5	Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines																																				
3.3	Training on APm Repair Works																																				
3.3-1	Conduct baseline survey on the training participants' skills and knowledge of APm repair works																																				
3.3-2	Conduct lectures on APm repair works																																				
3.3-3	Conduct OJTs on APm repair works at the selected sites in the project sites																																				
3.3-4	Conduct endline survey on the training participants' skills and knowledge of APm repair works																																				
3.3-5	Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines																																				
	Monitor the progress of the above activities and attainment & application of the technical contents periodically and report the results to JCC.				▲					▲						▲						▲						▲						▲			

Organization chart of the Project

Annex 3



LIST OF PROPOSED MEMBERS OF JOINT COORDINATING COMMITTEE

Chairperson: Advisor in Charge of Roads and Bridges,
Ministry of Infrastructures and Public Works (MIPW)

Vice Chairperson: Technical Director, Fonds National d'Entretien Routier (FONER)

Coordination Secretary / Responsible Agency:
Coordinator, Cellule Infrastructures, MIPW

Members:

(1) D.R. Congolese Side

1) Project Director: Director General, Office des Routes (OR)
Director General, Office des Voiries et Drainage (OVD)

2) Project Manager: Control Engineer, Road Direction, Department of Bridges and Roads, General Direction, OR
Auditor of Machinery, General Direction, OVD

3) Project Members:
- General Direction, OR
- Training Direction, OR
- Mechanized Maintenance Division, Road Direction, Department of Bridges and Roads, OR
- Kinshasa Provincial Office, OR
- Planning and Programme Division, OVD
- Machinery Management Division, OVD
- Kinshasa Provincial Office, OVD

4) Relevant personnel accepted by the Chairperson, if necessary.

(2) Japanese Side

1) JICA D.R. Congo Office
- Chief Representative
- Representative
- Project Formulation Advisor in charge of the Project

2) JICA Experts
- Leader / Road Maintenance Plan
- Road Inspection
- Road Inspection (Database)
- Pavement Repair
- Pavement Repair (Construction Supervision)
- Coordinator
- Monitoring and Evaluation

3) Other personnel accepted by JICA, if necessary

JCC will be scheduled based on the maximum availability of the members listed above.

LIST OF PROPOSED MEMBERS FROM OR

(1) Project Director

Mr. HERMAN MUTIMA SAKRINI	Director General

(2) Project Manager (Permanent)

Mr. MAKENGO MAVELELA	Control Engineer, Road Direction, Department of Bridges and Roads, General Direction

(3) Project Members

Mr. ISSAC KAPANGA	Technical Assistant of General Director, General Direction
Mr. ENOCH SANGANA MALONGA	Director, Training Direction
Mr. NSHIMBA DIA NSAFU	Chief, Mechanized Maintenance Division, Road Direction, Department of Bridges and Roads
Mr. GILBERT BAGULANSHIMBA	Director, Kinshasa Provincial Office

LIST OF PROPOSED MEMBERS FROM OVD

(1) Project Director

Mr. BENJAMIN WENGA BASUBI	Director General

(2) Project Manager (Permanent)

Mr. RICHARD MATANDA MWEMBA	Auditor of Machinery, General Direction

(3) Project Members

Mr. LEON MUTOMBO KABEYA	Planning and Programme Division
Mr. JEANSMIN BATOKA-BEMBA	Material Management Division
Mr. TIMOTHE SUMAHILI-SANGWA	Kinshasa Provincial Office

(4) Working Group Members

1) Headquarter

Mr. MOÏSE BIELO-KONDE
Mr. THOMAS TOHADI-KALONDA
Mr. OSCAR KONDE-KONDE
Mr. KABANGU BAKANDAYI-Fidèle

2) Kinshasa Provincial Office

Mr. ANACLET BIPOPO-LUBOYA
Ms. ROSE BUKAWU-KALUBI
Mr. ANGE NKUNGA-MANSIANTIMA
Mr. GISLAIN-TRESOR
Mr. JIMMY KABILA-MPASI
Mr. FRANÇOIS KALONGELA-TSHIBANDI
Mr. GULAIN LUZOLO-TUKITAKA
Mr. AGIGBA-ZONO

Appendix 2

MAIN POINTS DISCUSSED

MINUTES OF MEETING
BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
MINISTRY OF INFRASTRUCTURES AND PUBLIC WORKS
ON
JAPANESE TECHNICAL COOPERATION PROJECT
FOR
IMPROVEMENT OF THE ROAD MANAGEMENT CAPABILITY

In response to the official request of the Democratic Republic of the Congo (hereinafter referred to as "DRC"), the Detailed Planning Survey Team (hereinafter referred to as "the Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA")headed by Mr. Tomoki Kanenawa, visited DRC from the 19th July to the 6th August, 2015 for the purpose of determining the details of the technical cooperation programme concerning "the Project for Improvement of the Road Management Capability" (hereinafter referred to as "the Project"), had a series of discussions for setting up the framework and contents of the Project with DRC's authorities concerned of the Ministry of Infrastructures and Public Works (hereinafter referred to as "MIPW"). As a result of the discussion, Minutes of Meeting between JICA and MIPW was signed on 5th August, 2015.

In relation to the contents agreed by the Minutes of Meeting, JICA and MIPW agreed to modify the matters referred to in the document attached hereto.

Done in duplicate in the French and English languages, both are equally authentic. In case of any divergence of interpretation, the English text shall prevail.

Kinshasa, the 7 September, 2015

Mr. Toshimichi Aoki
Chief Representative
Democratic Republic of Congo Office
Japan International Cooperation Agency

Mr. Chrisostome ILA NGONGO MILAMBO
Vice Director of Cabinet
Ministry of Infrastructures and Public Works
The Democratic Republic of the Congo

MAIN POINTS DISCUSSED

1. PROJECT TITLE

Both sides agreed that the Project title in French shall be modified from "Projet pour le renforcement de capacité de maintenance des routes asphaltées" to "Projet pour le renforcement de capacité de maintenance des routes", and in English shall be modified from "The Project for Capacity Development of Asphalt Paved Road Maintenance Management" to "The Project for Capacity Development of Road Maintenance Management".

02 Minutes of JCC

République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES ET TRAVAUX PUBLICS

Cellule Infrastructures

MINUTES OF THE JOINT COORDINATION COMMITTEE MEETING
PROJET DE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	July 6, 2016
Duration	From 10:35 to 12:38
Place	the OKAPI Room of INPESS (formerly IEMK)
Meeting called by	Le Ministère des Infrastructures et Travaux Publics
Secretariat	Théophile NTELA LUNGUMBA, Coordinator of CI
Participants	*See annexed attendance list*
Agenda	Presentation of the activities already accomplished and those to be carried out in the Projet de Renforcement de capacités en Maintenance des Routes

Summary of the meeting

Opening address by the Cabinet Director of the MITP

The meeting started with the opening address by the Cabinet Director of the Ministère des Infrastructures et Travaux Publics, represented in this case by the Legal Advisor of the MITP.

In his address the Legal Advisor of the MITP recognized the commitment of the Donors in general and of JICA in particular to assist the DRC in the task of maintenance of its infrastructures.

However, he also expressed the wish that the new Projet de Renforcement de capacités en Maintenance des Routes might also cover earth roads since they constitute most of the DRC's road network.

Remarks by the Coordinator of CI

First of all, the Coordinator of CI presented all of the participants to those present after having welcomed them to it.

Words of the Technical Director of FONER

Although the Technical Director of FONER was initially supposed to talk about the general framework of the Projet de Renforcement de capacités en Maintenance des Routes, he concentrated more on presentation of FONER in view of the fact that Project Design Matrix of the Project was not yet defined.

He thus presented the following essential information to the meeting:

- *Created at the initiative of the DRC and its Donors (PTF), in particular the World Bank, who insisted that the granted investments for road rehabilitation be sustainable through regular and ongoing undertaking of maintenance thereof, FONER is a second-generation road maintenance fund with administrative autonomy and a board of directors.*
- *FONER is placed under the authority of the ministers who are in charge of public works and of finances, coordination between them being the responsibility of the minister in charge of public works.*
- *The absolutely necessary condition for a road to be eligible for FONER financing is that it first be rehabilitated and included in a program presented by a structure that is eligible for such funds (OR, OVD, DVDA and the provinces by virtue of decentralization);*
- *FONER is subject to abidance by the Operations Manual developed by the contribution by CI and the World Bank;*
- *At the present time the level of mobilization of funds stands at US$100,000,000 a year, FONER's main sources of funds being fees imposed on land motor vehicle lubricants (98%) and national road network tolls (2%).*

Words by the JICA Chief Representative

Next to speak was the JICA Chief Representative, who pointed out that his organization has been supporting the DRC since 2011 under the guidelines of the Poverty Reduction Strategy Paper (DSRP, 2011-2015) for improvement of the economic infrastructures of transportation and roads.

He then mentioned Japan's financial contribution in the form of grant aid amounting to about US$40 million for implementation of the Projet de Réhabilitation et de Modernisation de l'Avenue des Poids-Lourds, which has received considerable financial support by the Government of the DRC.

He went on to remind all those present of the fact that the rehabilitation and modernization work in that project was inaugurated in February of 2015 by His Excellency, the President of the Republic.

Given the importance of investment in roads, regular and ongoing maintenance would appear to be the best solution for considerable lengthening of the service life of road infrastructures, which in itself justifies JICA's implementation of the Projet de Renforcement de Capacités en Maintenance de Routes.

Concerning that project the Chief Representative expressed the wish that technology transfer and transfer of road maintenance administrative management know-how from the Japanese experts to their Congolese counterparts will result in improvement over the short term of the quality of maintenance of the roads for which OVD and OR are responsible in the interest of preservation of the transportation infrastructures that the DRC has so far acquired.

Presentation of the project activities

The Project Manager presented the Project Work Plan, stressing the fact that the final Project Design Matrix will be presented at the next JCC meeting.

He informed those present of the activities already carried out by his team, particularly:

	(i) *the information meeting with the Congolese counterparts;* (ii) *visits to some main routes of the OVD and OR road network;* (iii) *visit to OR and OVD facilities;* (iv) *visits to the SAFRICAS quarry at Lutendele and to the CARRIGRES quarry.* *All those activities are described in an activities plan that prescribes a capability evaluation phase for the first year, a capability improvement phase for the second year and a capability reinforcement phase for the third and last year.* *He drew the attention of all of the participants to the fact that the life cycle of the pavement of road depends on the timing of the work: repair cost is low if the repairs are undertaken timely, i.e. when deterioration is still minor. Five types of diagnosis have therefore been proposed by the team of Japanese experts. The photographic illustrations made it possible for those present to understand the condition of the roads visited by the team.* *The Project Manager then presented the different activities proposed in the work plan for the sake of getting three types of results, particularly: establishment of an asphalt road maintenance cycle, drawing up of technical guidelines for maintenance of asphalt roads and improvement of technical capabilities and knowledge concerning maintenance of asphalt roads.* *The project implementation structure, i.e. the JCC, the working group and the technical working group, was also covered in the Project Manager's presentation.* ***Discussion*** *The first to speak in the discussion session was the Director General of OVD. He recognized the weaknesses in maintenance of the DRC's road network enumerated by the Japanese experts and hopes that the level of the Congolese counterparts in road maintenance will be raised through JICA's assistance.* *As for the OR Technical Coordinator, he insisted that the team of JICA experts be able to devote a part of the program to definition of the different types of road deterioration.* *As for the BTC Technical Director, he congratulated the team of Japanese experts on the quality of the work that has been done. However, he asked that BTC personnel, too, be included considering the BTC's status as a structure of government control.* *Concerning that, the Chairman of the Joint Coordination Committee spoke out, insisting that in designation of the engineers to receive the training consideration also be given to the desirability of giving preference to younger people rather to those who will soon retire.* *In answer to the concern expressed by the Technical Director of FONER as to when the Project might be extended to earth roads, the Project*

	Manager said that for the time being the Project concerns only asphalt roads, but that it could soon concern earth roads as well. *The Technical Director of FONER also invited the participants to take active part in working out the budget for covering the Project activities, reminding them that the said budget would not be based on FONER's sources of funds until April 2017.* *The Coordinator of CI particularly stressed the contribution of the authorities of INPESS (formerly IMEK), who agreed to make their institution's OKAPI Room available free of charge for organization of this first JCC Meeting. The Coordinator took the occasion to remind the participants that the INEPSS (formerly IEMK), the construction of which saw participation by the OVD as regards the access roads) and the Japanese firm TODA as regards the buildings, was the fruit of Japanese cooperation in the form of grant aid.* *The meeting closed with words of gratitude expressed by the Chairman of the Joint Coordination Meeting to all of the DRC's donors (PTF) and to JICA in particular for their support to the DRC's development.* *The next JCC Meeting is set for November 2016.* *The meeting started at 10:35 and ended at 12:38.*

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

The person who drew up the minutes

Théophile NTELA LUNGUMBA,

Coordinator

République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES ET TRAVAUX PUBLICS

Cellule Infrastructures

MINUTES OF THE SECOND JOINT COORDINATION COMMITTEE MEETING
PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	November 8, 2016
Duration	Meeting started at 10:45 and ended at 14:12
Place	the OKAPI Room of INPESS (formerly IEMK)
Meeting called by	le Ministère des Infrastructures et Travaux Publics
Secretariat	Jean Pierre MUTAMBA, Chief of Roads Section of Cellule Infrastructures
Agenda	1. Opening address 2. Presentation of the agenda 3. Presentation of the participants 4. Words by the JICA Chief Representative 5. Presentation of the draft of the preparation of the asphalt paved road maintenance and repair 6. Discussion 7. Presentation of the inspection equipment and the road data base 8. Presentation of the program of training in Japan and the next Joint Coordination Committee Meeting 9. Closing address
How the meeting proceeded	**I. Introduction** 1. The second Joint Coordination Committee Meeting of the Projet pour le Renforcement de Capacités en Maintenance des Routes was held as scheduled in the OKAPI Room of the l'Institut National Pilote de l'Enseignement des Sciences de Santé (INPESS), formerly IEMK, on November 8, 2016. **II. Opening of the meeting** **A. Participation** 2. Representatives of the national and provincial government: • Mr. **Willy Carlos MPETE**, Cabinet Director of the Ministère des Infrastructures et Travaux Publics; • Mr. **Jésus SHITA LORENZO**, Advisor of the Ministre Provincial du Plan, Budget, Travaux Publics et Infrastructures. 3. Members of the Project Joint Coordination Committee: • Mr. **Achille BASEMENANENE**, Advisor of the Minister of MITP in charge of roads and Chairman of the JCC; • Mr. **Herman MUTIMA SAKRINI**, General Director of the OR and member of the JCC; • Mrs. **Nelly MWAMBA**, assistant of the General Director of OVD, in representation of the General Director, who was unable to attend; • Mr. **Jean-Pierre MUTAMBA**, Chief of the Roads Section of the Cellule Infrastructures, representing Coordinator of the Cellule Infrastructures, and secretary of the JCC, on assignment.

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4. In representation of the following structures of the MITP and the Provincial Government:
   - Mr. **Charles Médard ILUNGA**, General Director of ACGT;
   - Mr. **Joseph KISAKA AMAY**, General Director a.i. of BTC;
   - Mr. **Basile LUNGUANA**, General Director a.i. of RATPK;
   - Mr. **Pierre MBAYO**, Director of Works at RATPK;
   - Mr. **Moshe BIELO KONDE**, Technical Assistant of the General Director of OVD.

5. Representatives of the donors (PTF):
   - Mr. **AOKI TOSHIMICHI**, JICA Chief Representative;
   - Mrs. **AYA SHIMADA**, JICA Deputy Chief Representative;
   - Mr. **Léon MWAMBA**, JICA Infrastructures Program Deputy Director;
   - Mr. **Paul MWANZA**, socioeconomist at CTB.

6. Members of the faculties of universities and institutes of higher education of the DRC:
   - Mr. **Paul TSHIULA**, Professor of the faculté Polytechnique de l'Université de Kinshasa ;
   - Mr. **Évariste PHANZU**, Professor at the Institut National des Bâtiments et Travaux Publics;
   - Mr. **Pierre MUZYUMBA**, Professor at the Institut National des Bâtiments et Travaux Publics;
   - Mr. **Patrick NDOLO GOY**, Chief of Works of the faculté Polytechnique de l'Université de Kinshasa;
   - Mr. **Michel MISEKA**, Chief of Works at the Institut National des Bâtiments et Travaux Publics.

7. In representation of associations and organizations:
   - Mr. **Jean Bernard TSHIASUMA**, Secretary General of the Association Congolaise des Ingénieurs Civils (ACIC);
   - Mr. **Michel UYUMBU**, President of the Corporation Nationale des Ingénieurs BTP.

8. Experts of the Cellule Infrastructures (implementing entity of the Project):
   - Mr. **Augustin KABAMBA**, in charge of monitoring and evaluation;
   - Mr. **Baudouin MANZENZA**, in charge of communication.

9. Focal points of the structures of the MITP:
   - Mr. **Richard MATANDA** and Mr. **Léon MUTOMBO** of OVD;
   - Mr. **Enoch SANGANA** of OR;
   - Mr. **Patous MWA ILANGA** and Mr. **Matthieu KAZADI LONJI** of BTC;;
   - Mr. **Michel DINGANGA** of ACGT;
   - Mr. **Pascal BULONGO** and Mr. **Joseph MASISA** of FONER.

10. Members of the working group in charge of preparation of the asphalt paved road maintenance and repair:
    - Mr. **Timothée SUMAHILI**, Mr. **Zico NSIALA MPUNGI**, Mr. **Jimmy NKULA** and Mr. **PELA WASAMA** of OVD;
    - Mr. **WANET MUTUMOS** of OR;
    - Mr. **Willy MONDA** and Mr. **Fils ZENGA** of BTC;
    - Mr. **Mao MULUME** of ACGT.

11. Japanese experts of the Joint Venture of firms INGEROSE, EIGHT, JAPAN ENGINEERING CONSULTANTS Inc. and KATAHARI & ENGINEERS INTERNATIONAL:
    - Mr. **Nobahuro SHIMIZU,** Project Manager;
    - Mr. **Kohei SAKAI**, road data base expert;
    - Mr. **Hiroaki TAKAHASHI**, pavement repair expert;
    - Mr. **Mitsuya YAMAGISHI**, Project Coordinator;

- Mr. **Fumihiko SHISHIDO**, pavement expert;
- Mrs. **Junko TAGUCHI**, monitoring and evaluation expert;
- Mr. **Yaffa ELONGO**, interpreter;
- Mr. **Chocquet N'DOBE**, engineer in charge of monitoring and evaluation of the Project.

B. Addresses by participants

12. Opening address

The opening session of the second Joint Coordination Committee Meeting was chaired by the Mr. Willy Carlos MPETE, Cabinet Director of the Minister of ITP.

In his address the Cabinet Director of the Minister of ITP welcomed all of the participants to the second Joint Coordination Committee Meeting of the PRCMR Project and informed them about the different activities carried out in connection with it since the first such meeting was held on July 6, 2016. They have been particularly preparation of the asphalt paved road maintenance and repair manual by the group of Congolese counterparts belonging to OVD, OR, BTC, FONER, CI and ACGT. The manual will be finalized by the end of January of 2017.

He then solemnly expressed the gratitude of the Government of the Democratic Republic of Congo to the Government of Japan for this new support given to the road sector in the form of technical cooperation with a view to attainment of sustainability of road investment through an efficient road maintenance policy. He stressed that between 2008 and 2015 JICA financed several large-scale projects through grant aid, such as construction of INPP, construction of the nouvelle usine de traitement d'eaux de Ngaliema, construction of the Institut National Pilote d'Enseignement de Sciences de Santé (ex IEMK) and réhabilitation et de modernisation de l'avenue des Poids - Lourds.

In conclusion he thanked all of the donors (PTF) of the DRC for the decisive support given by them to the road sector and expressed the wish to see the work of the working groups in charge of preparation of the asphalt paved road maintenance and repair manual meet great success.

13. Presentation of the Agenda

The agenda of the meeting was presented by the Advisor of the Minister of ITP in charge of roads and Chairman of the Joint Coordination Committee.

14. Presentation of the participants

Each participant was asked to present himself or herself in turn going around the room. That task was conducted by the Chief of the Roads Section of the Cellule Infrastructures acting in lieu of the Coordinator of the Cellule Infrastructures and Secretary of the PRCMR Project Joint Coordination Committee, who was away on another mission.

15. Words by the JICA Chief Representative

In his talk the JICA Chief Representative noted that the main objective of the PRCMR Project is improvement of capabilities in maintenance of asphalt paved roads in the city of Kinshasa and its surrounding area.

In order to achieve that objective it is therefore necessary that all participate and the Congolese side ensure the ownership of the project.

He continued by the pointing out that this Second Joint Coordination Committee Meeting will make it possible to gather information on the progress of the project and to review the difficulties encountered to date in implementation thereof so as to be able to improve future activities.

He also called on the Congolese side to improve its know-how in planning and monitoring of road maintenance throughout implementation of the project. The results expected during the next six months will make it possible to confirm good progress in the project.

In conclusion the JICA Chief Representative thanked the Cellule Infrastructures for its catalyst role in carrying out of the project activities as well as the general directors of OR, OVD and FONER and all of the organizations concerned by the project for mobilization of their personnel for involvement in implementation of the project and, last of all, encouraged the Congolese side to stay on course regarding maintenance of infrastructures in order to ensure a brighter tomorrow for the Congolese nation.

16. Presentation of the Draft of the Manual

One of the members of the working group responsible for preparation of the asphalt paved road maintenance and repair manual, in the person of Mr. **MATANDA** of OVD, took about thirty minutes to present the draft of the manual. Two points were of particular interest to the participants:

- **The activities already carried out in the Project are as follows:**

- the information meeting with the focal points of different structures on June 6, 2016;
- the visit to some arterial roads of the road network in the vicinity of Kinshasa for which OVD and OR are responsible;
- the visit to the OVD and OR facilities in Kinshasa;
- the mission carried out at Matadi on August 9-11, 2016, by the joint Project team consisting of the JICA experts and their Congolese counterparts;
- organization of the first working group in charge of preparation of the asphalt paved road maintenance and repair manual;
- the demonstration on October 20, 2016, of use of equipment recently acquired by the ACGT;
- the operational testing on October 27, 2016, at the KITANO camp on Avenue des Poids-Lourds of a complete kit of inspection equipment for detection of deteriorations of the asphalt pavement brought to Kinshasa by the Japanese experts;
- selection of the members of the second working group, in charge of inspection, the data base and repair of asphalt pavement

- **Organization of the working group**

The work of the first working group, in charge of preparation of the asphalt paved road maintenance and repair manual, started on September 7, 2016.

Seven (7) meetings in all, one each Thursday, were held in the meeting rooms of the different structures of the MITP. Thus the working group produced a document containing four (4) chapters and a foreword of the ten (10) that are supposed to make up the manual, i.e:

- Chapter 1: Overview;
- Chapter 2: Work implementation structure;
- Chapter 3: Work planning and implementation;

- Chapter 4: Road safety measures.

The six (6) other chapters to be completed by the group by the end of January 2017 are:
- Chapter 5: Diurnal and nocturnal visual patrol
- Chapter 6: Maintenance and reparation plan
- Chapter 7: Maintenance methods
- Chapter 8: Reconditioning method
- Chapter 9: Quality control
- Chapter 10: Road data base

Barring unexpected adversary circumstances, the draft of the manual will be finalized before the end of January 2017 for its application in the field by the second working group, in charge of road inspection, data base and asphalt repairs. During that second stage changes could be made in the document on the basis of any weaknesses identified in the field.

The working group stressed the fact that the work done so far is not perfect, that, as in the case of any human endeavor, it is subject to changes that could be made by Congolese administration authorities in general and by scientists in particular. Thus, an appeal has been made to the staffs of the universities and other institutes of higher education concerned with the road sector to contribute to finalization of the manual before its publication in December 2018.

17.Discussion

Members of the working group gave clarifications on content of the draft manual for the benefit of the participants in the meeting.

That exchange between the members of the working group and the participants, particularly staff members of the universities and other institutes of higher education concerned with the road sector, which took about an hour, made it possible to highlight the adequacy of the asphalt paved road maintenance and repair manual.

Below is a summary of the questions asked by those present and the answers given by the members of the working group:

1. In answer to the question of the General Director a.i. of BTC why not include in the present manual partial and total repair work on the pavement, since most of the pavement of the DRC have suffered deep deteriorations, the members of the working group said that the scope of the manual now being prepared has already been defined in the minutes of the discussions on the Project signed on December 30, 2015, between JICA and the Government of the DRC and that it concerns only the surface courses and therefore applies to newly constructed roads the service life of which can be prolonged with an effective maintenance policy.

   That question was also discussed in a different way by the Professor PHANZU of INBTP and was the subject of an extensive debate lasting about a half an hour between the scientific personnel and the members of the working group. The basic substance of that debate was whether such partial and total repairs should be taken into account in the manual. In fact Professor PHANZU was of the opinion that it is absolutely necessary to provide for deep repair work since most of the deterioration of the asphalt paved roads of the DRC concerns the road foundation.

   As justification of that type of repair work not being taken up in the

manual the members of the working group cited the reasoning of newly constructed road maintenance policy. They took the occasion to urge those present not to encourage the old habit of wanting work on our roads to be restricted to appearance of serious deteriorations, and more often of very advanced deterioration.

The argument of the members of the working group was supported by Professor TSHIULA in words amounting to the following: When your wife has a still birth, there follows a burial and an effort to make another one. He went on to say that it is possible, as everywhere else, to have more than one manual, each specific to a different course of the pavement.

2. The members of the working group, supported by the Mr. SAKAI, a Japanese data base expert, addressed in the following manner the concerns voiced by CT Patrick NDOLO of the faculté Polytechnique de l'Université de Kinshasa, regarding: (i) the standards to be applied in the manual in order to ensure quality control and (ii) the software applied and accessibility by all of the organizational structures to the data base that is going to be created:

- So far only four (4) chapters of the manual have been completed by the group. Chapter 10 concerning quality control has not yet been worked on. Questions concerning the standards to be applied will be addressed at the time of preparation of that chapter.
- The software used in the design of the data base is "logiciel Real Petit Viemen", created with Axcess.
- It is possible to share that data base, however without altering the data in it. Only updating of the data is authorized.

3. In answer to the question by Mr. Léon MWAMBA, JICA expert, why earth roads have not been included in the work manual, the members of the working group said that that question was already raised in the initial discussions between the Congolese Government and the Japanese Government. In those discussions it was decided that the scope of work of the present Project would be asphalt paved roads, maintenance of earth roads being the possible subject of later financing by JICA.

4. In answer to the wish of CT MISEKA of INBTP to have the manual propose, beyond its content, the cost per kilometer of the road maintenance, the members of the working group told him that the manual now being prepared considers all of the stages of road maintenance management, i.e. inspection, scheduling, planning and budgeting. Once the budgeting stage is reached, administrative personnel will be able to determine the cost of the maintenance work.

18.Presentation of the inspection equipment and the road date base equipment

Assisted by Mr. **SAKAI**, Japanese road data base expert, the members of the working group presented the set of equipment for the data base, a set consisting of a camera, a GPS and a laptop installed on a vehicle and providing information on the condition of the pavement at well defined uniform intervals.

19. Presentation of the program of training in Japan and the next Joint Coordination Committee Meeting

Mr. SHIMIZU, PRCMR Project Manager, took stock of the activities

	already carried out and presented the schedule for the activities to be carried out up to the next Joint Coordination Committee Meeting, to be held in April or May of 2017. He insisted on training of the Congolese counterparts in Japan in April 2017. **20.Closing address** The meeting ended with the closing address by the roads advisor of the Minister of ITP, who, in it, expressed once again the MITP's gratitude to the donors (PTF) of the DRC for their support for development and sustainability of the road infrastructures of the DRC, especially to JICA. He then thanked and encouraged the members of the working group for the commitment and readiness to serve evinced by them in preparation of the asphalt paved road maintenance and repair manual. He thus wished them full success in that exciting and important work. Started at 10:45, the meeting ended at 14:12.

TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

The person who drew up the minutes

Jean Pierre MUTAMBA,
Head of Road Section, on behalf of the CI Coordinator, and Joint Coordination Committee Secretary, who was not able to attend

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République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule Infrastructures

MINUTES OF THE THIRD JOINT COORDINATION COMMITTEE MEETING
PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, May 25, 2017
Duration	Meeting started at 10:45 and ended at 13:47
Place	the OKAPI Room of INPESS (formerly IEMK)
Meeting called by	le Ministère des Infrastructures, Travaux Publics et Reconstruction
Secretariat	Théophile NTELA LUNGUMBA, Coordinator of Cellule Infrastructures
Agenda	1. Opening address 2. Presentation of the participants 3. Presentation of the agenda 4. Outline presentation of the asphalt paved road maintenance and repair manual 5. Discussion 6. Report on training in Japan 7. Presentation of the activities for the next six (6) months 8. Closing address
How the meeting proceeded	**I. Introduction** **1.** The Third Joint Coordination Committee Meeting of the Projet pour le Renforcement de capacités de maintenance des routes was held as scheduled in the OKAPI Room of the Institut National Pilote de l'Enseignement des Sciences de Santé (INPESS), formerly IEMK, on Thursday, May 25, 2017. **II. Opening of the meeting** **A. Participation** **2.** Representatives of the national and provincial government: • Mr. **Jacques BAYKPON**, Deputy Cabinet Director of the Ministère des Infrastructures, Travaux Publics et Reconstruction. **3.** Members of the Project Joint Coordination Committee: • Mr. **Théophile NTELA LUNGUMBA**, Coordinator of the Cellule Infrastructures and secretary of the JCC. **4.** In representation of the following structures of the MITPR and the Provincial Government: • Mr. **Charles Médard ILUNGA**, General Director of ACGT; • Mr. **Joseph KISAKA AMAY**, General Director a.i. of BTC; • Mr. **Patou MWA ILANGA**, Technical Director of BTC; • Mrs. **Christine BILA NGUNGA**, Chief of Bureau at BTC; • Mr. **KAYEMBE KAPANGA**, technical assistant of the General Director of OR; • Mr. **Théophile KIPULU**, logistical assistant at Office des Routes;

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5. Representatives of the donors (PTF):
- Mrs. **AYA SHIMADA**, JICA Deputy Chief Representative;
- Mr. **Paul MWANZA**, socioeconomist at CTB.
- Mr. **Anatole Désiré BIZONGO**, transportation engineer at the African Development Bank (BAD).

6. Members of the faculties of universities and institutes of higher education of the DRC:
- Mr. **Pierre MUZYUMBA**, Professor at the Institut National des Bâtiments et Travaux Publics;

7. In representation of associations and organizations:
- Mr. **Jean Bernard TSHIASUMA**, Secretary General of the Association Congolaise des Ingénieurs Civils (ACIC);
- Mr. **Michel UYUMBU**, President of the Corporation Nationale des Ingénieurs BTP.

8. Experts of the Cellule Infrastructures (implementing entity of the Project):
- Mr. Patrick MBUYA, ENGS;
- Mr. **Augustin KABAMBA**, in charge of monitoring and evaluation;
- Mr. **Oscar BADEO**, in charge of projects at CEPFGL;
- Mr. **Baudouin MANZENZA**, in charge of communication.
- Mr. Chris SUPER WONSONE, engineer trainee.

9. Focal points of the structures of MITPR:
- Mr. **Richard MATANDA** and Mr. **Léon MUTOMBO** of OVD;
- Mr. **BALAYI KADIMA** and Mr. **Enock SANGANA** of Office des routes;
- Mr. **Patous MWA ILANGA** and Mr. **Matthieu KAZADI LONJI** of BTC;;
- Mr. **Michel DINGANGA** of ACGT;
- Mr. **Pascal BULONGO** and Mr. **Joseph MASISA** of FONER.

10. Members of the working group in charge of preparation of the asphalt paved road maintenance and repair manual:
- Mr. **Timothée SUMAHILI**, Mr. **Jimmy NKULA** and Mr. **Zico NSIALA MPUNGI** of OVD;
- Mr. **Jean-Paul MAVUNGU** and Mr. **WANET MUTUMOSI** of Office des Routes ;
- Mr. **Willy MONDA** and Mr. **Fils ZENGA** of BTC;

11. Japanese experts of the joint venture of firms INGEROSE, EIGHT, JAPAN ENGINEERING CONSULTANTS Inc. and KATAHARI & ENGINEERS INTERNATIONAL:
- Mr. **Nobahuro SHIMIZU,** Project Manager;
- Mr. **Tatsuya MOCHIZUKI**, President of the company INGEROSEC;
- Mr. **Mitsuihide SAITO**, Deputy Project Manager;
- Mr. **Mitsuya YAMAGISHI**, Project Coordinator;
- Mr. **Fumihiko SHISHIDO**, Pavement expert;
- Mrs. **Junko TAGUCHI**, monitoring and evaluation expert;
- Mr. **Yaffa ELONGO**, interpreter;
- Mr. **Chocquet N'DOBE**, engineer in charge of monitoring and evaluation of the Project.

B. Addresses

12. Opening address

The opening session of the Third Joint Coordination Committee Meeting

was chaired by Mr. Jacques BAYKPON, SEM Deputy Cabinet Director of the Minister of ITPR.

In his address, deputy Cabinet Director of the Minister of ITPR enumerated the main activities carried out so far since the Project was started in June 2016, i.e.:

- preparation of the draft of the asphalt paved road maintenance and repair manual;
- training in place in the DRC of some OR and OVD personnel in use of the inspection equipment and the road data base;
- training in Japan of OR, OVD, BTC, Cellule Infrastructures and FONER Congolese experts from May 4 to May 22, 2017.

In that connection he praised the work being done by the JICA experts team and all of the government services involved directly or indirectly in implementation of this technical cooperation project.

He went on to say that the draft manual thus produced should constitute a reference document that the Congolese administrative authorities can rely on and that in that sense the cooperation of all of the technical personnel in the field of road maintenance in general and the staffs of the universities and other institutes of higher education in particular is absolutely necessary for the sake of making it as good as possible.

After reiterating his gratitude to all of the donors (PTF) of the DRC for the decisive support that they are giving the road sector and wishing full success for the work of PRCMR and the whole Project Team, he declared the Third Joint Coordination Committee Meeting of the PRCMR Project open.

13. Presentation of the Agenda

The agenda of the meeting was presented by the Coordinator of the Cellule Infrastructures and secretary of the Joint Coordination Committee of the PRCMR.

In the course of that presentation the CI Coordinator welcomed the presence of the President of the company INGEROSEC, who had come from Japan to attend the handing over ceremony of the installation work of the new public lighting system of Boulevard Congo-Japan, financed by JICA, and the Third Joint Coordination Committee Meeting of the PRCMR Project, in which INGEROSEC is involved through the joint venture of firms supporting the activities of the Project.

14.Presentation of the participants

Going around the room, each participant introduced himself/herself in turn. That task was conducted by the Coordinator of the Cellule Infrastructures and secretary of the Joint Coordination Committee of the PRCMR Project.

15. Presentation of draft manual

The draft manual produced by the OR, OVD, BTC, ACGT, CI and FONER Congolese counterparts working closely with the JICA Japanese experts was briefly presented by two members of the working group in charge of preparation of the asphalt paved road maintenance and repair manual in the persons of Mr. **Richard MATANDA** of OVD and Mr. **Joshua MUTSIA** of OR.

To begin with, the chairman of the Working Group invited those present to observe a minute of silence in memory of Mr. **Jean-Pierre MUTAMBA**, former head of the CI Roads Section and PRCMR Project Manager, who

passed away last January 9.

The two members of the 1st Working Group took about thirty minutes to explain the contents of the draft manual, which consists of the following eleven (11) chapters besides the foreword:

- Chapter 1: Overview;
- Chapter 2: Work implementation structure;
- Chapter 3: Work planning and implementation;
- Chapter 4: Road safety measures;
- Chapter 5: Day and night visual patrol
- Chapter 6: Maintenance and reparation plan
- Chapter 7: Maintenance methods
- Chapter 8: Reconditioning method
- Chapter 9: Quality control
- Chapter 10: Road data base
- Chapter 11: Supervision of the Work

The participants in the Third JCC meeting have adopted the following:

- The draft manual completed in February 2017 by the members of the 1st Working Group was prepared on the basis of a document proposed by the Japanese side and adapted to the realities of the DRC.
- After several clarification meetings between the JICA Japanese experts and the PRCMR Congolese counterparts the draft of the document was entirely completed in April 2017;
- Other amendments of the document are expected by the end of December 2017 as a result of (i) remarks that should come from application of the technical guidelines contained in the manual during the practice in the field by the 2nd Working Group, in charge of the inspection, the road data base and asphalt road repair and (ii) opinions that are expected from the technical working group consisting of staff of the universities and other institutes of higher education in the DRC.

Mr. **Richard MATANDA**, chairman of the 1st Working Group, also made mention in his remarks of the training in the DRC undergone by some OR and OVD trainees from May 2 to May 8, 2017, training based mainly on use of the road inspection equipment and the data base.

He also emphasized that some IT equipment (two desktop computers) was procured in the Project for use by the trainees in connection with the road data base.

16.Discussion

The meeting moderator explained to the participants that the JCC Meeting was a meeting for reviewing the activities of the Project and that therefore the exchanges to take place in it are limited to suggestions and requests for clarification.

Regarding more difficult questions requiring consideration in depth, workshops and seminars on the activities of the Project will be organized.

The exchanges between the participants and the members of the JCC and of the 1st Working Group are summarized in the following:

1. Comments by the Dupty General Director of OR

His comments concerned essentially the following three (3) points:

- the contradiction observed between what the manual is meant for, i.e. for work concerning only the asphalt surfacing course, on the one hand, and the content of the manual, on the other hand, mention being made of work for rehabilitation of the entire pavement structure in Chapter 8 thereof;

- the suggestion to reformulate the definition proposed in Chapter 1 for the term "maintenance", which identifies it as recurring repairs implemented urgently, to the following, emphasizing the frequency of carrying out of the work: "maintenance is repair work carried out regularly";

- the need to define, in Chapter 11 concerning supervision of the work, major inspection indicators that would make it possible to accomplish supervision of the work in an efficient manner on the basis of reports from the work sites.

In answer to those remarks, the CI Coordinator and secretary of the JCC promised to officially send the draft of asphalt paved road maintenance and repair manual to all of the entities concerned by the PRCMR Project, for feedback in the form of opinions and comments on it. Meetings will also be held shortly for the purpose of improving the document on the basis of the remarks concerning it.

2. Comments by Mr. Anatole Bizongo, Transportation Engineer at the African Development Bank

For his part, Mr. Anatole BIZONGO thanked JICA for having thought of improvement of the capabilities of Congolese personnel in asphalt paved road maintenance since in his opinion it was wise to give priority to human training in that humans figure centrally in everything.

He went on to point out that a considerable number of roads financed by the DRC's donors (PTR) often suffer deterioration for lack of maintenance and that such situation constitutes a weakness and a source of discouragement for the donors.

Thus, he said, the PRCMR Project comes timely for the donors as a reason for encouraging donors regarding sustainability of investments in the road sector.

He ended his remarks by expressing the wish that the document that is prepared be officially sent to him to make it possible for the donors to present their opinions and comments on it through the thematic group on "transportation infrastructures in the DRC".

Concerning that, the CDO promised to spare no efforts to see to it that the draft maintenance and repair manual that is produced be sent as soon as possible.

3. Comments by the General Director of ACGT

The General Director of ACGT thanked CI and JICA for this initiative, which is meant to be a framework for thinking about infrastructures.

He proposed that such cooperation be widened to include as many entities as possible so as to make it possible to achieve results acceptable to all.

In response to that concern, the CDO said that MITPR is already enthusiastic about having all relevant entities associated and that,

moreover, other organizations of the sector, such as the Association des chauffeurs du Congo, the Association des transporteurs du Congo and the Fédération des Entreprises du Congo will be associated in the next JCC Meeting.

4. Comments by Professor MUZYUMBA

For his part, Professor MUZYUMBA expressed the opinion that it is worth the trouble to organize the services of the entities concerned by the Project.

After all, according to him, good organization of the services dedicated to road maintenance would make it possible to reduce work time and the cost of the work.

That opinion was backed by the CDO, who promised to instruct the working group to enrich the document as regards that aspect.

5. Comments by the President of CNIBTP

The President of CNIBTP made a plea that design consultants and private companies also be associated with the Project in view of the fact that most of the players in the Project are government people.

In response to that, the CDO reassured him that inclusion of private players in the Project did not pose any problems, but that that should concern only companies since they are few in number. The professor agreed that good organization of services dedicated to road maintenance would make it possible to reduce work time and the cost of the work.

That opinion was supported by the CDO.

17. Presentation of the inspection equipment and the road date base equipment

Assisted by Mr. SAKAI, Japanese road data base expert, the members of the working group presented the set of equipment for the data base, a set consisting of a camera, a GPS and a laptop installed on a vehicle and providing information on the condition of the pavement at well- defined uniform intervals.

18. Presentation of the program of training in Japan and the next Joint Coordination Committee **Meeting**

Mr. SHIMIZU, PRCMR Project Manager, took stock of the activities already carried out and presented the schedule for the activities to be carried out up to the next Joint Coordination Committee Meeting, to be held in April or May of 2017. He insisted on training of the Congolese counterparts in Japan in April 2017.

19. Closing address

The meeting ended with the closing address by the roads and highways advisor of the Minister of ITP, who, in it, expressed once again the MITP's gratitude to the donors (PTF) of the DRC for their support for development and sustainability of the road infrastructures of the DRC, especially to JICA. He then thanked and encouraged the members of the working group for the commitment and readiness to serve evinced by

	them in preparation of the asphalt paved road maintenance and repair manual. He thus wished them full success in that exciting and important work. Started at 10:45, the meeting ended at 14:12.

TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

The person who drew up the minutes

Jean Pierre MUTAMBA,
Head of Road Section, on behalf of the CI Coordinator, and Joint Coordination Committee Secretary, who was not able to attend

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République Démocratique du Congo
MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION
Cellule Infrastructures

MINUTES OF THE FOURTH JOINT COORDINATION COMMITTEE MEETING
PROJET POUR LE RENFORCEMENT DE CAPACITES DE MAINTENANCE DES ROUTES

Date	Wednesday, November 15, 2017
Duration	Meeting started at 10:16 and ended at 12:47
Place	the OKAPI Room of INPESS (formerly IEMK)
Meeting called by	le Ministère des Infrastructures, Travaux Publics et Reconstruction
Secretariat	Baudouin MANZENZA, in charge of communication at the Cellule Infrastructures
Agenda	1. Opening address 2. Presentation of the participants 3. Presentation of the agenda 4. Words by the JICA Chief Representative 5. Presentation of the Project activities 6. Presentation of the results of on-the-job training 7. Presentation of the results of road inspection 8. Discussion 9. Presentation of the activities for the next six (6) months 10. Closing address
How the meeting proceeded	**0. Introduction** The Fourth Joint Coordination Committee Meeting of the Projet pour le Renforcement de capacités de maintenance des routes was held, as scheduled, in the OKAPI Room of the l'Institut National Pilote de l'Enseignement des Sciences de Santé (INPESS), formerly IEMK, on Wednesday, November 15, 2017. **1. Opening address** The opening session of the Fourth Joint Coordination Committee Meeting was chaired by Mr. Pius NGOIE, road advisor of the Minister of and Chairman of the JCC, representing the Cabinet Director, who was not able to attend. In his address he enumerated the main activities already carried out since the Third Joint Coordination Committee Meeting of the Project, held last May 25, particularly: **1.** The discussions between the Project Team and the Technical Group, composed of staff members of the UNIKIN and INBTP, on the one hand, and the members of the professional organizations, on the other hand, concerning improvement of the contents of the draft of the asphalt paved road maintenance and repair manual prepared by the PRCMR Project; **2.** Continuation of field training in the DRC of some Office des Routes

	and OVD personnel on use of the inspection and data base equipment a; **3.** Training of Office des Routes, OVD, BTC, CI and FONER Congolese experts on pavement repair work. The road advisor and Chairman of the JCC then reminded that before this new technical cooperation JICA had already financed in the form of grant aid several large-scale projects, such as the INPP construction project, the Ngaliema new water treatment plant project, the Institut National Pilote d'Enseignement de Sciences de Santé (formerly IEMK) construction project and the Projet de réhabilitation et de modernisation de l'avenue des Poids – Lourds. He solemnly praised the considerable work that is being done by the JICA team of experts and all of the government departments involved directly or indirectly in implementation of the PRCMR Project. After reiterating the MITPR's thanks to all of the donors (PTF) of the DRC for the decisive support given by them to the road sector and wishing full success to the work of the PRCMR and to the whole Project Team, he declared the Fourth Joint Coordination Committee Meeting open. **4. Presentation of the participants** Going around the room, each participant introduced himself/herself in turn. This task was conducted by the road advisor of the Minister of ITPR and Chairman of the JCC. **5. Presentation of the agenda** The agenda of the meeting was presented by the road advisor of the Minister of ITPR. **6. Words by the JICA Chief Representative** Taking his turn to speak, the JICA Chief Representative pointed out that his organization has noted with satisfaction the commitment of the Congolese counterparts shown in carrying out the activities of the PRCMR Project. Of the different activities carried out to date in the PRCMR Project, he made particular mention of: - organization of the technical group, - training in Japan of MITPR Congolese managerial staff last May, - preparation of the draft of the asphalt paved road maintenance and repair manual and - on-the-job training of the Congolese counterparts in road inspection, data base and asphalt road repair. He said that in view of the present progress of the activities JICA is convinced that the capabilities of OR and OVD personnel in asphalt road maintenance will have been considerable improved by the end of the PRCMR Project. He stressed the fact that the Fourth JCC Meeting was yet another occasion for each player in the Project to identify the strengths and the weaknesses encountered in carrying out preceding activities with a view to correcting the program of the future activities. After thanking the players in the project, particularly CI for the active role

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in the implementation of the PRCMR project, he ended his address by encouraging the Congolese side to make the project its own for the sake of ensuring good cooperation in the future.

7. Presentation of the project activities

The project activities were presented by Mr. **Richard MATANDA** of OVD, chairman of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual.

He first stressed the importance of the management structures of the PRCMR, i.e. the Project Joint Coordination Committee, the technical group and the two working groups, one in charge of preparation of the manual and the other inspection, the data base and asphalt road repair.

He then mentioned the activities presently being carried out in the PRCMR Project:

- compilation, after 40 meetings of the 1st Working Group and 3 meetings of the technical group, of the draft of the asphalt paved road maintenance and repair manual,
- on-the-job training for OR, OVD, BTC, ACGT and FONER personnel in asphalt road repairs on Boulevard Congo-Japon and on National Route 43 (Nsele-Maluku) and
- a series of training for some OR and OVR personnel in road inspection using a vehicle equipped with a camera and GPS.

8. Presentation of the results of on-the-job training

In September, October and November of 2017 the OR, OVD, ACGT, BTC and FONER Congolese counterparts underwent training in inspection and the road data base, supervision and asphalt road repair.

The road inspection took place on some arterial roads of the capital, and the training in asphalt road repair and work supervision was carried out on Boulevard Congo-Japon and National Route 43 (Nsele-Maluku).

The participants in that training who are members of the 2nd Working Group, in charge of inspection, data base and asphalt repair, made a wrap-up of these training activities.

One of the members of that working group, Mr. Pascal BULONGO of FONER, made a wrap-up of the training in work supervision and asphalt repair work. He explained that that training, which concerned cracks sealing and reinforcement of the surface course, took place on two arterial roads: Boulevard Congo-Japon and National Route 43 (Nsele-Maluku).

The decision whether or not to do that work was made on the basis of the results of *in situ* and laboratory tests, including Benkelman beam deflection tests and core tests.

The laboratory test results were explained by a member of the 2nd Working Group who works at LNTP. He said that two such tests were carried out by LNTP in September and November of 2017.

The tests in September were for checking the base course in soil stabilized by cement by use of soil taken from the shoulder of National Route 43 in accordance with the recommendations of the Japanese experts. Three mixes were made at 3%, 4% and 5%. The results of the tests showed that the compressive strength of the prepared test pieces varied from 0.68 to 1.47 kg/cm2.

In November 2017 tests for checking execution of the reinforcement course were carried out on National Route 43 for the purpose of making sure of the quality of the mixes that were laid and the thickness and density obtained.

The conclusions concerning those tests (Marshall stability, binder (bitumen) content and particle size of the mineral skeleton) is underway.

9. Presentation of the results of road inspection

As for the training on road inspection and the data base, which started last May, the members of the team in charge of road inspection said that it took place in two phases, the first being classroom theoretical training and the second practical training on arterial roads of the capital and that ten (10) Congolese counterparts, five (5) of them of OR and five (5) of OVD, took part in the training.

Road inspection by means of a vehicle equipped with cameras and GPS makes it possible to obtain visual images along with the coordinates and to assess the condition of the road using the images obtained.

The following equipment is used in road inspection:

- a camera,
- a GPS,
- a portable computer,
- a main control unit and
- an inverter.

After the inspection the information gathered is processed using the program REAL PETIT VIEWER.

Road inspection with a vehicle equipped with cameras follows the following procedure:

1. Preparation of the measurements
2. Installation of the instruments
3. Adjustment of the apparatus
4. Measurements
5. Verification of the data
6. Dismounting
7. Interpretation and processing of the data

A satellite overview based on processing of the data collected in the road inspection operations and showing the condition of each arterial road section inspected was also presented by the members of the 2nd Working Group.

10. Discussion

The meeting moderator explained to the participants that the JCC Meeting was a meeting for reviewing the activities of the Project and that therefore the exchanges to take place in it are limited to suggestions and requests for clarification.

Regarding more difficult questions requiring consideration in depth, there is provision for organization of workshops and seminars on the activities of the Project.

The exchanges between the participants and the members of the JCC Meeting and of the 1st Working Group are summarized in the following:

1. Comments by the Deputy General Director of OR

His comments concerned essentially the following three (3) points:

2. the contradiction observed between what the manual is meant for, i.e. for work concerning only the asphalt surfacing course, on the one hand, and the content of the manual, on the other hand, mention being made of work for rehabilitation of the entire pavement structure in Chapter 8 thereof;

3. the suggestion to reformulate the definition proposed in Chapter 1 for the term "maintenance", which identifies it as recurring repairs implemented urgently, to the following, emphasizing the frequency of carrying out of the work: "maintenance is repair work carried out regularly";

4. the need to define, in Chapter 11 concerning supervision of the work, major inspection indicators that would make it possible to accomplish supervision of the work in an efficient manner on the basis of reports from the work sites.

In answer to those remarks, the CI Coordinator and secretary of the JJCC Meeting promised to officially send the draft asphalt paved road maintenance and repair manual to all of the entities concerned by the PRCMR Project, for feedback in the form of opinions and comments on it. Meetings will also be held shortly for the purpose of improving the document on the basis of the remarks concerning it.

5. The Comments by Mr. Anatole Bizongo, Transportation Engineer at the African Development Bank

For his part, Mr. Anatole BIZONGO thanked JICA for having thought of improvement of the capabilities of Congolese personnel in asphalt road maintenance since in his opinion it was wise to give priority to human training in that humans figure centrally in everything.

He went on to point out that a considerable number of roads financed by the DRC's donors (PTR) often suffer deterioration for lack of maintenance and that that situation constitutes a weakness and a source of discouragement for the donors.

Thus, he said, the PRCMR Project comes timely for the donors as a reason for encouraging them regarding sustainability of investments in the road sector.

He ended his remarks by expressing the wish that the document that is prepared be officially sent to him to make it possible for the donors to present their opinions and comments on it through the thematic group on transportation infrastructures in the DRC.

Concerning that, the CDO promised to spare no efforts to see to it that the draft maintenance and repair manual that is prepared be sent as soon as possible.

6. Comments by the General Director of ACGT

The General Director of ACGT thanked CI and JICA for this initiative, which is meant to be a framework for thinking about infrastructures.

He proposed that such cooperation be widened to include as many entities as possible so as to make it possible to achieve results acceptable to all.

In response to that concern, the CDO said that MITPR is already enthusiastic about having all relevant entities associated and that, moreover, other organizations of the sector, such as the Congo Drivers Association, the Congo Transporters Association and the Congo Federation of Businesses will be associated in the next JCC Meeting.

7. Comments by Professor MUZYUMBA

For his part, Professor MUZYUMBA expressed the opinion that it is worth the trouble to organize the services of the entities concerned by the Project.

After all, according to him, good organization of the services dedicated to road maintenance would make it possible to reduce work time and the cost of the work.

That opinion was backed by the CDO, who promised to instruct the working group to enrich the document as regards that aspect.

8. Comments by the President of CNIBTP

The President of CNIBTP made a plea that design consultants and private companies also be associated with the Project in view of the fact that most of the players in the Project are government people.

In response to that, the CDO reassured him that inclusion of private players in the Project did not pose any problems, but that that should concern only companies since they are few in number. The professor agreed that good organization of services dedicated to road maintenance would make it possible to reduce work time and the cost of the work.

That opinion was supported by the CDO.

9. Presentation of the activities for the next six (6) months

Mr. SHIMIZU, the PRCMR Project Manager, took stock of the activities already carried out and presented the program for the activities to be accomplished up to the next Joint Coordination Committee Meeting, which is to be held in April or May of 2017. He stressed the importance of the training of the Congolese counterparts that will take place in Japan in April 2018.

10. Closing Words

The SEM road advisor of the Minister of ITP made the closing address of the meeting, reiterating MITP's gratitude to the donors (PTF) of the DRC for their support in development and sustainability the road infrastructures of the DRC, especially to JICA. He then thanked and encouraged the members of the working group for the commitment and readiness to serve evinced by them in preparation of the asphalt paved road maintenance and repair manual. He thus wished them full success in that exciting and important work.

Started at 10:45, the meeting ended at 14:12.

TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

The person who drew up the minutes

Jean Pierre MUTAMBA,
Head of Road Section, on behalf of the CI Coordinator, and Joint Coordination Committee Meeting Secretary, who was not able to attend

République Démocratique du Congo
MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION
Cellule Infrastructures

MINUTES OF THE FOURTH JOINT COORDINATION COMMITTEE MEETING
PROJET POUR LE RENFORCEMENT DE CAPACITES DE MAINTENANCE DES ROUTES

Date	Wednesday, November 15, 2017
Duration	Meeting started at 10:16 and ended at 12:47
Place	the OKAPI Room of INPESS (formerly IEMK)
Meeting called by	le Ministère des Infrastructures, Travaux Publics et Reconstruction
Secretariat	Baudouin MANZENZA, in charge of communication at the Cellule Infrastructures
Agenda	1. Opening address 2. Presentation of the participants 3. Presentation of the agenda 4. Words by the JICA Chief Representative 5. Presentation of the Project activities 6. Presentation of the results of on-the-job training 7. Presentation of the results of road inspection 8. Discussion 9. Presentation of the activities for the next six (6) months 10. Closing address
How the meeting proceeded	**0. Introduction** The Fourth Joint Coordination Committee Meeting of the Renforcement de capacités de maintenance des routes was held, as scheduled, in the OKAPI Room of the Institut National Pilote de l'Enseignement des Sciences de Santé (INPESS), formerly IEMK, on Wednesday, November 15, 2017. **1. Opening address** The opening session of the Fourth Joint Coordination Committee Meeting was chaired by Mr. Pius NGOIE, road advisor of the Minister of ITPR and Chairman of the JCC, representing the Cabinet Director, who was not able to attend. In his address road advisor of the Minister of ITPR enumerated the main activities already carried out since the Third Joint Coordination Committee Meeting of the Project, held last May 25, particularly: **1.** The discussions between the Project Team and the Technical Group, composed of staff members of the UNIKIN and INBTP, on the one hand, and the members of the professional organizations, on the other hand, concerning improvement of the contents of the draft of the asphalt paved road maintenance and repair manual prepared by the PRCMR Project; **2.** Continuation of field training in the DRC of some Office des Routes

	and OVD personnel on use of the inspection and data base equipment; **3.** Training of Office des Routes, OVD, BTC, CI and FONER Congolese experts on pavement repair work. The road advisor and Chairman of the JCC then reminded that before this new technical cooperation JICA had already financed in the form of grant aid several large-scale projects, such as the INPP construction project, the Ngaliema new water treatment plant project, the Institut National Pilote d'Enseignement de Sciences de Santé (formerly IEMK) construction project and the Projet de réhabilitation et de modernisation de l'avenue des Poids – Lourds. He solemnly praised the considerable work that is being done by the JICA team of experts and all of the government departments involved directly or indirectly in implementation of the PRCMR Project. After reiterating the MITPR's thanks to all of the donors (PTF) of the DRC for the decisive support given by them to the road sector and wishing full success to the work of the PRCMR and to the whole Project Team, he declared the Fourth Joint Coordination Committee Meeting open. **2. Presentation of the participants** Going around the room, each participant introduced himself/herself in turn. This task was conducted by the road advisor of the Minister of ITPR and Chairman of the JCC. **3. Presentation of the agenda** The agenda of the meeting was presented by the road advisor of the Minister of ITPR. **4. Words by the JICA Chief Representative** Taking his turn to speak, the JICA Chief Representative pointed out that his organization has noted with satisfaction the commitment of the Congolese counterparts shown in carrying out the activities of the PRCMR Project. Of the different activities carried out to date in the PRCMR Project, he made particular mention of: - organization of the technical group, - training in Japan of MITPR Congolese managerial staff last May, - preparation of the draft of the asphalt paved road maintenance and repair manual and - on-the-job training of the Congolese counterparts in road inspection, the data base and asphalt road repair. He said that in view of the present progress of the activities JICA is convinced that the capabilities of OR and OVD personnel in asphalt road maintenance will have been considerable improved by the end of the PRCMR Project. He stressed the fact that the Fourth JCC Meeting was yet another occasion for each player in the Project to identify the strengths and the weaknesses encountered in carrying out preceding activities with a view to correcting the program of the future activities. After thanking all of the players in the project, particularly CI for the active role in the implementation of the PRCMR, he ended his address by

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encouraging the Congolese side to make the project its own for the sake of ensuring good cooperation in the future.

5. Presentation of the project activities

The project activities were presented by Mr. **Richard MATANDA** of OVD, chairman of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual.

He first stressed the importance of the management structures of the PRCMR, i.e. the Project Joint Coordination Committee, the technical group and the two working groups, one in charge of preparation of the manual and the other with inspection, the data base and asphalt road repair.

He then mentioned the activities presently being carried out in the PRCMR Project:

- compilation, after 40 meetings of the 1st Working Group and 3 meetings of the technical group, of the draft of the asphalt paved road maintenance and repair manual,
- on-the-job training for OR, OVD, BTC, ACGT and FONER personnel in asphalt road repairs on Boulevard Congo-Japon and on National Route 43 (Nsele-Maluku) and
- a series of training for some OR and OVR personnel in road inspection using a vehicle equipped with a camera and GPS.

6. Presentation of the results of on-the-job training

In September, October and November of 2017 the OR, OVD, ACGT, BTC and FONER Congolese counterparts underwent training in inspection and the road data base, supervision and asphalt road repair.

The road inspection took place on some arterial roads of the capital, and the training in asphalt road repair and work supervision was carried out on Boulevard Congo-Japon and National Route 43 (Nsele-Maluku).

The participants in that training who are members of the 2nd Working Group, in charge of inspection, the data base and asphalt repair, made a wrap-up of these training activities.

One of the members of that working group, Mr. Pascal BULONGO of FONER, made a wrap-up of training in work supervision and asphalt repair work. He explained that that training, which concerned cracks sealing and reinforcement of the surface course, took place on two arterial roads: Boulevard Congo-Japon and National Route 43 (Nsele-Maluku).

The decision whether or not to do that work was made on the basis of the results of *in situ* and laboratory tests, including Benkelman beam deflection tests and core tests.

The laboratory test results were explained by a member of the 2nd Working Group who works at LNTP. He said that two such tests were carried out by LNTP in September and November of 2017.

The tests in September were for checking the base course in soil stabilized by cement by use of soil taken from the shoulder of National Route 43 in accordance with the recommendations of the Japanese experts. Three mixes were made at 3%, 4% and 5%. The results of the tests showed that the compressive strength of the prepared test pieces varied from 0.68 to 1.47 kg/cm2.

In November 2017 tests for checking execution of the reinforcement course were carried out on National Route 43 for the purpose of making sure of the quality of the mixes that were laid and the thickness and density obtained.

The drawing of conclusions concerning those tests (Marshall stability, binder (bitumen) content and particle size of the mineral skeleton) is underway.

7. Presentation of the results of road inspection

As for the training on road inspection and the data base, which started last May, the members of the team in charge of road inspection said that it took place in two phases, the first being classroom theoretical training and the second practical training on arterial roads of the capital and that ten (10) Congolese counterparts, five (5) of them of OR and five (5) of OVD, took part in the training.

Road inspection by means of a vehicle equipped with cameras and GPS makes it possible to obtain visual images along with the coordinates and to assess the condition of the road using the images obtained.

The following equipment is used in road inspection:

- a camera,
- a GPS,
- a portable computer,
- a main control unit and
- an inverter.

After the inspection the information gathered is processed using the program REAL PETIT VIEWER.

Road inspection with a vehicle equipped with cameras follows the following procedure:

1. Preparation of the measurements
2. Installation of the instruments
3. Adjustment of the apparatus
4. Measurements
5. Verification of the data
6. Dismounting
7. Interpretation and processing of the data

A satellite overview based on processing of the data collected in the road inspection operations and showing the condition of each arterial road section inspected was also presented by the members of the 2nd Working Group.

8. Discussion

Below is a summary of the exchanges between the participants in the meeting:

1. Remarks by Mr. MUTIA of OR

Mr. MUTIA expressed concern about the conclusion drawn from the laboratory tests regarding the condition of the base course in soil stabilized with cement of RN 43 in view of the fact that the results obtained for the compressive strengths of the test pieces prepared for that purpose (0.68-1.47 kg/cm2) are way too low to conclude that this

pavement, which is more than 40 years old, is in good condition.

In response to those remarks it was reminded that the standard used was the Japanese standard. That being the case, Professor MUZYUMA proposed that in the future LNTP be able in similar situations to carry out the tests by both methods, the Japanese method and usual one so as to be able to compare the results and benefit from such comparison.

2. Remarks by Professor MUZYUMA

Professor MUZYUMA made the following technical proposals to the administrative authorities:

- changing of the present drainage system (open gutter) by including off-road works,
- providing the entities of MITPR with inspection equipment so as to prevent other ministries such as the one in charge of urban planning to intrude into road work,
- seeking of financing for preparation of Congolese standards.

He next stressed that fact that sealing of cracks was different from reinforcement work, its purpose being that of stopping water from rising. That being the case, he encouraged the administrative authorities to schedule such work, which is less costly and makes it possible to lengthen the service life of that infrastructure, instead of waiting until the deterioration gets more serious to do repair work, which is then generally too costly.

3. Remarks by Professor PHANZU

In his remarks Professor PHANZU encouraged the administrative authorities to work in the direction of procuring inspection equipment that will make monitored maintenance of our roads possible and suggested that obtained values be associated with each test.

The chairman of the JCC expressed the opinion that the work done deserves improvements and urged the members of the inspection team to insist on the way the collected data is processed.

4. Remarks by DT LENDO LENDO

DT LENDO LENDO expressed concern about the conclusions concerning inspection of Boulevard du 30 juin, which uphold the view that the road is in good condition although in simple visual inspection one can see cracks in the road.

Concerning that, the members of the inspection team explained that inspection results depend on the lane that the vehicle runs on and that in the case in question that lane did not show any deterioration. They also took that opportunity to explain certain fundamental rules to be observed in the interests of successful inspection, including:

- Running on the lane at a uniform speed
- Avoidance of deviations
- Taking pictures at a uniform frequency (every 5 m), etc.

9. Presentation of the activities for the next six (6) months

Mr. SHIMIZU, the PRCMR Project Manager, took stock of the activities already carried out and presented the program for the activities to be accomplished up to the next Joint Coordination Committee Meeting, which is to be held in April or May of 2017. He stressed the importance of the training of the Congolese counterparts that will take place in Japan in April 2018.

10. Closing Words

The meeting was closed with the words of the road advisor of Minister of ITPR, who reiterated MITP's gratitude to the donors (PTF) of the DRC for their support in development and sustainability of the road infrastructures of the DRC, specially to JICA. He then called for everyone (the professors and the men in the field) to unite their efforts and for LNTP's support for the sake of attaining the expected results.

Started at 10:16, the meeting ended at 12:47.

TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

The person who drew up the minutes

Théodore NGAMBILA,
Transportation Projects Manager,
on behalf of the CI Coordinator / Joint Coordination Committee Secretary,
who was not able to attend

République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule Infrastructures

MINUTES OF THE FOURTH JOINT COORDINATION COMMITTEE MEETING
PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, November 8, 2018
Duration	The meeting started at 10:02 and ended at 12:14.
Place	UVIRA Room of INPESS (ex IEMK)
Meeting called by	le Ministère des Infrastructures, Travaux Publics et Reconstruction
Secretariat	Cyrille KITAPINDU, CI person in charge of communication
Agenda	1. Opening words of the Advisor of His Excellency the Minister of ITPR in charge of roads 2. Words by the JICA Chief Representative 3. Evaluation of the objectives of the PRCMR Project 4. Remarks and discussion 5. Closing words
How the meeting proceeded	**0. Introduction** The sixth and last Joint Coordination Committee Meeting of the PRCMR Project was held in the UVIRAI Room of Institut National Pilote de l'Enseignement des Sciences de Santé (INPESS), ex IEMK, on Wednesday, November 15, 2017. **1. Opening address** The opening session was presided over by Mr. NGOIE, advisor in charge of roads of his Excellency the Minister of ITPR and Chairman of the Joint Coordination Committee, representing the Cabinet Director, who was not able to attend. He outlined the main activities already accomplished since the start of the Project and applauded the results attained, mainly: **1.** Establishment of a road data base after the inspections carried out jointly by OR and OVD in the course of 2018 **2.** Preparation of the asphalt paved road maintenance and repair manual by a team consisting of FONER, OR, OVD, ACGT, BTC and CI counterparts. He then reminded those in attendance of the fact that before this new technical cooperation JICA had already financed several large-scale projects, such as the INPP construction project, the project for construction of the Ngaliema new water treatment plant, the project for development of INPESS (ex IEMK) and the project for rehabilitation and modernization of Avenue des Poids-Lourds. He solemnly hailed the considerable work that has been done by the team of JICA experts and all of the government services directly or indirectly involved in realization of the PRCMR Project. After reiterating MITPR's thanks to all of the donors of the RDC for their

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	decisive support to the road sector and wishing full success to the work of the PRCMR Project and to the whole project team, he declared the sixth and last Joint Coordination Committee Meeting of the PRCMR Project open. **2. Words by the JICA Chief Representative** Speaking in turn, the JICA Chief Representative said that his organization has noted with satisfaction the commitment of the Congolese counterparts in implementation of the activities of the PRCMR Project. He expressed the wish to see the sustainability of the accomplishments of the Project. After thanking all of the players in the project, particularly CI for the active role in the implementation of the PRCMR, he ended his address by encouraging the Congolese side to make the project its own for the sake of ensuring good cooperation in the future. **3. Evaluation of the objectives of the PRCMR and future perspectives** Speaking in turn, the Project Manager recalled that three results were defined at the start of the project: 1) establishment of a maintenance cycle for asphalt roads at the sites of the Project within OR and OVD with clearly defined division of roles and responsibilities, 2) establishment of guidelines for maintenance of asphalt roads and, last but not least, 3) improvement of the technical capabilities and knowledge of OR and OVD technical personnel in charge of maintenance of asphalt roads, all three of which have been attained. Indeed, a data base has been established on the basis of the road inspections carried out in the course of 2018, the asphalt paved road maintenance and repair manual has been prepared and, finally, the technical capabilities of OR and OVD personnel regarding road maintenance have been improved. Recommendations were made by the Consultant for the sake of continuation of the activities of the PRCMR Project. He proposed in particular: 1. Creation of a Maintenance Monitoring Committee with the objective of supporting implementation of maintenance of asphalt paved roads This committee represents in itself a successor of the Joint Committee. Its organization must be fostered to maturity by the entities concerned. 2. Continuation of the inspection of the arterial roads of the city of Kinshasa and its surroundings, mainly those that were not inspected in 2018. This committee represents in itself a successor of the Joint Committee Meeting. Its organization must be fostered to maturity by the entities concerned. The Project Manager drew the participants' attention to the problem connected with maintenance of the machinery, which could constitute an obstacle to road maintenance. He also recommended sharing of knowledge between the different generations within the entities to make it possible for younger

personnel to raise their level.

4. Discussion

The essence of the exchanges of opinions between the participants is summarized as follows:

1. ***Comments by Mr. Jacques IPONGO, ITP Secretary General***

The ITP Secretary General talked about the structures that are to contribute to the sustainability of the accomplishments of the PRCMR Project. For that purpose he proposed integration of the following structures:

a) Direction des Etudes et d'Evaluation des Projets, which monitors and evaluates the policies and programs of the road sector
b) Centre de Formation des Agents Voyers, which furnishes OR and OVD with the engineers of the road machinery
c) Direction des Ponts et Chaussées

In answer to that the CDO of the CI promised to integrate those structures and that action in that direction will be planned.

2. Comments by Mrs. Nicole FISHER of the European Union:

For her part, the EU person concerned with infrastructures asked, after congratulating the players in the Project, if it was intended to extend the activities of the PRCMR to the whole country.

She then expressed concern about the poor state of the machinery of OR and OVD due to inadequate maintenance since it is not only roads that need maintenance but also the necessary equipment for road maintenance.

Regarding establishment of a road data base, she suggested that there be a common data base with the harmonized information of all of the structures of the MITPR. She proposed, for example, that the terms of reference for recruiting road consultancy firms be completed with requirements concerning the characteristics of the pavement and the engineering structures, which could be included to make it a common road data base.

The CDO embraced Mrs. Nicole's idea relating to establishment of a road data base.

However, the Director General of OR pointed out that the problem of maintenance of machinery was due to failure of budget mobilization in that regard by the Congolese government. He also explained that another problem faced by the structures is that of ensuring training of personnel.

He went on to say that whereas 800 personnel members would be going into retirement by 2019, there is a budget problem regarding replacing them since the new recruits would have to be trained in operating the machinery provided by the donors.

3. Comments by Mr. Jean Remy NGALA, President of CNPR:

The concern of the President of CNPR was addressed to JICA's RR. He wanted to know if JICA was planning training on road signs.

4. Comments by Mr. Patrick MBILA, BTC Engineer

His comments amounted to recommendation that BTC be included in the Maintenance Monitoring Committee and that maintenance of engineering structures be included in the next activities of the Project in view of the fact that the RDC has serious drainage problems.

5. Comments by Mr. Michel UYUMBU, President of Corporation Nationale des Ingénieurs BTP

Supported by the recommendation of the Consultant's team on quality control of maintenance work, he expressed the wish to see JICA help the RDC to establish a referential quality control manual.

6. Mr. Alioune DIOP, infrastructure expert at ENABEL:

He recommended definition of limitation of axle loads. This approach was also supported by Mr. Miche DNGANGA of ACGT, who in addition recommended that monitoring of maintenance be extended to engineering structures.

In response to that concern Mr. Pascal BULONGO of FONER stated that the process of weighing of vehicles was underway.

5. Closing Words

The meeting ended with closing words by the Minister of ITPR's roads advisor, who reiterated MITPR's thanks to the donors of the RDC for their support to development and sustainability of the road infrastructures of the RDC, especially JICA. He made an appeal to everyone for sustainability of the Project.

Started at 10:16, the meeting was closed at 12:47.

TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

The person who drew up the minutes

Théophile NTELA LUNGUMBA,
CI Coordinator /
Joint Coordination Committee
Secretary, who was not able to attend

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République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES ET TRAVAUX PUBLICS

Cellule *Infrastructures*

MINUTES OF THE 1ST MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Wednesday, September 7, 2016
Duration	Meeting started at 10:45 and ended at 16:00
Place	Meeting room of the Laboratoire National des Travaux Publics of Office des Routes
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Examination and approval of the table of contents and the draft of the manual; 2. Choosing of the arterial road sections that OVD and OR are responsible for to be used for the on-the-job training

How the meeting proceeded	The meeting concerned the two points included in the above agenda and began with words of welcome to the participants by the Head of the Road Section of the Cellule Infrastructures. That was followed by reminder of the Working Group's schedule for September, which is presented as follows: i) September 7, 2016: 1st meeting of the working group; ii) September 15, 2016: 2nd meeting of the working group; iii) September 23, 2016: joint meeting between the Working Group and the Technical Group. The main points of the meeting were addressed by the Deputy Project Manager, who proposed that detailed examination of and debate on the content of the chapters of the draft manual be undertaken in the following meetings of the Working Group, this first meeting being devoted to approval of the table of contents of the draft asphalt road maintenance and repair manual. Below are mentioned the main points discussed and the corrections made in the document: **1. Examination and approval of the table of the contents of the draft road maintenance manual** On the basis of the draft of the asphalt road maintenance manual provided the representatives of OR, OVR, BTC and FONER, the participants in the meeting applied themselves to examination of the table of contents proposed by the JICA expert's team. The table of contents thus proposed provides for nine (9) chapters, i.e.: *Chapter 1: Overview* *Chapter 2: Work implementation structure*

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	Chapter 3: Work planning and implementation *Chapter 4: Schedule of work implementation and road safety measures* *Chapter 5: Patrols* *Chapter 6: Maintenance and reparation plan n* *Chapter 7: Evaluation of the pavement* *Chapter 8: Maintenance methods* *Chapter 9: Reconditioning method* **1.1. The Title of the Manual** The first concern of the members of the Working Group was the title of the manual. In their opinion the fact of limiting the maintenance to just asphalt pavement as mentioned in the draft manual presupposes not making any mention of certain types of degradation that concern even the pavement structure, such as potholes, which are very frequent on the roads of the DRC. The members of the Working Group therefore proposed change of the title of the manual to the following: "**ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL**", and that was approved by the JICA expert's team. **1.2. The Foreword** The JICA expert's team informed the participants of the meeting that the part of the document that constitutes the foreword has been left to the discretion of the Working Group. A distribution of tasks was there made for the purpose of doing that work: Mr. MUTIA and Mr. WANET of Office des Routes were assigned to writing about the history of roads in the DRC, Mr. Fils ZENGA and Mr. Willy MONDA of BTC to writing about the context and Mr. Jimmy NKULA and Mr. Zico NSIALA to writing about the manual that OR and OVD have in common. **Concerning Chapter 1, on the overview** In connection with the title of the chapter 1, which the Working Group considered to be "General on Roads," the JICA expert's team informed the participants in the meeting that it follows the chronological order of the stages of implementation of maintenance, i.e. inspection, input in the data base, formulation of the budget and implementation of the work. The members of the Working Group approved the points included in chapter 1. **Concerning Chapter 2, on the Work implementation structure** The JICA experts promised to insert a new chapter on "quality control" by the end of November 2016. Another chapter that is to concern the data base and that is being prepared by the JICA expert's team will also be inserted in the draft before the Project Second Joint Coordination Committee Meeting.

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	The meeting approved the different points included in Chapter 2, the following corrections, however, being made: 1. In point 2.5 the word “Equipment” was replaced by “Machines”; 2. In point 2.5.2 the word “work” was replaced by “equipment” **Concerning Chapter 3, on Work planning and implementation** It was agreed that Chapter 3 should be enriched and proposed by the Japanese side even though the Japanese system is different from that applied in the République Démocratique du Congo. **Concerning Chapter 4, on the schedule for implementation of the work and road safety measures** The following proposals were made concerning Chapter 4: - considering its content, point 2.5.2 of Chapter 2 should be transferred to Chapter 4, - Chapters 3 and 4 should be merged into a single chapter, - the title of Chapter 4 should be changed to “Road Safety Measures”, the first part of the title, i.e. the schedule for implementation of the work, being transferred to Chapter 3, on planning and implementation of the work, and - the Congolese side should ask for the support of the Commission Nationale de la Prévention Routière (CNPR) in preparation of Chapter 4. **Concerning Chapter 5, on patrols** Concerning Chapter 5 it was proposed that the title be changed to “Daytime and Nighttime Visual Auscultation”, this proposal by the Working Group being considered necessary in order to avoid any confusion that the term “patrols” might lead to considering the fact that it is more generally used in the field of national security than in the field of roads. **Concerning Chapter 6, on the Maintenance and reparation plan** The meeting approved the different points included in Chapter 6, the following corrections, however, having been made: 1. In point 2.5.2 the word “work” was replaced by “equipment”. 2. In points 6.2, 6.2.1, 6.2.2 and 6.2.3 the word “surveys” was replaced by “inspection”. 3. In point 6.3 the word “deteriorations” was replaced by “degradation”. 4. Addition of illustrations 5. Page numbering of the document In response to the request by the participants that Chapters 6 and 7 be merged, the JICA experts’ team promised to reexamine that and to propose new chapters. **2. Choosing of the arterial road sections that OVD and OR are**

	responsible for that are to be used for the on-the-job training Concerning on-the-job training the JICA experts’ team informed the participants in the meeting of the road sections that are to serve as sites of the training. **i) Concerning roads that OR is responsible for** The choice went to the section of RN 1 between N'djili and N'sele Bridge. However, in view of the fact that work is in progress on the first part of that section it was requested that the choice concern the section of RN 1 between the airport and N'sele Bridge. Furthermore, the representative of FONER was asked to check whether that section is included in FONER’s maintenance program for 2016. **ii) Concerning roads that OVD is responsible for** The choice went to Avenue Poids-Lourds, which is undergoing maintenance work by a Congolese SME. However, after confirmation by FONER of the fact that Boulevard Sendwe is included in the budget for 2016 the meeting finally decided to choose both Avenue Poids-Lourds and Boulevard Sendwe. Started at 10:45, the meeting was ended at 16:00.

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES ET TRAVAUX PUBLICS

Cellule Infrastructures

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MINUTES OF THE 2ND MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, September 15, 2016
Duration	Meeting started at 10:38 and ended at 16:00
Place	Meeting room of the Office des Routes's Laboratoire National des Travaux Publics
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of September 7, 2016 2. Presentation of the new Japanese expert in charge of repair of road pavement 3. Verification of the table of contents of the draft manual 4. Discussion on the contents of Chapter 1 "Overview" 5. Selection of the members of the Technical Group 6. Selection of the members of the 2nd Working Group 7. Presentation of the work schedule for October

How the meeting proceeded

The second meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual dealt with the following 7 points included in agenda.

1. Approval of the minutes of the first meeting of the Working Group

After reading of the minutes of the 1st meeting of the Working Group, the meeting approved its content while asking the person who drew it up to make some corrections regarding form of the document..

2. Presentation of the new Japanese expert

The head of the Road Section of the Cellule Infrastructures next introduced Mr. KIYOSHI MUKAI, the Japanese expert in charge of road pavement repair who arrived in Kinshasa on Monday, September 12, 2016, to the members of the Working Group. He will be in charge of the on-the-job training.

3. Verification of the table of contents of the draft manual

After verification of the table of contents the following changes were made:

- Concerning Chapter 4:
  1. Readjustment of the sub-points of the chapter not shown in the table of contents
  2. Change of the title of the chapter to "Road Safety Measures" and transfer of the content of the sub-point on the schedule of implementation of the work to Chapter 3
- Concerning Chapter 9:
  1. Change of the title of sub-point 9.2.2 to "Traffic Studies" in place of "Traffic Counts"

Moreover, the Japanese side promised to prepare a document that clearly explains the service index mentioned in point 1.3.1 and the meaning to be given to point 1.4, which seeks to establish a parallel between the attitude to be shown by a doctor to a patient in diagnosis and that to be shown by the engineer at the time of inspection of road deterioration. That document will be provided to the members of the Working Group at the beginning of the week.

4. Discussion of the content of Chapter 1, "Overview"

The discussion centered on the foreword prepared by the members of the Working Group and proposed for approval to the meeting.
After careful reading the foreword was approved by the participants after some corrections of the form to be given the original text. The corrected version will be submitted to the next meeting of the Working Group.

It was agreed that the content of Chapter 1 also be examined at the next meeting of the Working Group.

5. Selection of the members of the Technical Group

Regarding the Japanese experts interest in forming the Technical Group the members of the Working Group asked that that task be carried out later. Considering that it has been decided that the Technical Group consist of staff members of universities and other institutes of higher education in the DRC and representatives of the donors, it is considered premature to convene the Technical Group to approve the work already done by the Working Group while that work is considered to still be in the embryonic stage. It was thus proposed that that meeting be held later, when at least three (3) of the chapters of the draft manual have been completed.
In the meantime the composition of the Technical Group is to limited to the focal point personnel of the different structures of MITP.

6. Selection of the members of the 2nd Working Group

On the subject of the members of the 2nd Working Group, which will be in charge of road inspection, road repair and the data base, it was agreed that the General Director of OR be requested to send a list of the candidates for membership in that group.
It was pointed out that the OVD and BTC candidates have already been interviewed by the Japanese experts. What remains is only completion of those lists with one or two engineers to be assigned to the data base.

7. Presentation of the work program for October

	The work program of the Working Group for October was presented as follows: 1. Thursday, October 6, 2016: 10:00 to 16:00 2. Thursday, October 13, 2016: 10:00 to 16:00 3. Thursday, October 20, 2016: 10:00 to 16:00 The meeting between the Working Group and the Technical Group will be held on Thursday, October 28, 10:00-16:00. All of the meetings will be held in the meeting room of the Office des Routes's Laboratoire National des Travaux Publics. Started at 10:38, the meeting closed at 16:00.

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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MINUTES OF THE 3RD MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, October 6, 2016
Duration	Meeting started at 10:35 and ended at 14:15
Place	Meeting room of the Cellule Infrastructures
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of September 15, 2017 2. Presentation of the additions made by the Japanese side to Chapter 9 3. Approval of the content of the foreword 4. Discussion on the content of Chapter 1, "Overview" 5. Distribution of the tasks of the members of the Working Group concerning examination of Chapter 2 6. Review of the schedule for selection of the members of the 2nd Working Group 7. Reminder of the work schedule for October

How the meeting proceeded	The third meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual concerned the 7 points included in the above agenda. **1. Approval of the minutes of the second meeting of the Working Group** After reading of the minutes of the 2nd meeting of the Working Group the meeting approved its content although asking for some misprints in the document to be corrected. **2. Presentation of the additions made by the Japanese side** Some elements of the Chapter 9 concerning quality control were presented to the members of the Working Group. Discussion of this chapter will take place at the time of examination of Chapter 9. **3. Approval of the content of the foreword** In that meeting the different reservations made concerning the foreword were reminded, particularly concerning certain references at the bottom of the page, the area of the DRC down to the last unit, etc. The area of the DRC was corrected down to the last unit, i.e. from 2,345,000 km2 to 2,345,410 km2. As regards the references, they are being checked.

	The foreword was thus approved, subject to confirmation of the above-mentioned references. **4. Discussion of the content of Chapter 1, "Overview"** Concerning the content of Chapter 1, which gives an overview of asphalt paved road maintenance and repair, a reservation was made concerning the title of point 1.1, "Importance of and need for road maintenance and repair". A syntactical check must be made regarding the accepted meaning of the redundancy of the conjunction "and". Examination of the text of the second paragraph, considered defective and incomprehensible, was left to later in view of shortage of time. The rest of the discussion concerned correction of certain misprints noted in this chapter, including: - in paragraph 4 of point 1.1: the term "deterioration", which was replaced by "decrease" and - in point 1.1.i) concerning the definition of maintenance the term "refection", which was replaced by "repairs". **5. Distribution of the tasks of the members of the Working Group regarding examination of Chapter 2** Regarding distribution of tasks among the members of the Working Group for examination of Chapter 2, to be treated in the next meeting, it was proposed that it be sent in advance by email to all of the members of the group for opinions and comments to speed up progress of the work. That could be done, preferably, each Friday to make it possible to compile the changes to be made in the document by Tuesday at the latest. That would make it possible for the version to be discussed at the next meeting to be sent to the members of the group Tuesday evening. Engineer Chocquet was immediately requested to send the members of the Working Group the files of chapters 1 and 2 as soon as possible for examination. **6. Reminder of the schedule for selection of the members of the 2nd Working Group** As announced at the last meeting of the working group, a letter was sent by the Cellule Infrastructures to OVD and Office des Routes for designation of the candidate engineers for the second working group, in charge of inspection, the data base and asphalt repairs, BTC engineers being excluded since they had already been selected for inspection and repairing of roads. It was also reminded that only OVD and Office des Routes engineers will be included in the team in charge of constitution of the data base. Barring unforeseen circumstances, the makeup of that 2nd Working Group will be known before the end of October 2016. **7. Reminder of the work schedule for October** The schedule of the working group presented at the last meeting on

	September 15, 2016, was retained unchanged, that schedule being as follows: 1. Thursday, October 6, 2016, 10:00-16:00: 3rd meeting of the Working Group 2. Thursday, October 13, 2016, 10:00-16:00: 4th meeting of the Working Group 3. Thursday, October 20, 2016, 10:00-16:00: 5th meeting of the Working Group 4. Thursday, October 27, 2016, 10:00-16:00: meeting between the Working Group and the Technical Group It was proposed that the next meeting of the Working Group take place at FONER. Started at 10:35, the meeting ended at 14:15.

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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MINUTES OF THE 4TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, October 13, 2016
Duration	The meeting started at 10:30 and ended at 15:40.
Place	Meeting room of FONER
Meeting called by	Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of October 06, 2016 2. Examination of the content of Chapter 2, "Work Implementation Structure" 3. Continuation of examination of Chapter 1, "Overview" 4. Information on the schedule for interviewing the members of the 2nd Working Group 5. Reminder of the work schedule for October

How the meeting proceeded	The fourth meeting of the working group in charge of preparation of the asphalt paved road maintenance and repair manual concerned the 5 points included in the above agenda. The meeting began with word of welcome by the head of the Roads Section of the Cellule Infrastructures, and Project Manager of the Projet pour le Renforcement de Capacités en Maintenance des Routes, to the two Japanese experts in charge of, respectively, road inspection and the data base, who have been in Kinshasa since October 09, 2016, in connection with the PRCMR Project, i.e. Mr. Hiroaki Takahashi and Mr. Kohei Sakai. After a briefing on the last meeting, in which he, the head of the Roads Section, had pointed out to those present that the Japanese experts' team made available the Working Group for examination of the elements of Chapter 9 on quality control, the meeting focused its attention on the points included in the agenda. **1. Approval of the minutes of the third meeting of the Working Group** After reading of the minutes of the 3rd meeting of the Working Group those present approved its content subject to certain changes, including enumeration of the corrected misprints mentioned in the minutes of the second meeting of the Working Group. **2. Examination of the content of Chapter 2, "Work Implement Structure"**

	After examination of the content of each point of Chapter 2 the members of the Working Group made changes in the original text proposed by the JICA experts' team However, Mr. MATANDA of OVD was asked to propose elements regarding point 2.5.1 concerning the type and allocation of the equipment, which would make it possible to temporarily close examination of Chapter 2. **3. Continuation of examination of Chapter 1, "Overview"** The members of the Working Group next reviewed the points of Chapter 1 that were not treated in the last meeting. On that subject it was noted: - that the title of 1.1 was left as follows: "Importance and Necessity of Road Maintenance and Repairs", - that in point 1.3.1 the concepts service index and indicators making it possible for road administrators to analyze and evaluate the condition of the pavement should be enriched. The task of further developing those notions for proposal of a text to the Working Group being given to Mr. MUTIA of Office des Routes, - that in point 1.3.2 a check would have to be made regarding the meaning to be given the term "robustness", - that in 1.3.4 the title was changed to "Data Base / Updating of Data" from "Collection and Updating of Data", - and that point 1.4 concerning preparation of personnel involved in road maintenance and repair was assigned to Mr. MATANDA of OVD and Mr. WANET of Office des Routes for proposal to the Working Group of a text to be put in the manual. **4. Information on the schedule for interviewing members of the 2nd Working Group** The schedule for interviewing the members of the working group in charge of inspection, data base and road repairs was presented by the Japanese experts. Barring unexpected circumstances, there is to be an interview of the OVD engineers this Friday, October 14, 2016, at OVD. Awaiting the sending of the list of Office des Routes engineers to be assigned to that group, the schedule for interviewing those engineers will be announced later. It was reminded to those present that only the candidate proposed for inspection and the data base will be interviewed then, those to be assigned to repairs having already been selected by Mr. SHISHIDO, the Japanese expert in charge of repair of road pavement. **5. Reminder of the work schedule for October** No changes had been made in the Working Group's schedule. However, it was pointed out that the next meeting would take place at the Agence Congolaise des Grands Travaux (ACGT). The meeting began at 10:30 and ended at 15:40.

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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MINUTES OF THE 5TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, October 20, 2016
Duration	The meeting started at 10:15 and ended at 15:50
Place	Meeting room of ACGT
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of October 13, 2016 2. Examination of the additional information included in chapters 1 and 2 by the members of the working group 3. Examination of the content of Chapter 3, "Work Planning and Implementation" 4. Presentation of the chapter on the data base 5. Program for practice on the data base 6. Information concerning the next Joint Coordination Committee Meeting 7. Reminder of the work schedule for October

How the meeting proceeded	To start with, the Head of the Roads Section welcomed all of the members and excused himself for the slight delay in opening the meeting, due to presentation of courtesies by the JICA Japanese team to the General Director of ACGT. He then reminded the participants of the visit scheduled for around noon to see the equipment newly procured by ACGT and based on the grounds of the ACGT facilities on Boulevard Triomphal. He also informed them that following the presentation and testing of the equipment for the data base by the Japanese team the next meeting of the Working Group, which was initially scheduled to be held at OVD, will take place at Office des Routes' Laboratoire National des Travaux Publics. The rest of the meeting concerned the matters included in the agenda. **1. Approval of the minutes of the third meeting of the Working Group** Subject to some corrections of form to be made by the person who prepared them, the minutes of the 4th meeting of the Working Group was approved by those present.

	2. Examination of the additional information included in chapters 1 and 2 by the members of the Working Group The Working Group reviewed in turn the information added to chapters 1 and 2 by Mr. MUTIA, Mr. MATANDA and Mr. WANET respectively. On the subject of the addition made by Mr. MUTIA concerning point 1.3.1. i) of Chapter 1 on the service index and the indicators that make it possible for road maintenance administrators to analyze and evaluate the condition of the road pavement from a technical point of view the Working Group expressed appreciation for the elements of information on the index of the quality of the paved roads in the DRC, but asked that that information be further enriched and presented again at the next meeting. Technical support was requested of the Japanese team in that regard for finding the numerical values of those indices that are presently being applied. As for the additions made by Mr. MATANDA, it consisted in enrichment of point 1.4 concerning preparation of the personnel involved in road maintenance and repair. Having analyzed the information set forth on that subject, including the organizational structure of a typical brigade, the Working Group considered that it was basically correct and therefore unquestionable. Nevertheless, Mr. MATANDA was asked to propose, for the purposes of the document being prepared, a typical organizational chart for a small unit to be in charge of road maintenance, that new approach being expected at the next meeting. Concerning the additions made by Mr. WANE to point 2.5.1 of Chapter 2 concerning the type and allocation of the equipment the Working Group requested, after examining the list of the proposed equipment, that the equipment be included for minor maintenance work. It also proposed that the crusher and the mixing plant be removed from the list in view of the fact that the work can just as well be made by the production of the mini mixing plant. **3. Examination of Chapter 3, "Work Planning and implementation"** After examination of the content of Chapter 3 in the version proposed by the team of Japanese experts the following changes and additions were made: - The initial sentence of the first paragraph of point 3.2.2 was completed as follows: "…taking into account adequate distribution, good timing according to the type of work and the funds available." - In the second paragraph of point 3.2.2 the term "concrete precautions" was replaced by "methodology". - In the second sub-point describing the methodology of establishment of the annual plan the word "correctly" was replaced by "in an efficient and rational manner". - In the third sub-point describing the methodology of establishing the annual plan the words "climatic characteristics" were replaced by "climatic conditions".

	- A sixth sub-point describing the methodology of establishing the annual plan was added. It is described as follows: “ensuring monitoring and evaluation of the planned work.” - In point 3.3 (2) concerning survey of underground structures the term “survey” was replaced by “Inspection”. Likewise, the words “occupants” and “auscultations” were respectively replaced by “roadside residents” and “inspections”. In accordance with the chronology of what takes place it was suggested that this point be preceded by point 3.3. (3) concerning communication with road users and roadside residents. - In point 3.3. (3) concerning communication with road users and roadside residents the words “communication with road users and roadside residents” were replaced by “awareness raising of road users and roadside residents”. - Regarding point 3.3. (4), over which there was a debate concerning whether to use the word “social” or the word “societal,” it was proposed that the expertise of an environmental expert be consulted. - Regarding point 3.2.2 (2) concerning noise nuisance and vibration in choice of the type of equipment involved in the work Mr. SANGANA was assigned the task of enrichment it. - Point 3.3 (8) on worksite organization was assigned to Mr. Pascal BULONGO for enrichment. **4. Presentation of the chapter on the data base** That presentation will take place next Thursday at the time of testing of the equipment for road inspection and the data base. Awaiting that, a document serving as a manual of the equipment for road inspection and the data base was handed out to the members of the Working Group. **5. Schedule for practice using the data base** Practice using the data base is scheduled for Thursday, October 27, 2016, at the next meeting of the Working Group, which is to be held this time on the grounds of the Office des Routes’ National Laboratory. **6. Information on the next JCC, to be held on November 8, 2016** For the second meeting of Joint Coordination Committee (JCC) of the Projet pour le renforcement de capacités en maintenance des routes (PRCMR), the PRCMR Project Manager proposed the date November 8, 2016. However, in view of the progress of the Working Group in its work so far the Head of the Roads Section of the Cellule Infrastructures expressed the opinion that it was reasonable for that date to be postponed a little in order to make it possible for it to complete that work for presentation at that major event of the Project. The final date for the next JCC will be announced later. **7. Reminder of the work schedule for October** The initial program for the next meeting of the Working Group called for a working meeting between the Working Group and the Technical Group.

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	Considering the work that has been done so far, it was proposed that this meeting be put off till a later date. The next meeting will therefore concern the work of the Working Group and will take place in the meeting room of the Office des Routes’ Laboratoire National des Travaux Publics. Started at 10:15, the meeting was closed at 15:50.

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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MINUTES OF THE 6TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, October 27, 2016
Duration	The meeting started at 10:30 and ended at 16:10.
Place	Meeting room of the company KITANO's camp at the OR's equipment center
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of October 20, 2016 2. Reexamination of the information added to chapters 1, 2 and 3 by the members of the Working Group 3. Examination of the content of Chapter 4, "Road Safety Measures" 4. Presentation on inspection and the data base 5. Testing of the inspection and data base equipment 6. Information on the next Joint Coordination Committee Meeting, to be held on November 8, 2016 7. Work schedule for November 2016

How the meeting proceeded	The head of the Roads Section of the Cellule Infrastructures started the meeting by welcoming all of the participants. He then proposed the agenda of the sixth meeting of the Working Group, and the participants agreed to adopt it. The rest of the meeting concerned the points set forth in the agenda. **1. Approval of the minutes of the fifth meeting of the Working Group** The meeting approved the minutes of the 5th meeting of the Working Group subject to some corrections in form to be made by the rapporteur. **2. Reexamination of the information added by the members of the Working Group to chapters 1, 2 and 3** The members of the Working Group reexamined the points of chapters 1, 2 and 3 to which some corrections in content and form were to be made, which they also did regarding the information that was to be added by certain members of the Working Group. The changes and additions to Chapter are as follows: - In point 1.2 concerning establishment of a road operation and maintenance cycle a clarification was added at the bottom of the page concerning the meaning to be ascribed to the Deming wheel.

	- Regarding point 1.3.2.i) concerning the service index the additions made by Mr. MUTIA were reviewed by the members of the Working Group. However, since the target values for helping to decide the type of work to be done did not correspond to the present project, Mr. Fils ZENGA and Mr. Chocquet N'DOBE were asked to add a remark that would define the range of considerations of those values and to formulate definition of real values that would correspond to the PRCMR Project. - In point 1.3.1.ii) concerning the indicators for making it possible for road maintenance administrators to analyze and evaluate the condition of the pavement from a technical point of view the additions made by Mr. SHIMIZU constitute a method of visual evaluation of the degree of cracking and rutting. As in the case of the additions made to point 1.3.1.i), the members of the Working Group had difficulty in essentially understanding those numerical values. Mr. SHIMIZU was therefore asked to add references to that document if possible. - The additions made by Mr. MATANDA and Mr. WANET to point 1.4 concerning preparation of personnel involved in road maintenance and repair were transferred to point 5 of Chapter 2 on the type and allocation of the equipment. In the meantime the Japanese experts team made it clear to the participants that in their understanding of the matter the counterparts should make mention in this point at awareness-raising to be made to the personnel assigned to such work for their conscientiousness in accomplishing their respective tasks. Regarding Chapter 2 the members of the Working Group examined the additional information provided by Mr. MATANDA and Mr. WANET on assignment of field personnel and equipment. It was requested that the information be compiled into a single text to constitute point 5.1 of Chapter 2 on work structure and implementation. **3. Examination of Chapter 4, "Road Safety Measures"** Considering the time left in the meeting, discussion of that point was put off to the next meeting of the Working Group. **4. Briefing on inspection and the data base** The Japanese expert in charge of the data base talked about the data base and the equipment for it. His remarks centered mainly on the following three (3) points: - a review of present road maintenance work - an outline of constitution of a data base for road maintenance - the equipment for data collection **5. Testing of the equipment for inspection and for the data base** The members of the Working Group were able to participation in practical sessions on use of the road inspection and data base equipment which were done by Mr. Kohei SAKAI, the Japanese data base expert. For that purpose they were divided into three subgroups of three persons each for taking turns in the practice on the grounds of the KITANO base camp located at the Office des routes' equipment center.

	The inspection and data base equipment consisted essentially of a camera and a GPS mounted on a vehicle. That equipment made it possible for the user to input data on the state of deterioration of the road using a laptop by reading of the images produced from data collected over a distance of 5 m. **6. Information on the next JCC, to be held on November 8, 2016** The date of that event, which was not set at the last meeting of the Working Group, was confirmed in this meeting as being scheduled to take place on Tuesday, November 8, 2016, in the OKAPI Room of the l'Institut National Pilote d'Enseignement de Sciences de Santé (formerly IEMK). **7. Work schedule for November 2016** The schedule of the Working Group for November 2016 is as follows: - Thursday, November 3, 2016, 10:00-16:00: 7th meeting of the Working Group, in the OVD meeting room - Thursday, November 10, 2016, 10:00-16:00: 8th meeting of the Working Group, in the BTC meeting room - Thursday, November 17, 2016, 10:00-16:00: 9th meeting of the Working Group, in the meeting room of the Office des Routes' Laboratoire National des Travaux Publics. - Thursday, November 24, 2016: 10th meeting of the Work Group, at a place yet to be determined. Started at 10:30, the meeting was closed at 16:10.

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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MINUTES OF THE 7TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, November 3, 2016
Duration	The meeting started at 10:32 and ended at 16:05.
Place	Meeting room of OVD
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of October 27, 2016 2. Introduction of Mrs. TAGUCHI, Japanese expert 3. Examination of Chapter 4, "Road Safety Measures" 4. Preparation of presentation of the draft manual already made by a member of the Working Group 5. Preparation of presentation of the inspection and data base equipment by a member of the next Joint Coordination Committee Meeting 6. Information on the information meeting on the 2nd Working Group to be held on November 9, 2016 7. Reminder of the work schedule for November 2016

How the meeting proceeded	The seventh meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual concerned the seven (7) points included in the above agenda. The chairman of the meeting started it by welcoming all of the participants. Before the meeting the JICA Japanese experts team, accompanied by the chairman of the meeting and the representatives of OVD, had presented their courtesies to the General Director a.i. of OVD. To mark the occasion souvenir photos of the members of the Working Group were taken with the General Director a.i of OVD. **1. Approval of the minutes of the sixth meeting of the Working Group** The meeting approved the minutes of the 6th meeting of the Working Group subject to some corrections in form to be made by the rapporteur. **2. Introduction of Mr. TAGUCHI, JICA expert** The Head of the Roads Section introduced Mrs. TAGUCHI, a JICA expert in charge of monitoring and evaluation who has been in Kinshasa since October 26, 2016, to the members of the Working Group. In her remarks she praised the work already done by the members of the group and encouraged them to keep up the good work in the interests of smooth progress of the Project.

3. Examination of Chapter 4, "Road Safety Measures"

In examination Chapter 4 the members of the Working Group were able to make the following additions and changes:

- In the first paragraph of point 4.1, concerning general information, the words "…measures regarding traffic" were changed to "measures regarding management of general traffic."
- In the second paragraph of point 4.1, concerning general information, the words "…done on roads open to general traffic" were replaced by "…done on roads open to traffic."
- Addition of a new sub-point 4.2, on definition of some concepts such as "danger", "risk", "incident" and "accident"
- Addition of a new sub-point 4.3, on measures for prevention of accidents during the work, i.e. measures to be taken for the safety of the personnel, the equipment and the work area
- In the first paragraph of point 4.6.1 concerning general considerations the sentence "the work hours are to be set on the basis of traffic data collected in the period of lowest level of traffic" was reformulated to "the work hours are to be set on the basis of traffic data collected when traffic is at its lowest level."
- In the second paragraph of point 4.6.1 concerning general considerations the sentence "noise nuisance and disturbance by vibrations must be treated so as not to pollute the environment of roadside residents" was reformulated as "noise nuisance and disturbance by vibrations must be treated so as not to disturb the environment of roadside residents."
- In the third paragraph of point 4.6.1 concerning general considerations the sentence "in cases in which it would be difficult to ensure a healthy environment during the work, the work methods must be reexamined, and, if possible, consideration could be given to changing the work hours and giving preference to use of machinery that produces less noise and vibrations" was reformulated to "in cases in which it would be difficult to ensure a healthy environment during the work, consideration can be given to changing the work hours and giving preference to use of machinery that produces less noise and vibrations, such machinery being mentioned in Chapter 3."

Finally, the participants asked that the figures and the legend given in that Chapter be redone since they were illegible.

4. Preparation of presentation of the draft manual already made by a member of the Working Group

The participants were informed of the agenda of the Joint Coordination Committee to be held on November 8, 2016, which includes presentation by one of the members of the Working Group of the draft manual as drawn up to date.

Mr. BALAYI was chosen as the person to present the work done by the Group.

5. Preparation of presentation of the inspection and data base equipment

The participants in the meeting proposed that that task be given Mr.

	MATANDA. **6. Information on the first contact meeting on the 2nd Working Group to be held on November 9, 2016** The JICA team took this occasion to announce immediately that the information meeting on the Second Working Group, in charge of inspection, data base and asphalt road repair, will be held on Wednesday, November 9, 2016, at the Cellule Infrastructures. In that connection the members of the Working Group were requested to get the word out on that in their respective structures awaiting sending of the letters in question by the Cellule Infrastructures. **7. Reminder of the work schedule for November 2016** No change has been made in the Working Group's schedule for November 2016, which is as follows: - Thursday, November 3, 2016, 10:00-16:00: 7th meeting of the Working Group, in the OVD meeting room - Thursday, November 10, 2016, 10:00-16:00: 8th meeting of the Working Group, in the BTC meeting room - Thursday, November 17, 2016, 10:00-16:00: 9th meeting of the Working Group, in the meeting room of the OR's Public Works National Laboratory - Thursday, November 24, 2016: 10th meeting of the Working Group, at the FONER meeting room. Started at 10:30, the meeting was closed at 16:10.

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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MINUTES OF THE 8TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, November 10, 2016
Duration	The meeting started at 10:31 and ended at 15:31.
Place	Meeting room of BTC
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of November 3, 2016 2. Report on the information meeting on the second Working Group 3. Examination of Chapter 5 on nocturnal visual patrol 4. Reminder of the work schedule for November 2016

How the meeting proceeded	The eighth meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual was held, as scheduled, on November 10, 2016, at the meeting room of BTC. It concerned the four (4) points included in the above agenda. The meeting was chaired by Mr. MATANDA in the absence of Mr. MUTAMBA, who usually chairs the meetings but was not able to attend this time. After words of welcome and presentation of the agenda of the meeting by the chairman the floor was given to the new Technical Director of BTC and member of the working group in the person of Mr. Patou MWA ILANGA, who welcomed the participants and assured them that everything had been arranged by BTC for the success of today's work. Later the members of the Working Group received a visit by the new General Director a.i. of BTC. Aside from the agenda the chairman gave some information on personnel movements on the part of the JICA Japanese experts, i.e.: - arrival of Mr. SHISHIDO, specialist in asphalt pavement - departure of Mrs. TAGUCHI, expert in monitoring and evaluation, Mr. SHIMIZU (Project Manager), Mr. YAMAGISHI (in charge of communication) and Mr. TAKAHASHI (expert in asphalt repair) - arrival soon of Mr. SAITO, Deputy Project Manager **1. Approval of the minutes of the seventh meeting of the Working Group** Subject to some corrections in form to be made by the person who drew them up and the addition of a sub-point to Chapter 4 on environment which

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	would change the title of the chapter to "Road Safety and Environmental Measures", the minutes of the 7th meeting of the Working Group were approved by the participants. **2. Report on the information meeting on the second Working Group** The chairman went over the essential details concerning the information meeting on the second Working Group which was held on November 9, 2016, at the Cellule Infrastructures. Summing up, he said that a survey would soon be launched by the JICA expert's team to get a better ideal of the level of the Congolese technical personnel, which would also help them to know more about the work conditions of the Congolese counterparts assigned to the second Working Group. He also reminded that in order for the second Working Group, so to say, to quickly soak up the manual being prepared by the first Working Group a joint meeting between the two groups has been arranged for Wednesday, November 16, 2016, in the meeting room of the Office des Routes' National Laboratory, at which the members of the first Working Group will present the work already accomplished (wrap-up) by them to the members of the second Working Group. **3. Examination of Chapter 5, "Road Safety Measures"** Examination of Chapter 5 resulted in making of the following additions and changes by the members of the Working Group: - In point 5.1.1 the objectives of visual auscultations were redefined as follows: General objective: maintenance of the service level of the pavement as well as possible Specific objectives: i) determination of the condition of the pavement ii) collection of the whole information on the condition of the pavement (historical information on the pavement, types and causes of deterioration, etc.) iii) updating of the road data base iv) planning of maintenance and repair work - The words "ordinary" and "regular" were replaced by "daily" and "periodic", respectively. - In the first paragraph of point 5.1.3 concerning training of auscultations personnel the words "the fact of inspection plays ..." were reformulated to "…auscultation plays a role …", and the term "patrol" was replaced by "inspection." - In the second paragraph of point 5.1.3 concerning training of auscultation personnel the word "enemy" was replaced by the word "weakness". - In point 5.2.1 the following corrections were made: "pavement" in place of "roads", "detachment of stones" instead of falling of rocks" and "road signs" instead of "ground-level marking." - In point 5.2.2 the term "inspections" was replaced by "auscultations" - In point 5.2.3 concerning planning and implementation of auscultations, the following words were changed: "the auscultations

	team" instead of "the auscultations teams", "inspect" instead of "patrol" and "inspection" instead of "patrol". - The following equipment was added for summary auscultation: booklet, pen and/or mechanical pencil, road map, traffic cones, cyclometer, photo apparatuses, distance meter and linear diagram. - In point 5.3.1 concerning points to be inspected the words "night patrol" were replaced by "night auscultations", and "the state of marking of the pavement" was removed and replaced by "the state of roads signs (horizontal and vertical)". - In the third paragraph of point 5.5.2 concerning points to be inspected in extraordinary auscultation the terms "scale", "landslides and slope slides" and "seismic depth" were replaced by "magnitude", "landslides and embankment slides" and "size of the earthquake", respectively. - In point 5.5.3 concerning implementation "log or card" was added to the fourth bullet. **4. Reminder of the work schedule for November 2016** No change was made to the Working Group's schedule for November 2016, which is as follows: - Thursday, November 3, 2016, 10:00-16:00: 7th meeting of the Working Group, in the OVD meeting room - Thursday, November 10, 2016, 10:00-16:00: 8th meeting of the Working Group, in the BTC meeting room - Thursday, November 17, 2016, 10:00-16:00: 9th meeting of the Working Group, in the meeting room of the OR's Public Works National Laboratory - Thursday, November 24, 2016: 10th meeting of the Working Group, at the FONER meeting room. Started at 10:31, the meeting ended at 16:31.

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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MINISTERE DES INFRASTRUCTURES ET TRAVAUX PUBLICS

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MINUTES OF THE 9TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, November 17, 2016
Duration	The meeting started at 10:27 and ended at 16:32.
Place	Training room of the OR's Direction de Formation (LNTP)
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of November 10, 2016 2. Examination of the content of Chapter 6, "Maintenance and reparation plan" 3. Reminder of the work schedule for November 2016

How the meeting proceeded	The ninth meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual was held as scheduled on November 17, 2016, in the meeting room of the Office des Routes' training Directorate, located on the grounds of the Laboratoire National des Travaux Publics. It concerned the three (3) points included in the above agenda. Some members of the Working Group, including Mr. MATANDA and Mr. MONDA, were unable to attend. After the chairman of the meeting welcomed all of the participants, the meeting went on to deal with each point included in the agenda. **1. Approval of the minutes of the 8th meeting of the Working Group** The minutes of the 8th meeting of the Working Group were approved by those present after the following amendments were made to Chapter 5: - The title of that chapter was changed to "Diurnal and nocturnal auscultation". - The third hyphen of the point 5.2.1 was reformulated to "state of the drainage system: malfunctioning and breakage of structural elements of the drainage works". - In point 5.4.1, the paragraph 3 was changed as follows: "the main points to be inspected are the degree of damage to and ageing of the pavement of roads and the structures of the road works (bridges, tunnels, culverts, etc.). They are to be distributed between daytime inspections and periodic inspections as described in each respective subchapter." **2. Examination of Chapter 6, "Maintenance and Reparation Plan"** Examination of Chapter 6 was not completely accomplished by the member of the Group. Only points 1 and 2 of Chapter 6 were dealt with. The other points

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	will be examined at the next meeting of the Working Group. The changes made are summarized as follows: - In point 6.1 on general information the sentence "the present chapter indicates the procedures for analysis and survey of the state of damage by experts as regards damage to the pavement observed at the time of patrols and inspections as well as choice of adequate maintenance and repair methods according to the degree of the deterioration and the causes" was amended as follows: "the present chapter indicates: o the procedures for analysis and survey of deterioration of pavement observed at the time of daily and periodic auscultations and o choice of the method of maintenance and repair best suited to the cause and/or the state of the observed deterioration." - In point 6.2 the term "surveys" was replaced by "diagnosis". - Point 6.2.1 was changed to the following: "Examination of the surface of the pavement concerns essentially visual observation and detailed auscultations of the pavement for the purpose of identifying deteriorations as described in Table 6.1 of point 6.3". - Point 6.2.2 was reformulated as follows: "What is meant is examination of the internal state of constituent courses of the carriageways (pavement, base course and subbase course). It serves the purpose of evaluating deflections and the state of the structures of the pavement by means of Benkelman beam and core sample tests." - In point 6.2.3 two (2) objectives were adopted, i.e.: o analysis of the type, extent and causes of the deterioration of the pavement for the sake of design for determination of the best suited method of maintenance and repair o formulation of a program for design of maintenance and repair - A new sub-point 6.3 on classification of deterioration of the pavement foundation was added. The other sub-points of Chapter 6 will be taken up at the next meeting of the Working Group. It was agreed that after Chapter 6 the members of the Group would reevaluate the points of the first five chapters that had not been taken up. For that purpose a monitoring matrix of the progress of the work on the manual will be submitted to the members of the Group before the next meeting. **3. Reminder of the work schedule for November 2016** The last point of the agenda was not taken up. Started at 10:27, the meeting was closed at 16:32.

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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MINUTES OF THE 10TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, November 24, 2016
Duration	The meeting started at 10:34 and ended at 16:20.
Place	Meeting room of FONER
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of November 17, 2016 2. Continuation of examination of the content of Chapter 6, "Maintenance and Reparation Plan" 3. Presentation of the changes made in Chapter 4, "Road Safety and Environmental Measures" 4. Explanation concerning some pavement auscultation equipment 5. Work schedule for December 2016

How the meeting proceeded	The tenth meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual was held as scheduled on November 24, 2016, at the meeting room of FONER. It concerned the five (5) points included in the above agenda. In the absence of the usual chairman of the meeting, currently Mr. MUTAMBA, the meeting was presided over by Mr. Joshua MUTIA of Office des Routes. Considering the time available and the attention given to Chapter 6, only the first two points of the agenda were taken up. Incidentally, this working meeting was visited by the Technical Director of FONER. **1. Approval of the minutes of the 9th meeting of the Working Group** The minutes of the 9th meeting of the Working Group were approved by those present, subject to certain changes in form. **2. Examination of Chapter 6, "Maintenance and Reparation Plan"** As at the preceding meeting, examination of Chapter 6 was not completed by the members of the Group. In the discussions the participants made the following changes and additions: - Regarding point 6.1 concerning general information it was proposed that a definition of the term "deterioration" be added. That task will be finalized at the next meeting.

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	- In point 6.3 preference was given to the subtitle "Classification of the Pavement Deterioration" over "Classification of Pavement Structure Deterioration". In the same point the members of the Group proposed the following definition for characterizing structural deterioration: "It is the deterioration resulting from insufficiency of the structural capabilities of the pavement. In other words, it is all of the other types of deterioration due to various causes that affect the courses under the surface course." - In point 6.3.1 the words "deterioration due to the properties of the surfacing course" was replaced by "deterioration due to the properties of the surface course". - The second paragraph of point 6.3.1 was reformulated as follows: "They refer to direct deteriorations of the road environment connected with ride quality, traffic safety and road user comfort that could lead to shortening of the service life of the pavement". - In Table 6.1 of point 6.3.1 the first type of deterioration, i.e. "deterioration due to the properties of the pavement surface" was reformulated as "surface deterioration". - In point 6.3.1.1 concerning surface deterioration the reservations expressed regarding the proposed definitions were essentially as follows: o The proposed crack width threshold of 5 mm was considered too large. o Ruts were defined as longitudinal, not transversal, deformation of the road. o The transverse direction of manifestation of washboard (corrugated sheets) was stated. o Wear was defined as weakening of the pavement due to ageing of the asphalt over time. o Potholes were defined as circular cavities created on the surface of the pavement by separation of the materials of the pavement courses. In point 6.4 the terms "ordinary roads with low traffic frequency" and "ordinary roads with high traffic frequency" were replaced by "low traffic roads" and "high traffic roads". Regarding classification of deterioration as proposed in this chapter, it goes without saying that it is difficult to clearly distinguish the categories of deterioration. That being the case, the members of the Working Group proposed that explicit classification of categories of deterioration encountered in the DRC be proposed at the next meeting considering that it is at the very heart of the manual. The other sub-points of Chapter 6 that were not taken up at this meeting will be examined at the next meeting of the Working Group. **3. Explanation of some pavement auscultation equipment** Mr. SHISHIDO, a JICA Japanese expert in road pavement, took about thirty minutes to explain use of main pavement auscultation equipment, i.e. the Benkelman beam and the falling-weight deflectometer. That explanation was supplemented by the chairman of the meeting, Mr. MUTIA, who will put more emphasis on the principle of operation of those two items of equipment.

	4. Reminder of the work schedule for December 2016 The last point of the agenda was not taken up. Started at 10:34, the meeting ended at 16:20.

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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MINUTES OF THE 11TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, December 1, 2016
Duration	The meeting was started at 10:36 and ended at 15:47.
Place	Meeting room of the Office des routes' Training Directorate
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of the November 24, 2016 2. Continuation of examination of the content of Chapter 6, "Maintenance and Reparation Plan" 3. Presentation of the changes made in Chapter 4, "Road Safety and Environmental Measures" 4. Work schedule for December 2016

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How the meeting proceeded	The eleventh meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual has held as scheduled on December 1, 2016, at the meeting room of the Office des Routes' Training Directorate. It was presided over by Mr. MATANDA of OVD and concerned the four (4) points included in the above agenda. In his remarks Mr. MATANDA informed those present of the passing in Kinshasa of Mr. Jean Pierre MUTAMBA's father. **1. Approval of the minutes of the 10th meeting of the Working Group** The minutes of the 10th meeting of the Working Group were approved by the participants subject to a few changes in form. **2. Examination of Chapter 6, "Maintenance and Reparation Plan"** During the discussions the participants made the following changes and additions: - In point 6.1 concerning general information the members corrected the introduction as follows: "The present chapter concerns: o identification of different types of deterioration of asphalt paved roads and their definitions, their causes and their treatment o the procedures for analysis and survey of pavement deterioration observed in daily and periodic auscultations o planning of maintenance and choice of the repair method best suited to the cause and/or state of the observed deterioration The members took care to define deterioration in the second paragraph of point 6.1, concerning general information, as follows: "It should be

	noted that deterioration is defined as reduction of the structural performances of pavement for various reasons (ageing, aggressiveness of external agents, poor operation, etc.)". - Regarding the second remark of point 6.3.1 concerning study by the FWD method a footnote reference was added to explain the type of deflectometer to be used, i.e. the falling-weight deflectometer." - The second paragraph of point 6.3.1 was reformulated as follows: "They refer to direct deteriorations of the road environment connected with ride quality, traffic safety and road user comfort that could lead to shortening of the service life of the pavement". - In point 6.3.1.1 concerning surface deterioration the reservations expressed regarding the proposed definitions were essentially as follows: o The proposed crack width threshold of 5 mm was considered too large. o The figure illustrating flush should be replaced - In point 6.3.1.2 concerning structural deterioration the reservations expressed concerning the definitions were essentially the following: o Generalized cracking was defined as alligator cracking due to development of the cracks mentioned in point 6.3.1.1.A. - In point 6.4 concerning observance of the pavement, the members of the Working Group considered that Table 6.2 on the degree of seriousness of deterioration of paved road is given for reference and that it could therefore be adapted to the reality of roads in the DRC. - In point 6.4 "the objectives of this table are as follows" was replaced by "the information regarding this table is as follows". - In point 6.5 (1) concerning cracks it was requested that ACGT add to the list of crack measuring apparatus. - On the subject of record of cracks using sketches as explained in point 6.5 (1) it was suggested that the sentence "that can be done several times, and once the rate of cracking reaches several percent of the forecasted rate there can be direct evaluation of the rate of cracking by 3-5 technical personnel to obtain an average value" be clarified by Mr. SHISHIDO, the Japanese road pavement expert. - Concerning the method of auscultation of undulation explained in point 6.5 (4) the members of the Group reformulated it as follows: lay a 3 m ruler in the axis of the road and take a vertical measurement D1 from the ruler corresponding to the deepest point of the undulation in the same manner as in (3) and then move the ruler 1.5 m for measurement D2 and so on and so forth for measurement of undulation on the road section with the values D1, D2, …Dn, the arithmetical average or standard deviation of which will constitute the value of undulation. - In Table 7.1 of point 6.7.2 the main causes of fretting, i.e. use of snow chains or studded tires after the snow is cleared are not relevant to roads in the DRC. They should be amended. The same thing can be said of "presence of groundwater" which has been replaced by "capillary rise". - In point 6.7.3 concerning evaluation of the pavement surface, the sentence "utilization of the formula $PSI=4.53-0.518\ log\sigma-0.371\sqrt{C}-0.174\ D^2$ probably being impossible in the DRC, another solution must be given" was replaced by "utilization of this formula will require procurement of appropriate equipment." Regarding this formula Mr. MUTIA was asked to verify its applicability in the DRC. - In point 6.7.4 concerning selection of the method of repair "method of maintenance and repair" was replaced by "method of repair".

	3. Presentation of the amendments made to Chapter 4, "Road Safety and Environmental Measures" That point will be taken up at the next meeting. **4. Reminder of the work schedule for December 2016** No change was made to the Working Group's schedule for December 2016, which is as follows: - Thursday, December 1, 2016, 10:00-16:00: 11th meeting of the Working Group, at the meeting room of the Laboratoire National des Travaux Publics of Office des Route - Thursday, December 8, 2016, 10:00-16:00: 12th meeting of the Working Group, at the meeting room OVD - Thursday, December 15, 2016, 10:00-16:00: 13th meeting of the Working Group, at the meeting room of BTC - Thursday, December 22, 2016, 10:00-16:00: 14th meeting of the Working Group, at the meeting room of the Laboratoire National des Travaux Publics of Office des Routes Started at 10:32, the meeting ended at 16:14.

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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MINUTES OF THE 12TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, December 8, 2016
Duration	The meeting started at 10:31 and ended at 16:07.
Place	Meeting room of the General Director's Office of OVD
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of December 1, 2016 2. Reexamination of the content of Chapter 4, "Road Safety and Environmental Measures" 3. Reexamination of the content of Chapter 3, "Work Planning and Implementation" 4. Reexamination of the content of Chapter 2, "Work Implementation Structure" 5. Reexamination of the content of Chapter 1, "Overview of Maintenance and Reparation of Asphalt Paved Roads" 6. Work schedule for December 2016

How the meeting proceeded	The twelfth meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual concerned the six (6) points included in the above agenda. The meeting was presided over by Mr. MATANDA because its chairman, Mr. MUTAMBA was not able to attend. It began with words of welcome by the temporary chairman. After his opening remarks in which he stressed the fact that this meeting would essentially center on additions to be made to Chapters 1, 2, 3 and 4, the meeting took up the points included in the above agenda. **1. Approval of the minutes of the 11th meeting of the Working Group** The minutes of the 11th meeting of the Working Group were approved by the participants subject to a few changes in form. **2. Reexamination of the content of Chapter 4, "Road Safety and Environmental Measures"** That chapter was harmonized by inclusion of the texts on environmental and social measures provided by Office des Routes and OVD.

	A table associating the types of work to the different measures for mitigation of environmental impacts was thus prepared. Chapter 4 was completed by addition of a new point concerning environmental and social measures. **3. Reexamination of the content of Chapter 3, "Work Planning and Implementation"** In Chapter 3 the members of the Group added two points: point 3.5 on keeping a record of work statements and point 3.6 on charging and invoicing. In point 3.5 the members opted for the text: "A record of work statements will also be kept. To be entered in it are the different daily quantities actually done, the time worked and the weather conditions. The record is to be signed by the contractor and the administration. It is always to be attached to the contractor's invoice since it constitutes one of the prerequisite documents giving entitlement to payment for the work done". The task of proposing a draft text for point 3.6 concerning charging and invoicing was given Mr. Willy MONDA. That draft text is expected before the next meeting of the Working Group. Chapter 3 was completed in its entirety subject to addition of the above-mentioned sub-point 3.6. **4. Reexamination of the content of Chapter 2, "Work Implementation Structure"** Regarding Chapter 2 on the structure of implementation of the work, Mr. Mao MULUME of ACGT and Mr. MUTIA of Office des Routes were asked to propose a draft text for point 2.4.2 on the road information monitoring system before the next meeting./ Regarding point 2.5 on the machinery and facilities necessary for implementation of the work, the rapporteur was asked to take into account the text proposed in that regard at the 2nd Joint Coordination Committee Meeting. Amendment of those two points made it possible to wind up that stage of reexamination of the draft of Chapter 2. **5. Reexamination of the content of Chapter 1, "Overview of Maintenance and Reparation of Asphalt Paved Roads"** Reexamination of Chapter concerned point 1.4 on preparation of the personnel involved in road maintenance and repair. First of all, that point was corrected to the following: "ethical and psychological preparation of personnel involved in maintenance and repair of roads". But after analysis the members realized that they should make mention in that point of the task of raising awareness on the part of the personnel assigned to maintenance before, during and after the work for the sake of their ownership of the works.

Also to be included there are texts for creating within the team the sense of belonging that is to be developed in the work ambience which, so to speak, makes the worker feel that the structures he is building in a sense belong to him personally.

The lesson to remember from the content of this point lies in this thought: "What kind of men are needed for success of the maintenance work in view of the fact that in the past many worksites were abandoned before completion and their works destroyed prematurely as a result of negligence and lack of feeling of ownership of the works undergoing maintenance on the part of the personnel doing the work?"

It was agreed that Mr. MATANDA will further pursue that subject with the General Director of INPP.

6. Reminder of the work schedule for December 2016

No change was made to the Working Group's schedule for December 2016, which is as follows:

- Thursday, December 1, 2016, 10:00-16:00: 11th meeting of the Working Group, at the meeting room of the Laboratoire National des Travaux Publics of Office des Routes
- Thursday, December 8, 2016, 10:00-16:00: 12th meeting of the Working Group, at the meeting room OVD
- Thursday, December 15, 2016, 10:00-16:00: 13th meeting of the Working Group, at the meeting room of BTC
- Thursday, December 22, 2016, 10:00-16:00: 14th meeting of the Working Group, at the meeting room of the Laboratoire National des Travaux Publics of Office des Routes

Started at 10:31, the meeting ended at 16:07.

TASKS TO BE ACCOMPLISHED

TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT
Draft text for point 3.6 on charging and invoicing	Mr. Willy MONDA	15:00 Tuesday (adjustable)
Draft text for point 2.4.2 on the road information monitoring system	Mr. MUTIA and Mr. Mao MULUME	15:00 Tuesday (adjustable)
Further pursuit of the subject "*preparation of the personnel involved in road maintenance and repair*" with the General Director of INPP	Mr. MATANDA	15:00 Tuesday (adjustable)

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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MINUTES OF THE 13TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, December 15, 2016
Duration	The meeting started at 10:45 and ended at 16:13.
Place	Meeting room of BTC
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of December 8, 2016 2. Examination of Chapter 7, "Maintenance Methods" 3. Work schedule for December 2016

How the meeting proceeded	The thirteenth meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual took place as scheduled in the meeting room of BTC. In the absence of the usual chairman the meeting was presided over by Mr. MATANDA of OVD and concerned the three (3) points included in the agenda. In his opening words the temporary chairman reminded that in the two preceding sessions the members of the Group were able to reexamine the points of the other chapters that had been left pending. Regarding the task given to him by the Group at the last session of December 8, 2016, he said that he had half completed it in that following his discussions on that with the authorities of INPP, it was suggested to him that he consult the "KAISEN" program, which contains information on ethical and psychological preparation of the personnel involved in the work, which was one of the topics that had not been taken up in Chapter 1. On the subject of the draft text to be proposed in point 2.4.2 concerning the road information monitoring system, Mr. MUTIA asked to be excused for not having prepared it yet and promised to send it to the rapporteur before the next meeting. Concerning the model to be proposed for work statements, Mr. Willy MONDA promised to propose one on the basis of improvement of existing local and foreign models. The chairman asked Mr. Pascal BULONGO of FONER to lend support to Mr. Willy MONDA in that task of designing the model to be adopted for work statements.

	The rest of the meeting focused on the points included in the agenda. **1. Approval of the minutes of the 12th meeting of the Working Group** After several changes in form the minutes of the 13th meeting of the Working Group were approved by the meeting. **2. Examination of the content of Chapter 7, "Maintenance Methods"** In view of the importance of that chapter for understanding the manual the members of the Working Group considered that it was necessary to reshape its content to a format suited to the realities in the DRC and that it would not be difficult to do so, and Mr. Fils ZENGA of BTC and Mr. Zico NSIALA of OVD were therefore asked to assume that task of improving Chapter 7. However, to win time, the content of Chapter 7 as proposed by the JICA Japanese experts was scrutinized. After the chapter 7 was read through, the following changes and additions were made: - In the introduction of the chapter 7, the following formulation was proposed by the members of the Group: "Maintenance of a road in an ongoing fashion entails repair of surface deterioration while maintaining traffic at its normal volume". - In the second paragraph of the introduction the sentence "maintenance work must therefore not amount to rehabilitation" was preferred to "maintenance work must not amount to complete repair of deterioration of the pavement but rather be limited to urgent repairs for maintaining the pavement's fitness for service". - The following text was removed from the chapter: "Thus, the methods of maintenance work are not for the purpose of complete repair of pavement deterioration but simply for urgent repairs needed in order to maintain the pavement's capability for service". - The introduction of Chapter 7 was closed as follows: "Therefore in the following are presented some methods and operations considered for maintenance of asphalt paved roads". - The members of the Group were interested in seeing the technical guide for simplified execution of pavement several references to which were made in this chapter. - In the second paragraph of the point 7.4 on partial reconstruction the term "center line of the road" was replaced by "axis of the road". **3. Review of the work schedule for December 2016** No change was made to the Working Group's schedule for December 2016, which is as follows: - Thursday, December 1, 2016, 10:00-16:00: 11th meeting of the Working Group, at the meeting room of the Laboratoire National des Travaux Publics of Office des Routes - Thursday, December 8, 2016, 10:00-16:00: 12th meeting of the Working Group, at the meeting room OVD - Thursday, December 15, 2016, 10:00-16:00: 13th meeting of the Working Group, at the meeting room of BTC - Thursday, December 22, 2016, 10:00-16:00: 14th meeting of the

	Working Group, at the meeting room of the Laboratoire National des Travaux Publics of Office des Routes Started at 10:45, the meeting ended at 16:13.

TASKS TO BE ACCOMPLISHED		
TASKS	THOSE RESPONSIBLE FOR THEM	TIME ALLOWED FOR ACCOMPLISHMENT
Arrangement and formatting of Chapter 7	Mr. Fils ZENGA and Mr. Zico NSIALA	15:00 Tuesday
Draft text for point 3.6 on charging and invoicing	Mr. Willy MONDA	15:00 Tuesday
Draft text in point 2.4.2 on the road information monitoring system	Mr. MUTIA and Mr. Mao MULUME	15:00 Tuesday
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule *Infrastructures*

MINUTES OF THE 14TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Friday, December 23, 2016
Duration	The meeting started at 10:37 and ended at 16:14.
Place	Meeting room of the OR's Training Directorate
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of December 15, 2016 2. Examination of the supplements to be made to Chapter 7, "Road Safety and Environmental Measures" 3. Examination of Chapter 8, "Work Planning and Implementation" 4. Work schedule for December 2016

How the meeting proceeded	The fourteenth meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual was held as scheduled in the meeting room of the Office des Routes' Training Directorate. The meeting was presided over by Mr. MATANDA of OVD and concerned the four (4) points included in the above agenda. During the meeting the points of the agenda were not taken up as they usually are. The members of the Working Group were more focused for hours on the models of the worksite log and the work statement to be adopted in the manual. Examination of the texts presented by the subcommittee in charge of treatment of the chapter on "maintenance methods" was postponed to the meeting of Thursday, December 29, 2016. The drafts of Chapters 8, 9 and 10 were passed out to the members of the Working Group. They will be taken up at the next three meetings. **1. Reminder of the work schedule for December 2016** No change was made to the Working Group's schedule for December 2016, which is as follows: - Thursday, December 1, 2016, 10:00-16:00: 11th meeting of the Working Group, at the meeting room of the Laboratoire National des Travaux Publics of Office des Routes - Thursday, December 8, 2016, 10:00-16:00: 12th meeting of the Working Group, at the meeting room OVD - Thursday, December 15, 2016, 10:00-16:00: 13th meeting of the Working Group, at the meeting room of BTC

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	- Friday, December 23, 2016: 14th meeting of the Working Group, in the meeting room of the Laboratoire National des Travaux Publics of Office des Routes The members of the Group proposed that the meetings be held from now on at the laboratory to make transportation easier for them. That measure will therefore apply starting from the meeting of Thursday, December 29, 2016. Started at 10:37, the meeting ended at 16:14.

TASKS TO BE ACCOMPLISHED

TASKS	PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT
Arrangement and formatting of Chapter 7	Mr. WANET, Mr. Fils ZENGA and Mr. Zico NSIALA	Already submitted
Arrangement and formatting of Chapter 8	Mr. Willy MONDA and Mr. Pascal Bulongo	Wednesday, December 28, 2016
Arrangement and formatting of Chapter 9	Mr. MUTIA	Tuesday, January 3, 2017
Arrangement and formatting of Chapter 10	Mr. MAVUNGU	Already submitted

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule *Infrastructures*

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MINUTES OF THE 16TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, January 5, 2017
Duration	The meeting started at 10:52 and ended at 16:03.
Place	Meeting room of OR's Training Directorate
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of December 29, 2016 2. Continuation of examination of Chapter 8, "Reconditioning method" 3. Examination of Chapter 9, "Quality Control" 4. Work schedule for January 2017

How the meeting proceeded

The sixteenth meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual was held on January 5, 2017, in the meeting room of Office des Routes' Training Directorate.

In the absence of the usual chairman the meeting was chaired by Mr. MATANDA of OVD. The first to speak, he took the opportunity to wish all of the members of the Group a happy new year 2017.

The rest of the meeting centered on the four (4) points included in the above agenda.

1. Approval of the minutes of the meeting of December 29, 2016

The minutes of the 15th meeting of the Working Group were adopted after some corrections in form.

2. Continuation of examination of Chapter 8, "Reconditioning Methods"

The subcommittee in charge of arrangement of Chapter 7 on maintenance methods presented the final text of its work to the meeting. In the way of a summary, the subcommittee was asked to put the different maintenance methods in association with the corresponding ways of implementation, materials and equipment in a single table for reasons of convenience.

In reviewing Chapter 7 the members of the Group made some changes, including:

- **Regarding the methods of road maintenance truck (point-à-temps) with hot mix**:

- The members of the Group considered it unnecessary to mention white chalk for tracing the rectangular geometric forms in the column on the way the work is to be carried out. They also suggested addition of spray next to white paint.

The adjective "careful" was removed in point v) of the column on ways of carrying out the work.

Likewise in points vii) – xiii) the term "base course" was replaced simply by "layers" in point vii), the words "removal of the excess coating with a rag" was removed in point ix), the terms "hot mix" and materials" were replaced in point xi) by "mix and materials", respectively, and the words "making it possible to lay one's hand there" were removed.

In the column concerning materials everything was replaced by the following materials: class 60/70 bitumen, 0/10 or 0/14 mix, 0/1 cut back for impregnation or 400/600 or 800/1400 cut back, white paint or spray.

In the column on equipment the members made a point of removing white paint and white chalk since they were considered to be materials rather than equipment.

- **Regarding the method of road maintenance truck (point-à-temps) with cold mix**:

  - In the column on how the work is to be done everything was replaced by the following materials: class 60/70 bitumen and emulsion with a bitumen content of 60-65%.

- **Regarding the method of filling cracks**:

  - In point iv) of the column on how the work is to be done the term "seal coat" was preferred to "asphalt mortar". A footnote indicating that that method is specific (was added).

- **Regarding method of surface treatment**:

  - In the column on how the work is to be done the following sentence was added: "However, the above-mentioned operations are applied this time to the existing surface courses".

The changes made in the column "way the work is to be done" of the method of road maintenance truck (point-à-temps) with mixes" were repeated in this method, including (1) replacement of the terms "hot mix" and "equipment" respectively by the terms "mix" and "materials" in point i) and (2) removal of the words "making it possible to lay one's hand there" in point vi).

3. Examination of Chapter 8, "Reconditioning Methods"

The members of the Group examined the first point of Chapter 8 on general information. Some changes were made in the original text, including preference of "lengthening service life" over "extension of longevity" and "reinforcement" over "resurfacing" and replacement of "degeneration" by

	"deterioration". The task of arranging the other points of Chapter 8 was assigned to Mr. Pascal BULONGO of FONER and Mr. Willy MONDA of BTC, the Japanese experts being asked for their support in that work in the interest of making it as good as possible. **4. Submission of the minutes of the meetings of the Working Group** Submission of the minutes of prior meetings did not take place. The documents will be temporarily handed out to the members awaiting signing by the Chairman. **5. Submission of the draft manual to the members of the Working Group** The members of the Working Group will not be provided with the draft manual until the work is completed. **6. Reminder of the work schedule for January 2017** The schedule for January 2017 is as follows: - Thursday, January 5, 2017, 10:00-16:00: 16th meeting of the Working Group, in the meeting room of the Office des Routes' Training Directorate - Thursday, January 12, 2017, 10:00-16:00: 17th meeting of the Working Group, in the meeting room of the Office des Routes' Training Directorate - Thursday, January 19, 2017, 10:00-16:00: 18th meeting of the Working Group, in the meeting room of the Office des Routes' Training Directorate - Thursday, January 26, 2017, 19th meeting of the Working Group of the Office des Routes' Training Directorate Started at 10:31, the meeting closed at 16:13.

TASKS TO BE ACCOMPLISHED

TASKS	PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT
Arrangement and formatting of Chapter 8	Mr. Willy MONDA and Mr. Pascal Bulongo	Wednesday, January 4, 2017
Arrangement and formatting of Chapter 9	Mr. MUTIA	Tuesday, January 3, 2017

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Engineer in charge of monitoring and evaluation

For approval,
Richard MATANDA,
Chairman of the Working Group

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République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES ET TRAVAUX PUBLICS

Cellule *Infrastructures*

MINUTES OF THE 17TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, January 12, 2017
Duration	The meeting started at 11:03 and ended at 15:53.
Place	Meeting room of the OR's Training Directorate
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of January 5, 2016 2. Examination of Chapter 10, "Data Base" 3. Examination of Chapter 8, "Reconditioning Methods" 4. Examination of Chapter 9, "Quality Control" 5. Work schedule for January 2017

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How the meeting proceeded	The meeting of Thursday, January 12, 2017, held in the meeting room of the Office des Routes' Training Directorate, was marked by sad remembrance of the passing on Monday, January 9, 2017, at Ngaliema Clinics of Mr. Jean-Pierre MUTAMBA, Head of Cellule Infrastructures' Roads Section and Chairman of the Working Group in charge of preparation of the asphalt paved road maintenance manual. Mr. Joshua MUTIA took the opportunity, as a pastor, to ask all of the members of the Group to praise God Almighty, who ordained this to happen not as an exception but rather as a general rule. A minute of silence was observed in memory of the late Mr. MUTAMBA. Mr. MATANDA of OVD, acting as chairman, continued the meeting with these words: "We think that holding this meeting is a way of honoring our Chairman, all the more so because we all know that he was a great worker. We honor him by accepting the challenge to make the project that he started with all of us a success. The rest of the meeting centered on the five (5) points included in the above agenda. **1. Approval of the minutes of the meeting of January 5, 2017** After some corrections in form the minutes of the 16th meeting of the Working Group were approved by the members. **2. Examination of Chapter 10, "Data Base"**

	After reading of the content of Chapter 10 the following changes were made with the support of Mr. Jean-Pierre MAVUNGU, in charge of the data base of Office des Routes: - In point 10.1 outlining development of a data base for road maintenance: i) The idea expressed by the words "nonexistence of manuals" was not met with approval by the members of the Group, who considered it very pejorative. In its place they preferred "nonexistence of common official manuals", which better reflects the reality of the matter. ii) In the second paragraph of point 10.1 the words "constructed" and "linked with" were respectively replaced by "constituted" and "based on". iii) The third paragraph was reformulated as follows: "Such a maintenance system making use of a data base and information and communication technologies (ICT) will make it possible to improve reliability and efficiency of operations. It should be noted that design and operation of such a system will make it possible to carry out adequate operations with under-utilized human resources in the République Démocratique du Congo. - In point 10.2.1 on design of a data base covering road maintenance methods and methods of use and enhancement of data: i) The first paragraph was reformulated to the following: "The operation consists in designing the functionality of a structured date base with the function of input (entry interfaces) and updating of data as well as utilization of the information contained in such a data base by unified and coordinated management of road information (inventory, inspection and repair). - In point 10.2.1 on entry of road imagery data for sharing of information and communication between the different stations concerned, the first paragraph was reformulated to the following: "By placing the information on identification of road deterioration on the road imagery base as the main data given, a platform (data base) will be designed so as to establish the objective maintenance plan and to create appropriate communication between the different stations concerned by the maintenance. - The title "Rationalization of Road Inspection by Using Imagery" was preferred for point 10.3.1 over and in place of "Rationalization of Road Inspection by Using Road Imagery". - In point 10.3.3 on ensuring of reliability by establishing unified and coordinated management of data and the management system, "in order to ensure data reliability at the user stations for inspection of roads, it is not desirable that there be more than one data base within the user stations for inspection of roads. It is therefore necessary to structure a single common data base for access use by all of the users concerned with road maintenance" was replaced by "in order to ensure data reliability at the user stations for road inspection, it is therefore recommended that there be a single common structured data base for access and use by all of the users concerned with road maintenance."

	ii) Examination of Chapter 9, "Quality Control" That chapter will be examined at the next meeting of the Working Group. **iii) Reminder of the work schedule for January 2017** No changes have been made in the schedule for January 2017, which is as follows: - Thursday, January 5, 2017, 10:00-16:00: 16th meeting of the Working Group, in the meeting room of the Office des Routes' Training Directorate - Thursday, January 12, 2017, 10:00-16:00: 17th meeting of the Working Group, in the meeting room of the Office des Routes' Training Directorate - Thursday, January 19, 2017, 10:00-16:00: 18th meeting of the Working Group, in the meeting room of the Office des Routes' Training Directorate - Thursday, January 26, 2017, 19th meeting of the Working Group of the Office des Routes' Training Directorate Started at 10:52, the meeting was closed at 16:03.

TASKS TO BE ACCOMPLISHED

TASKS	MAIN PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT
Arrangement and formatting of Chapter 8	Mr. MUTIA, Mr. Pierre WANET, Mr. Willy MONDA, Mr. Fils ZENGA, Mr. Jimmy NKULA and Mr. Jean-Paul MAVUNGU	Tuesday, January 17, 2017
Arrangement and formatting of Chapter 9	Mr. MUTIA and Mr. Fils ZENGA	Tuesday, January 17, 2017

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Rapporteur

For approval,
Richard MATANDA
Chairman of the Working Group

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République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule *Infrastructures*

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MINUTES OF THE 19TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, January 26, 2017
Duration	The meeting started at 10:27 and ended at 15:25.
Place	Meeting room of CI
Meeting called by	La Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of January 19, 2017 2. Reexamination of Chapter 8, "Reconditioning Methods" 3. Examination of Chapter 9, "Quality Control" 4. Submittal of the draft manual to the members of the Working Group 5. Submittal of the minutes of the meetings to the members of the Working Group 6. Work schedule for January 2017

How the meeting proceeded	The nineteenth meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual was held as scheduled on January 26, 2017, in the meeting room at CI and concerned the six (6) points included in the above agenda. First of all the chairman of the meeting informed the attendants that the last-minute change in the place of the meeting due to the inconvenience caused by power failure at the installations of the National Laboratory (LNTP) of Office des Routes. Mr. MUTIA took the opportunity to point out the inadequacy of failure to include (i) a linear diagram in the content of Chapter 10 on the data base and (ii) an explanation of how the provinces would profit from procurement of the equipment for the data base and decentralized use of data. In response to that concern the chairman proposed that those amendments be discussed after the draft manual is handed over to the JICA Japanese Experts. However, he expressed the wish that a request for financing such equipment be made to JICA. On that subject Mr. SHISHIDO, Japanese Expert and Coordinator of the PRCMR Project, reminded the members that the present project concerned only Kinshasa and its surrounding areas and said that such a step was therefore not justified. **1. Approval of the minutes of the meeting of January 12, 2017** After they were read and some corrections in form were made in them, the

	minutes of the 18th meeting of the Working Group, held on January 19, 2017, were approved by the members of the Group. **2. Reexamination of the Chapter 8: "Reconditioning Methods"** The subcommittee in charge of reexamination of Chapter 8 proposed new content for Chapter 8 that takes realities in the DRC into account. Apart from point 8.1 on general information, which had already been adopted by the members of the Working Group in prior meetings, the following amendments were made: - In point 8.2 on reinforcement, the subcommittee made a point of defining "reinforcement" as follows: "reinforcement of pavement is its reconditioning by a possible addition of a base course and essentially regarding a surface course consisting of dense macadam (or possibly coating)". The committee then proposed a second paragraph, formulated as follows: "Reinforcement of pavement makes it possible to remedy one or more surface and/or structural defects and to adapt the pavement-bearing capacity future traffic. In this manual devoted to asphalt paved road, we are concerned only with roads with usual flexible or semi-rigid pavement structures and the old (i.e. existing) base courses of which consist of either natural materials or materials improved with cement or bitumen. Furthermore, of the many known reinforcement techniques, we have adopted only two in this manual, i.e.: • reinforcement by simply laying surfacing (asphalt concrete or surface dressing) • Reinforcement using crushed gravel or natural gravelly". - In point 8.2.1 on the method of calculation of reinforcement the subcommittee insisted on the two main categories of dimensioning methods applicable in the DRC: classical or empirical methods (the CBR, CEBTP, AASHTO and other methods) and theoretical methods. - In point 8.2.2 on classes of deflection and traffic the subcommittee gave in a table five classes of characteristic deflection from a low of 60 x 1/100th to a high of values in excess of 150 x 1/100th. A table giving the classes of traffic applicable in the DRC was also included in this sub-point. - In Point 8.2.3 on typical reinforcement structures, the subcommittee deemed it both useful and necessary to include a table stipulating the practical thicknesses of asphalt concrete surfacing reinforcement. The content of points 8.2.1, 8.2.2 and 8.2.3 on dimensioning on the basis of the CBR, dimensioning of reinforcement on the basis of deflection and methods of execution of reinforcement was removed because it was not considered suited to the realities in the DRC. The subcommittee pointed out that the content of those sub-points is covered by Table 8.3 on reconstruction work. - In point 8.3 on reconstruction work, the subcommittee stressed that since reconstruction work is more costly, it requires careful study before being undertaken. - In point 8.3.1 on method of calculation, the subcommittee noted that the method considered was in accordance with the current standards in the DRC.

- In point 8.3.2, initially on study and design, the members of the subcommittee preferred to have it deal with certain considerations to be kept in mind regarding the strength of the pavement. They also replaced “subbase course” with “carriageway area soil” and removed the other information contained in that sub-point, mainly concerning soil tests and study results.
- In point 8.3.3 on classes of pavement area bearing capacity the subcommittee proposed a table listing the classes of bearing capacity from under CBR 5 to over CBR 30.
- In point 8.3.4 on typical reconstruction structures, the subcommittee proposed a table defining the structures that can be adopted according to local resources in terms of materials, traffic and pavement area soil bearing capacity.
- The content of point 8.3.2 concerning reconstruction of asphalt paved roads as proposed by the JICA Japanese experts was removed since it was considered to be already contained in Table 8.7 on description of reconditioning methods.
- In point 8.4 the subcommittee proposed a text on road widening work.

3. **Examination of Chapter 9, “Quality Control”**

Reexamination of Chapter 9 was put off to Tuesday, January 31, 2017, since the subcommittee assigned that task had not been able to finish its work.

4. **Submittal of the draft manual to the members of the Working Group**

The completed draft manual will be submitted to the members of the Working Group at the end of its last meeting.

Started at 10:27, the meeting ended at 15:25.

5. **Submittal of the minutes of the meeting to the members of the Working Group**

The minutes of all of the meetings will be submitted to the members of the Working Group at the end of its last meeting.

Started at 10:27, the meeting ended at 15:25.

6. **Remind of the work schedule for January 2017**

The last meeting of the Working Group is scheduled for Thursday, February 2, 2017, at the meeting room of FONER.

Started at 10:27, the meeting ended at 15:25.

TASKS TO BE ACCOMPLISHED

TASKS	MAIN PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT
Arrangement and formatting of Chapter 9	Mr. MUTIA and Mr. Fils ZENGA	Tuesday, January 31, 2017

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Rapporteur

For approval,
Richard MATANDA
Chairman of the Working Group

République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule Infrastructures

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MINUTES OF THE 20TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, February 2, 2017
Duration	The meeting started at 10:37 and ended at 16:12.
Place	Meeting room of FONER
Meeting called by	La Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of January 26, 2017 2. Continuation of examination of Chapter 9, "Quality Control" 3. Words of thanks by the Chairman 4. Miscellaneous

How the meeting proceeded

The twentieth meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual was held as scheduled on February 2, 2017, in the meeting room of FONER and concerned the four (4) points included in the above agenda.

The meeting was presided over by Mr. MATANDA of OVD. The meeting essentially centered on the points included in the agenda:

1. Approval of the minutes of the meeting of January 26, 2017

After they were read and corrections in form were made in them, the minutes of the meeting of the Working Group held on January 26, 2017, were approved by its members.

2. Continuation of examination of Chapter 9, "Quality Control"

The subcommittee in charge of reexamination of Chapter 9 proposed the content of the other sub-points not yet discussed by the Working Group. In view of the quantity of work to be presented by the subcommittee it was proposed that examination of that chapter in the Working Group be continued on Tuesday, February 7, 2017, at the same place, i.e. in the meeting room of FONER. The main additions made to the chapter in those two sessions is summarized as follows:

- In point 9.1 on general information the members of the Working Group supported the principle that control be accomplished in three phases:
  - control before the work,
  - control during the work and
  - control after the work.

  Mention was made in this sub-point of the standards and tests applicable to quality control: AASHTO, ASTM and AFNOR.

- A new sub-point 9.2 on quality control before the work essentially consisting of the following points was inserted in Chapter 9:
  - tests of the pavement area soil (test for identification of the soil in the boring grain size analysis, Atterberg limits, Modified Proctor test, test of CBR at 4 days of imbibition and organic materials test),
  - tests on conformity of the materials of the pavement structure (grain size analysis, Atterberg limits, organic materials content, natural water content, optimal water content, maximum dry density, etc.),
  - specifications concerning macadam and materials for fills and top of subgrade, capping layers, the subbase and the base course.

  An important remark on the reasons for and restrictions on use of local selected materials (bituminous, polymer, lime or, if need be, cement) was added at the end of this sub-point.

- In point 9.3 on quality control during the work the following controls and *in situ* tests were recommended:
  - topographical control
  - control of the thicknesses of the different pavement courses
  - control of degree and conditions of compaction of the pavement area and different road courses
  - control of impregnation and adhesion
  - control of temperatures of production and laying of hot mix
  - control of the conditions of carrying out of the work (equipment used, personnel, weather conditions, etc.)

  It was even proposed that a regulatory restriction be included that makes "payment of the bill presented by the contractor dependent on a quality of the work done that meets the technical requirements to an evaluated degree of at least 98%".

- For the control of the mix used that is proposed in point 9.3.1 the following *in situ* tests were proposed:
  - optimal binder content and characteristics of the binder
  - grading requirements and Los Angeles test
  - Marshall stability, creep and compactness
  - temperature of use: at least 135 ºC

- Specifications concerning compaction control of the mixes were also inserted, including those concerning the 3-wheel static compactor and the tires roller. The Group also approved the conditions of execution of the asphalt pavement as proposed by the subcommittee.

- In point 9.3.3 the members of the Working Group adopted the content proposed by the subcommittee concerning height tolerances.

- In point 9.4 on quality control after the work, the important role that

played in guarantee of the completed structure after it is put in service was stressed.

- In point 9.5 mention was made of the frequency of all of the tests prescribed for quality control (identification of the soils, tests on the materials of the different courses of the pavement structure and testing of the mixes, cements, mixing water and concrete).

  Three types of concrete were mentioned as regards testing of concrete:
  - "study" concrete, made by the contractor for the purpose of confirmation of the formulation proposed by the consultant
  - "convenience" concrete, prepared by the contractor before the work starts for each concrete mixer plant on the basis of the results obtained with the "study" concrete
  - "information" concrete, meant for determination of the probable strengths of the concrete of the structure to be executed

- Point 9.6 on test equipment was not examined. The subcommittee was asked to propose its content in table form.

3. Words of thanks by the Chairman

At the end of the meeting the Chairman expressed his sincere thanks to the members of the Working Group for their availability and unprecedentedly active participation in the Project for the sake of its success. He reminded them of the compelling need to complete the manual in accordance with the initially set deadlines. Regarding next meetings between the Japanese experts and the Congolese counterparts for harmonization of the prepared draft manual he announced the setting up of a consistent schedule for that purpose.

4. Miscellaneous

The Chairman reassured the members of the Working Group regarding the financial situation of the Project, saying that administrative follow-up has been provided for in order to guarantee raising and release of the funds necessary for implementation of the Project as soon as possible.

Started at 10:37, the meeting was closed at 16:12.

TASKS TO BE ACCOMPLISHED

TASKS	MAIN PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT
Arrangement of Chapter 9 (control equipment)	Mr. Fils ZENGA	Tuesday, February 7, 2017

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Rapporteur

For approval,
Richard MATANDA
Chairman of the Working Group

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République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule Infrastructures

MINUTES OF THE 22ND MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, February 16, 2017
Duration	The meeting started at 10:31 and ended at 16:42.
Place	Meeting room of the Direction of Training of Office des Routes
Meeting called by	La Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of February 9, 2017 2. Discussions between the Japanese experts and the Congolese counterparts on the content of Chapter 5, "Diurnal and nocturnal visual patrol" 3. Conclusion of point 9.6 on work control equipment 4. Miscellaneous

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The twenty second meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual was held as scheduled on Thursday, February 16, 2017, in the meeting room of the OR's Direction Formation.

It concerned the four (4) points included in the above agenda.

Speaking first, the chairman of the meeting, Mr. MATANDA, took the opportunity to note the presence of Mr. BALAYI, who had been absent for several weeks for reasons of health.

After adoption of the agenda of the meeting by the members of the Group the rest of the meeting centered on the points included in the agenda.

1. Approval of the minutes of the meeting of February 9, 2017

After they were read and some changes in form were made in them, the minutes of the 21st meeting of the Working Group, held on February 9, 2017, were approved by the members of the Group.

2. Discussion between the Japanese experts and the Congolese counterparts on the content of Chapter 5, "Diurnal and nocturnal visual patrol"

As the proper approach to the discussions the chairman stressed the principle of the discussions expressed in the following words: "It is assumed that the Congolese side has had time to read the manual and is therefore able to answer any and all concerns that the Japanese experts might have regarding its content."

Examination of Chapter 5 on Diurnal and nocturnal visual patrol by the Japanese experts resulted in the following corrections being made:

- The choice of the word "auscultation" in preference to "patrol" was a subject of debate between the Japanese expert in charge of the data base and the members of the Working Group, the latter stressing the fact that although "patrol" has the same sense as "inspection", it is more appropriately used in the area of national security (police, army) and that "auscultation" is more appropriate on the subject of roads and was given preference over "inspection".
- The term "visual auscultation" mentioned in point 5.1.1 should be redefined for the sake of coherence of the content of the chapter.
- The general objective of the chapter was changed to the following: "maintaining the level of service of the pavement as well as possible for the benefit of road users".
- The specific objectives were redefined as follows:

  i) Surveying the state of the surface of the pavement and roadside ancillaries
  ii) Collection of all of the information (types and causes of deterioration, etc.) on the condition of the pavement in order to comprise a history of the pavement and updating the road data base
  iii) Planning of the envisaged work on the basis of what has been confirmed concerning the state of the road

- In point 5.1 on types of auscultation, the definitions of the different types of auscultations were changed to the following:

  - *Diurnal and nocturnal auscultation:*

    That is done at night by the maintenance unit's team for the purpose of checking visibility, particularly as regards road lighting and visibility of road signs..

    The sentence "such auscultation requires appropriate equipment of the team, including with uniforms with fluorescent marking and a patrol vehicle, etc.", which had been an integral part of the definition was transferred to point 5.1, which deals with the details of diurnal and nocturnal auscultation.

  - *Periodic auscultation:*

    That is carried out regularly, the periodicity thereof depending weather, environmental and traffic conditions.

  - *Extraordinary (urgent) auscultation*

    That is carried at points in time, including when phenomena that markedly disturb the flow of traffic occur (torrential rains, earthquakes and other natural disasters). Such auscultation is implemented for the purpose of contributing to application of adequate prevention measures and to reconstruction after the disaster.

- In point 5.1.1 on the frequency of auscultation the following was stated: "The frequency of such auscultation is to be determined in advance. The frequency decided is to take into account the importance of the road, the condition of pavement, the number of years it has been

	in service, the number of inspectors, etc. For example, a frequency of once a month can be adopted." - The content of point 5.1.3 on equipment and supplies was improved to the following: "It should be pointed out that appropriate equipment is needed for nocturnal auscultation, such as uniforms with fluorescent marking, a patrol vehicle, etc." The following equipment was also added: - flashlights - surveillance vehicle projector lights - In point 5.3.1 on carrying out extraordinary auscultations, the sentence "if the disaster threatens to put the population at risk, communication and evacuation measures are to be taken for informing and evacuating residents" was changed to "if the disaster might put the population at risk, communication and evacuation measures are to be taken". **3. Conclusion of point 9.6 on work control equipment** The Working Group assigned Mr. Joshua MUTIA, Mr. Fils ZENGA, Mr. Willy MONDA, Mr. Zico NSIALA and Mr. Mao ULUME to the task of finalizing that point. **4. Miscellaneous** The discussion of miscellaneous matters essentially concerned the budget for the Project activities, work on which is progressing normally, and the Project activities for the first half of 2017. Started at 10:31, the meeting ended at 16:42.

TASKS TO BE ACCOMPLISHED		
TASKS	MAIN PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Rapporteur

For approval,
Richard MATANDA
Chairman of the Working Group

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République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule *Infrastructures*

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MINUTES OF THE 23RD MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, February 23, 2017
Duration	The meeting started at 10:28 and ended at 12:37.
Place	Meeting room of the Direction of Training of Office des Routes
Meeting called by	La Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of February 16, 2017 2. Discussions between the Japanese experts and the Congolese counterparts on the content of Chapter 3, "Work planning and implementation" 3. Handing over of the draft manual 4. Miscellaneous

How the meeting proceeded	The twenty-third meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual was held on Thursday, February 23, 2017, in the meeting room of the Training Direction of Office des Routes. The meeting started with words of welcome by the chairman, Mr. MATANDA to Mr. TAKAHASHI, a Japanese Expert on road inspection who has been in Kinshasa since February 21, 2017. After adoption of the agenda of the meeting by the members of the Group the rest of the meeting centered on the points included in the agenda. **1. Approval of the minutes of the meeting of February 16, 2017** After they were read and some corrections in form were made in them, the minutes of the 22nd meeting of the Working Group, held on February 16, 2017, were approved by the members of the Group. **2. Discussion between the Japanese experts and the Congolese counterparts on the content of Chapter 3, "Work planning and implementation"** Review of the Chapter 3 on work planning and implementation gave the Japanese expert in charge of road inspection an opportunity to ask the Working Group for certain clarifications. The question asked and the clarifications made resulted in improvement of the content of that chapter. The following is a summary of those exchanges:

	- In the first paragraph of point 3.1 on general information "program" was replaced by "planning". As a syntactical consideration "…maintenance and road repair" was replaced by "…road maintenance and repair". - In the first paragraph of the point 3.3 on measures to be taken before the work, the words "it is desirable to indicate them clearly in a list" were removed. The expert justified that request for removal by the fact that the text constituted a message between Japanese experts at the time of translation of the original text of the manual from Japanese to French rather than something substantial. - In point 3.2.i) the words "raising the awareness of the target public" were preferred to "raising the awareness of users of the road and roadside residents". The first paragraph of that sub-point, initially formulated as "…road users and roadside residents must be provided information describing the work…", was also changed, the members preferring "the administration must provide the target public with information describing the work" to that. - In point 3.2.v) on work instructions "the supervisory personnel are to inform the workers of the content of the work that very day through the person in charge of it" was changed to "the person in charge of the worksite is to inform the workers of the content of the work that very day". - In point 3.2.vi) on prevention of risk to the workers "control personnel" was replaced by "regulatory officials". - In point 3.2.vii) on worksite organization the "all other materials from the preparatory work must be rapidly removed from the work zone" was replaced by "materials from the preparatory work not suitable for reuse (products of demolition and excavated materials) must be rapidly removed from the work zone". **3. Handing over of the draft manual** The chairman had promised that the first draft would be handled over to the members of the Working Group that same day for their opinions and comments, but that was put off to Friday, February 24, 2017, because of the volume of the manual and the time that printing of its 175 pages would take. **4. Miscellaneous** The point "Miscellaneous" of the agenda was not taken up at the meeting since the attention of the members of the Working Group was focused on printing of the first draft of the asphalt road maintenance and repair manual produced by them. Started at 10:20, the meeting ended at 12:37.
TASKS TO BE ACCOMPLISHED	

TASKS	MAIN PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Rapporteur

For approval,
Richard MATANDA
Chairman of the Working Group

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République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule Infrastructures

MINUTES OF THE 24TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, March 2, 2017
Duration	The meeting started at 10:41 and ended at 14:12.
Place	Meeting room of the Laboratoire National des Travaux Public (LNTP)
Meeting called by	La Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the meeting of February 23, 2017 2. Discussions between the Japanese experts and the Congolese counterparts on the content of Chapter 6, "Maintenance and Reparation Plan" 3. Miscellaneous

How the meeting proceeded	The twenty-fourth meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual was held on Thursday, March 3, 2017, in the meeting room of OR's LNTP. The meeting was presided over by Mr. Richard MATANDA of OVD. After adoption of the agenda of the meeting by the members of the Group the rest of the meeting centered on the points included in the agenda. **1. Approval of the minutes of the meeting of February 23, 2017** After they were read and some corrections in form were made in them, the minutes of the 23rd meeting of the Working Group, held on February 23, 2017, were approved by the members of the Group. **2. Discussions between the Japanese experts and the Congolese counterparts on the content of Chapter 6, "Maintenance and Reparation Plan"** The discussions on that chapter essentially concerned the following points: - In point 6.3.1.1 on surface deterioration, "ruts" was redefined as follows: "by definition that term means longitudinal deformations of the road occurring regularly where the wheels of vehicles run most frequently. Such deformation is to be evaluated in both directions but mostly in the transverse direction. A distinction is made between two types of ruts: small-radius ruts and large-radius ruts." The same was done regarding the definition of "undulation", resulting in:

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	"the term "undulation" means by definition, as shown in Figure 6.4 below, regular transverse waves relatively close together along the axis of the road. Such deformation is to be evaluated in both directions but mostly in the transverse direction. - In point 6.7.3 on evaluation of the pavement surface mention was made of the source of the present serviceability index: "the present serviceability index is calculated on the basis of ASSHO formula (7.1), adapted to Japan". **3. Miscellaneous** The chairman was anxious to reassure the members that the problems connected with finances would soon be resolved. An extraordinary meeting was called for on Wednesday, March 8, 2017, for the Working Groups to be able to make internal corrections of the content of the manual. Started at 10:41, the meeting ended at 14:12.

TASKS TO BE ACCOMPLISHED

TASKS	MAIN PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Rapporteur

For approval,
Richard MATANDA
Chairman of the Working Group

République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule *Infrastructures*

MINUTES OF THE 28TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, April 13, 2017
Duration	The meeting started at 11:27 and ended at 15:45.
Place	The meeting room of the Direction of Training of Office des Routes
Meeting called by	La Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Continuation of discussions between the Japanese experts and the Congolese counterparts on the content of Chapter 8, "Road Reconditioning Methods" 2. Discussions between the Japanese experts and Congolese counterparts on the content of Chapter 9, "Quality Control" 3. Miscellaneous

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How the meeting proceeded

The twenty-eighth meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual was held as scheduled on Thursday, April 13, 2017, in the meeting room of the Direction of Training of Office des Routes.

The meeting was led by Mr. MUTIA, the chairman of the Group not being able to attend in the morning.

The course of the meeting is summarized below.

1. Continuation of discussions between Japanese experts and Congolese counterparts on the content of Chapter 8, "Road Reconditioning Methods"

The first point of the agenda of the meeting was marked by involvement of the Japanese expert in charge of asphalt repair, Mr. SHISHIDO, in the discussion.

He informed the members of the Working Group that all of the reservations expressed on the content of Chapter 8 were withdrawn at the preceding meeting. However, he expressed concern regarding the difference noted between the values of the thicknesses of different courses of the pavement contained in Table 8.6 of Chapter 8 of the draft manual and those of the practical guide for dimensioning of pavement for the tropical countries of the CEBTP.

On that subject the members of the Working Group assured the Japanese side of the certainty of those values considering that the structures used (flexible pavement in the case of the manual and semi-rigid pavement as a result of stabilization of the cement in the case of the above-mentioned practical guide) are quite different.

For the purpose of making the manual more understandable it was decided to add to Table 8.6 a column giving details on the materials of the courses in question.

It was also noted in discussion of Table 8.7 on description of road reconditioning methods that the numbering should correspond to that used in Chapter 7, specifically in Table 7 on description of reconditioning methods.

2. Discussions between the Japanese experts and Congolese experts on the content of Chapter 9, "Quality Control"

Speaking in turn, the Japanese expert in charge of pavement, Mr. MUKAI, although not contradicting the content proposed by the Working Group, mentioned some things required for improvement of Chapter 9, including:

- addition of a sub-point on the objectives of quality control
- regrouping of the elements of quality control according to the materials and the work done
- summarization of all of the elements of control in a table to make it easier for the reader to understand
- reference to the appendix of the manual for details on the test procedures and the equipment

In response to the concerns expressed by the Japanese expert the members of the Working Group agreed on the following:

1. *Concerning addition of a new sub-point on the objectives of quality control:*

   That sub-point was worded as follows:
   "In general, quality control aims at ensuring the quality of the structure for the sake of its sustainability.
   Specifically, it aims at ensuring:
   - that the materials used correspond to those described in the technical specifications and
   - that the execution and control thereof are accomplished in conformity with the workmanship within the limits set by the Contract."

2. *Concerning regrouping of the elements of quality control according to the materials and the work done:*

   The members of the Working Group considered that presentation of the elements of quality control as proposed in the manual does not cause confusion and therefore expressed the wish to see it retained considering its more detailed nature (control before, during and after the work).

   However, they accepted Mr. SHISHIDO's suggestion that control of paraffin content be added to Table 9.2.3 on the characteristics of the asphalt mix.

3. *Concerning summarization of all of the elements of control in a table in order to make it easier for the reader to understand*

   The members of the Working Group did not subscribe to the idea of adding a presentation of Chapter 9 in table form, which to them

	would constitute a distortion thereof since it would make the chapter less detailed. However, the proposal to remove the sentence “payment to the contractor is to depend on meeting of the technical specifications to an evaluated degree of at least 98%”, included in point 9.3 on quality control during the work, was accepted. It can be reconsidered in the new Chapter 11 on monitoring of the work. 4. *Concerning a reference to the appendix of the manual for details on the test procedures and equipment:* The proposal was approved by all of the members of the Working Group. An appendix to the manual must therefore be included for that purpose. The Japanese expert on pavement also proposed a new chapter devoted to monitoring of the work. **3. Miscellaneous** The successful candidates for training in Japan were informed of the meeting to be held at JICA on Friday, April 21, 2017, from 10:00. Started at 11:27, the meeting ended at 15:54.

TASKS TO BE ACCOMPLISHED		
TASKS	MAIN PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT
Arrangement of Table 8.6	Mr. Zico NSIALA, Engineer	Tuesday, April 18, 2017
SIGNATURES		

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Rapporteur

For approval,
Richard MATANDA
Chairman of the Working Group

République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule Infrastructures

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MINUTES OF THE 32ND MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Wednesday, July 21, 2017
Duration	The meeting started at 10:32 and ended at 13:35.
Place	Meeting room of the Direction of Training of Office des Routes
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Discussion of the work schedule of the 1st Working Group for the purpose of taking into account the observations made by the entities (OVD, BTC, CNITP) on the draft of the asphalt paved road maintenance and repair manual 2. Discussion of the program for the next activities of the Project (workshops, seminars) 3. Miscellaneous

How the meeting proceeded	The 32nd meeting of the Working Group in charge of preparation of the asphalt paved road maintenance and repair manual was held on Friday, July 21, 2017, in the meeting room of the OR's Direction de la Formation. The meeting was presided over by Mr. Richard MATANDA of OVD, who thanked the participants for their presence at this 32nd meeting after more than a month of inactivity. The next to speak was Mr. SHIMIZU, the PRCMR Project Manager, mainly on the subject of the methodology to be adopted for taking into account or not taking into account the observations made to the Group on the draft manual that has been produced by it. In his opinion the members should judge the observations according to how they relate to the content to the manual, not taking into account those that do not fit in with the manual. After the agenda of the meeting was adopted by the members of the Group, the rest of the meeting centered on the points included in it. **1. Discussion of the work schedule of the Working Group 1 for taking into account the observations made by the entities (OVD, BTC, CNIBTP) on the draft of the asphalt paved road maintenance and repair manual** A work schedule for the 1st Working Group was submitted to the meeting. It indicates its meetings for August and September 2017. Three meetings between the Technical Group and the 1st Working Group are also scheduled to make it possible for the professors to make their contribution to improvement of the draft manual.

	2. Discussion of the program for the next activities of the Project (workshops, seminars) After exchange of views on the matter it was proposed that the next activities of the Project be scheduled after analysis of the observations by the entities on the draft manual that has been produced. The members opted for analysis of those observations together at their weekly meetings. The first meeting for that is scheduled for Thursday, July 27, 2017. **3. Miscellaneous** The chairman informed the members that the financial situation of the project had been partly resolved by FONER. Started at 10:32, the meeting ended at 13:35.

TASKS TO BE ACCOMPLISHED

TASKS	MAIN PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Rapporteur

For approval,
Richard MATANDA
Chairman of the Working Group

République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule Infrastructures

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MINUTES OF THE 33RD MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, July 27, 2017
Duration	The meeting started at 11:09 and ended at 15:55.
Place	Meeting room of the Direction of Training of Office des Routes
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the 32nd meeting of the Working Group 2. Discussion of the observations made by the entities (OVD, BTC, CNIBTP) on the draft of the asphalt paved road maintenance and repair manual 3. Miscellaneous

How the meeting proceeded	The 33rd meeting of the first Working Group, in charge of preparation of the asphalt paved road maintenance and repair manual, was held on Thursday, July 27, 2017, in the meeting room of the OR's Direction de la formation. The meeting started with words of welcome by Mr. Richard MATANDA, Chairman of the Working Group, who took the opportunity to remind the members of the source of the comments on the manual, i.e. BTC, OVD and CNIBTP. After adoption of the agenda of the meeting by the members of the Group the rest of the meeting centered on the points included in the agenda. **1. Approval of the minutes of the 32nd meeting of the Working Group** After they were read and some changes in form were made in them, the minutes of the 32nd meeting of the Working Group, held on July 21, 2017, were approved by the members of the Group. **2. Discussion of the observations made by the entities (OVD, BTC, CNIBTP) on the draft of the asphalt paved road maintenance and repair manual** In examination of the comments made by CNIBTP the following elements were identified: - The first concern of that entity was the clarifications to be given Chapter 4 concerning road and environmental safety measures, instructions regarding concentrations with the Police and raising of the awareness of road users and roadside residents, particularly clarification regarding the authority of the Police over the road to be worked on, the time required, the means to be used for informing the public and the purpose of raising the awareness of road users and roadside residents.

	In response to that concern the members of the Group stressed that the manual produced has no pretension to being encyclopedic, i.e. that it contains only the essence of the instructions on asphalt paved road maintenance and repair. Therefore, if necessary, the administrator that manages the road networks has to determine in each case, in accordance with its competences and practice, the competent Police authority to be contacted, the time required and the means to be employed for raising the awareness of the public regarding any work to be done. - The second concern of CNIBTP was the scope of application of the manual. In its opinion no mention of the user of the manual has been made in it although it is considered to be meant for use by all managing engineers, persons responsible for studies and persons supervising or carrying out the asphalt paved road maintenance and repair work for the Congolese government. It considers that strict observance of the manual is an obligation and not an option. On that subject the members of the Group said that the framework of the present Project is well-defined, that mention is already made, on page 13 of the manual, that the potential beneficiaries of the Project are Office des Routes and Office des Voiries et Drainage. - **3. Discussion of the program for the next activities of the Project (workshops, seminars)** After exchange of views on the matter it was proposed that the next activities of the Project be scheduled after analysis of the observations by the entities on the draft manual that has been produced. The members opted for analysis of those observations together at their weekly meetings. The first meeting for that is scheduled for Thursday, July 27, 2017. **4. Miscellaneous** The chairman informed the members that the financial situation of the project had been partly resolved by FONER. Started at 10:32, the meeting ended at 13:35.

TASKS TO BE ACCOMPLISHED		
TASKS	MAIN PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Rapporteur

For approval,
Richard MATANDA
Chairman of the Working Group

République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule Infrastructures

MINUTES OF THE 35TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, August 11, 2017
Duration	The meeting started at 10:53 and ended at 15:53.
Place	Meeting room of the Direction of Training of Office des Routes
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Approval of the minutes of the 34th meeting of the Working Group 2. Continuation of discussion of the observations made by BTC, OVD and CNIBTP on the draft of the asphalt paved road maintenance and repair manual

How the meeting proceeded	The 35th meeting of the first Working Group, in charge of preparation of the asphalt paved road maintenance and repair manual, was held on Friday, August 11, 2017, in the meeting room of OR's Direction de la formation. Speaking first, the Chairman of the Group, Mr. Richard MATANDA, thanked all of the participants for having accepted attendance at this 35th meeting of the Group in spite of being very busy with other matters as well. After adoption of the agenda of the meeting by the members of the Group, the rest of the meeting centered on the points included in the agenda. **1. Approval of the minutes of the 34th meeting of the Working Group** The Chairman of the Group excused himself for the fact that the minutes of the 34th meeting were not ready, the person in charge of preparing them not having been able to attend this meeting. Examination of those minutes was therefore put off until later. **2. Continuation of discussion of the observations made by OVD, BTC and CNIBTP on the draft of the asphalt paved road maintenance and repair manual** In continuation of examination of the comments made by CNIBTP on the draft of the manual produced the members of the Group agreed on and decided the following: - Regarding the 16th comment concerning point V. on worksite organization as set forth on page 47 of the draft manual, for which CNIBTP suggests that the maintenance and repair work be done with minimal inconvenience to the public and with preparation of mandatory detours, the members of the Group considered that all such concerns were

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	already addressed on page 60 of the draft manual. - CNIBTP's suggestion to restore the definitions of 4.2 on pages 53-60 of the draft manual was not approved by the members of the Working Group, who considered that the decision made was in the interest of better understanding of the document. - The wish of CNIBTP for further development of point 4.3 of the manual on measures for preventing accidents at the time of the work by including indication of the road police authorities that are to be informed and associated depending on the route on which the work is to be done, the means to be used to inform roadside residents, the distance of placement of traffic guidance personnel, etc., was already taken into account at the preceding meeting. The fact of the matter is that in the opinion of the members of the Working Group all such arrangements should be made on the basis of the good judgment of the engineer in charge of the work and therefore cannot be standardized. - In response to the proposal by CNIBTP to insert a table giving the frequencies of all types of auscultation according to the importance of the route, the condition of the pavement and the number of inspectors, etc. as mentioned on pp. 61-68 the members of the Group considered that it was not easy to do so such it depends on the particular case and therefore that it should be determined case by case by the experts of OVD and OR in the second phase of application of the content of the manual. - In response to CNIBTP's proposal to classify the deterioration of the pavement (cf. point 6.7.3 on page 88 of the manual) from the viewpoint of the causes thereof and the courses concerned the members made reference to point 6.3 of page 86 of the draft manual as evidence of existence already of the proposed classification. - Regarding the CNIBTP's proposal to carry out studies to draw inspiration form the Japanese model for adaptation of the serviceability index (Psi) (cf. point 6.7.3 of page 88 of the manual on evaluation of the surface of the pavement), the members of the Group considered that it was addressed on page 89 of the manual. - The proposal by CNIBTP to add, to point 9.1 of the manual, indication of the fact that our laboratories are neither certified nor accredited, the fact of nonexistence of Congolese standards adapted to our climatic and geotechnical conditions and the fact of total lack of road research was accepted by the members of the Group. For that purpose they added the following to page 109 of the manual: o Too many laboratories with neither qualification nor certification o Insufficient support to road research Regarding the latter indication the members of the Group made a point of including the following clarification: "Furthermore, the sustained support of the Administration is indispensable to finalization, validation and publication of the Congolese standards presently being prepared by Office des routes for application". - Regarding CNIBTP's concern that the content of Chapter 9 (Quality Control) seems to address only new pavement, the members of the Group

	stated that the control is limited within a well-defined context but that it also, of course, extends beyond just maintenance. Started at 10:53, the meeting was closed at 15:53.

TASKS TO BE ACCOMPLISHED		
TASKS	MAIN PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Rapporteur

For approval,
Richard MATANDA
Chairman of the Working Group

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République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule *Infrastructures*

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MINUTES OF THE 45TH MEETING OF THE WORKING GROUP IN CHARGE OF PREPARATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Friday, December 29, 2017
Duration	The meeting started at 10:43 and ended at 13:43.
Place	Meeting room of the OR's Direction Formation
Meeting called by	la Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	1. Formatting of the draft of the asphalt paved road maintenance and repair manual

How the meeting proceeded	The 45th meeting of the first Working Group, in charge of preparation of the asphalt paved road maintenance and repair manual, was held on Friday, December 29, 2017, in the meeting room of the OR's Direction de la formation. The meeting was chaired by Mr. Jean-Paul MAVUNGU, a data base expert of OR. Only one point was included in the agenda of the meeting, i.e. summary of formatting of the draft manual as arranged by Mr. Jean-Paul MAVUNGU. **1. Formatting of the draft of the asphalt paved road maintenance and repair manual** After projection of the version of the manual formatted by the data base expert the members of the Working Group who were present and its Chairman excused themselves for the fact that the minutes of the 34th meeting were not ready, the person assigned the task of preparing them not having been able to attend this meeting. Examination of those minutes was therefore put off to a later date. Started at 10:53, the meeting was closed at 15:53.

TASKS TO BE ACCOMPLISHED		
TASKS	MAIN PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

For the PRCMR Project,
Chocquet N'DOBE di SOKI,
Rapporteur

For approval,
Richard MATANDA
Chairman of the Working Group

04 Minutes of TG

République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule Infrastructures

PROCES-VERBAL DE LA REUNION TECHNIQUE TENUE LE 19 JANVIER 2018 A LA CELLULE INFRASTRUCTIURES

PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Friday, January 19, 2018
Duration	The meeting started at 10:20 and ended at 11:25.
Place	Meeting room of CI
Meeting called by	La Cellule Infrastructures
Participants	***See the annexed attendance list***
Agenda	Analysis of ways and means of ensuring the diligence of maintenance of certain arterial roads of the capital in the framework of the PRCMR Project

How the meeting proceeded	At the invitation of CI the focal points of the entities of MITPR (OR, OVD and ACGT) met on Friday, January 19, 2018, in the meeting room of CI for the analyzing the ways and means of application of diligence for ensuring maintenance of certain arterial roads of the capital that have suffered deterioration due to recent rains, particularly Boulevard Congo-Japon, RN 43, Avenue Tourisme, Avenue Biangala, etc. Before taking up the subject of maintenance of arterial roads of the capital, the activities of the PRCMR Project were reviewed for the focal points present, the essence of that review being summarized as follows: **1. Formatting of the draft of the Asphalt Paved Road Maintenance and Repair Manual** The focal points were informed of finalization of the draft of the manual by a subcommittee composed of some members of the Working Group in charge of preparing that manual. That draft was sent to the Project Manager in December 2017. Presentation of the formatted draft to the members of the Technical Group will take place on Thursday, January 25, 2018, at the 4th meeting of the Technical Group. **2. Inspection** Regarding inspection the focal points were told that the inspection scheduled for December 2017 did not take place because of a technical problem with the camera, the same problem as that encountered in September. After several exchanges with the Japanese experts the Congolese trainees were able to remedy the problem, and the inspection was rescheduled for January 19, 2018, today. In the opinion of the focal points it would be better to replace the equipment if the problem persists, all the more so since establishment of the data base is

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	one of the objectives to be attained in the PRCMR. **3. Construction of the Offices of the PRCMR Project** The focal points were informed that CI has been waiting since December 31, 2017, for DGCMP's "no objection" opinion on the tender documents for the work of construction of the offices for the PRCMR Project on the grounds of LNTP. Barring unforeseen circumstances, publication of the above-mentioned tender documents will take place at the end of January 2018, and the work will start in March 2018. **4. 2nd Stage of Training in Japan** Regarding the 2nd stage of training of the Congolese counterparts in Japan, it was announced that the Project Manager is going to provide a list of eight candidates in February. The focal points insisted that the Project assume the expenses of the training mission. Some actions must be taken in advance for mobilization of those funds before the training, which is scheduled for March 2018. **Maintenance of certain arterial roads of the city of Kinshasa in the framework of the PRCMR Project** The focal points agreed that maintenance work be increased on several arterial roads of the city for visibility of the PRCMR Project. That will be an opportunity for the Congolese trainees of OR, OVD, BTC, ACGT and FONER to apply the theory learned in classroom and on-the-job training from the Project's Japanese experts. Awaiting mobilization by FONER of the remaining funds requested by CI, the focal points have asked for the maintenance work to be carried out on the following arterial roads: Boulevard Congo-Japon (sealing of cracking), RN 43 (sealing of cracking), Avenue Biangala (overlay), etc. The other avenues (Entrée Kiyimbi, Jonction Banunu – Boulevard Lumumba, Tourisme, Lumumba, etc.) will be undertaken later. Regarding Boulevard Congo-Japon, the focal points proposed that the deterioration observed on 15ème rue, which is considered to be due mainly to the heavy traffic on that avenue and to required implementation of a starting section of rigid pavement, be undertaken by DPK/OVD in the framework of the FONER maintenance program, which would make it possible to avoid departure from the scope of application of the Project, i.e. maintenance of asphalt paved roads. Started at 10:53, the meeting was closed at 15:53.
TASKS TO BE ACCOMPLISHED	
TASKS	THOSE RESPONSIBLE / TIME ALLOWED FOR

	FOR THEM	ACCOMPLISHMENT
SIGNATURES		

For OR

Enoch SANGANA
Training Director

Jean-Paul MAVUNGU
Data base expert

For OVD

Richard MATANDA
Programming and Planning Director

Léon MUTOMBO
Programming and Planning Sub-director

For ACGT

Michel DINGANGA
Head of Division Voiries

For CI

Chocquet N'DOBE
Engineer supporting CI

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République Démocratique du Congo

MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION

Cellule Infrastructures

MINUTES OF THE WORKSHOP FOR PRESENTATION OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL
PROJET POUR LE RENFORCEMENT DE CAPACITES EN MAINTENANCE DES ROUTES

Date	Thursday, October 18, 2018
Duration	Meeting started at 10:15 and ended at 12:08
Place	OKAPI Room of INPESS (ex IEMK)
Workshop convened by:	La Cellule Infrastructures
Secretariat	Chocquet N'DOBE, Supporting Engineer at Section Voiries
Agenda	1. Opening words 2. Introduction of the participants 3. Presentation of the agenda 4. Introduction of the members of Group 1, in charge of preparation of the manual 5. Presentation of the asphalt paved road maintenance and repair manual 6. Remarks and discussion 7. Closing words
Course of the workshop	**0. Introduction** The workshop for presentation of the asphalt paved road maintenance and repair manual was held as scheduled in the OKAPI Room of Institut National Pilote de l'Enseignement des Sciences de Santé (INPESS), ex IEMP, on Thursday, October 18, 2018. **1. Opening words** The opening words of the workshop were delivered by Mr. Véance, advisor in charge of roads of His Excellency the Minister of ITPR and Chairman of the Joint Coordination Committee, in representation of the road advisor of His Excellency the Minister of ITPR and Chairman of the Joint Coordination Committee of the PRCMR Project, who was not able to attend. In his remarks he solemnly hailed the considerable work done by the MITPR team under the supervision of the JICA experts. He expressed the wish to see that document used by everyone with a view to sustainability of what has been learned in the training in the PRCMR Project and to improvement of the road infrastructures of the RDC. After reiterating the thanks of the MITPR to all the donors of the RDC for their decisive support to the road sector and wishing full success to the work of the workshop and to the whole Project team, he declared the workshop for presentation of the asphalt paved road maintenance and repair manual open.

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2. Introduction of the participants

Going around the room, each participant introduced himself in turn. That was led by CI's person in charge of communication.

3. Presentation of the agenda

The agenda of the meeting was presented by CI's person in charge of communication.

4. Introduction of the members of Group 1

After a brief reminder by the Chairman of the Group, Mr. **Richard MATANDA** of OVD, of the history of the work done in preparation of the manual, during which he reminded the participants that the document produced was the result of many meetings of the Group, the members of the Group introduced themselves in turn.

A minute of silence was observed in memory of Mr. Jean-Pierre MUTAMBA, former Head of Sections Voiries and Chairman of the 1st Working Group, who passed away on January 9, 2017, at the Ngaliema clinics.

5. Presentation of the asphalt paved road maintenance and repair manual

Two members of Group 1, Mr. Pascal BULONGO of FONER and Mr. Fils ZENGA of BTC, presented the contents of the asphalt paved road maintenance and repair manual to the participants in the workshop.

They said the following:

- The manual thus produced is the result of 106 meetings, starting from September 7, 2016.
- The presented manual represents improvement of a basic document proposed by the JICA Japanese team for adaptation to the realities of the RDC.
- Many amendments were made to the final version of the manual on the basis of comments obtained in four preceding meetings of the Technical Group.
- The manual consists of eleven (11) chapters: (i) overview of asphalt paved road maintenance and repair, (ii) work implementation structure, (iii) work planning and implementation, (iv) road safety and environmental measures, (v) Diurnal and nocturnal visual patrol, (vi) maintenance and repair plan, (vii) maintenance methods, (viii) reconditioning methods, (ix) quality control, (x) data base and (xi) supervision of the work.

6. Exchanges of opinion

The exchanges between the participants can be summarized as follows:

1. **Remarks by Mr. Damien MANYAMALA, Specialist in Conclusion of Contracts (SPM) of CI**

He wanted, first of all, to know if the private sector has been involved in preparation of the manual since measures should be taken for application thereof.

That idea of association of private enterprises with preparation of the manual for a much wider application was also taken up by Mr. Michel UYUMBU, President of Corporation Nationale des Ingénieurs BTP.

	His second concern was taking maintenance of drainage structures into account in the manual. In response to the first words by the SPM of CI, Professor MUZYUMA reminded those present that since the Government is the sole owner of the roads, it was not necessary to associate private enterprises with preparation of the present manual. He proposed for the sake of informative and educational influence of the manual in universities and other institutes of higher education that informative sessions on the subject be organized for their faculty members with a view to updating of their courses of instruction. **7. Closing words** The meeting ended with closing words by the Advisor of His Excellency the Minister of ITPR in charge of logistics, who reiterated the thanks of the MITPR to the donors of the RDC for their support of development and sustainability of the road structures of the RDC, especially JICA. Started at 10:15, the meeting was closed at 12:08.

TASKS	MAIN PERSON(S) RESPONSIBLE	TIME ALLOWED FOR ACCOMPLISHMENT

SIGNATURES

Rapporteur

Chocquet N'DOBE of SOKI,
Supporting Engineer at Section
Voiries / CI

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05 Comment for Technical Guidelines

1. Chapter I

Page 19:

- Second paragraph: reference number to be put at the end of the paragraph.
- Fourth paragraph: replace “ruts” with “deformations”.
- In the last paragraph: “Figure 1.1 below”.

Page 23:

- Omission of the numbering of the different tables.

Page 27:

- Put the appropriate photos for ruts (deformations).

2. Chapter II

- Omission of the numbering of the different tables in general.

Page 38:

- See the Ministry to obtain an updated organizational chart.

Page 39:

- Add “the Internet” as a means of communication.

3. Chapter III

- Change of font and line spacing starting from page 51.

4. Chapter IV

- Nothing to mention.

5. Chapter V

- Nothing to mention.

6. Chapter VI

Page 72:

- Enumerate the types of deterioration, giving the definition, causes, development and repair technique thereof.

Page 73:

- Enlarge the photos, explaining the different types of deterioration.

Page 81:

- Define in text form and leave only the formula as regards the rate of cracking.

Page 86:

- Table 6.3, probable main causes.

Page 88:

- Formatting problem (alignment).

7. Chapter VII

- Nothing to mention.

8. Chapter VIII

Page 100:

- Formula for calculation of the pavement course missing.

Page 103:

- Project a formula of traffic movement.

9. Chapter IX

Page 111:

- Add the sand equivalent test for formation level soil.

Page 113:

- Insert the figure of the asphalt plant.

Page 118:

- Temperature of laying of the mix: 135 ºC – 150 ºC.

Page 122:

- Mention the allowance value regarding the slope of the course.

Page 124:

- Say something about the embankments contiguous to the drainage structures and engineering structures as well.

Page 128:

- Maintain a single nomenclature for concrete batching and strength.

Page 129:

- Do not give the form of the concrete samples.

Page 131:

- Put “samples” in place of “cylinders”.

10. Chapter X

- Nothing to mention.

11. Chapter XI

Page 147:

- Replace “lower” with “check” in point 11.8.

Annexes

- Add “coring rig” as laboratory test equipment.

With the above, BTC encourages the different working groups that have participated in preparation of this manual and hopes that the different remarks and suggestions will be taken into account for the sake of improving the manual

The Director General ad interim

(signed)

Joseph KISAKA AMAY

Construction Civil Engineer

République Démocratique du Congo
Ministère des Infrastructures, Travaux Publics et Reconstruction

BUREAU TECHNIQUE DE CONTROLE

Kinshasa, Feb. 16, 2018

Cellule Infrastructures
Received: 16.02.18
By: Pierrette
Registration No.: 0278118
Initials:

No. BTC / DG / 00 / 00 / 0045 / JKA / FMK / 2018

To: Coordinator of Cellule Infrastructures at Kinshasa/Gombe

Re: Projet pour le Renforcement de Capacités en Maintenance des Routes. Submittal of BTC's comments on the amended draft of the Asphalt Paved Road Maintenance and Repair Manual

Dear Sir:

I am pleased to send you, attached hereto, the BTC's comments on the draft of the Asphalt Paved Road Maintenance and Repair Manual as amended on the basis of our previous comments.

Sincerely yours,

Director General *ad interim*
(signed)
Joseph KISAKA AMAY
Construction Civil Engineer

Cellule Infrastructures
Date: Feb. 16, 2018
No. 0278

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Kinshasa

INFORMATION NOTE NO. BTC/DT/NI/00/00/00088/JKA/FMK/2018
FOR THE ATTENTION OF THE COORDINATOR OF CELLULE INFRASTRUCTURES
AT KINSHASA/GOMBE

Re: **Projet pour le Renforcement de Capacités en Maintenance des Routes. Submittal of BTC's comments on the draft of the Asphalt Paved Road Maintenance and Repair Manual as amended on the basis our previous comments.**

After analysis of the received draft of the Asphalt Paved Road Maintenance and Repair Manual, Bureau Technique de Contrôle (BTC) has formulated the following remarks and suggestions for the different chapters:

1. Chapter I
Page 20:
- Second paragraph: the reference to be put at the end of the paragraph.
- OK - Fourth paragraph: replace "ruts" with "deformations".

2. Chapter II
Page 38:
- In point 2.4.1 add "the Internet" as a means of communication.

3. Chapter VI
Page 76:
- OK - Add the photo showing glaze.

Page 85:
- OK - Table 6.3: better to give the probable main causes.

4. Chapter VIII
Page 102:
- Formula for calculation of the courses of the pavement missing.

Page 103:
- Project a traffic movement formula.

5. Chapter IX

Page 112:

- Add the sand equivalent test for the soil of roadbed

Page 119:

- Third paragraph: temperature of 135 ºC - 150 ºC for laying of the asphalt mix to be indicated.

Page 122:

- In point 9.4.4 mention the allowance value regarding the slope of the course.

Page 124:

- Say something about the embankments contiguous to the drainage structures and engineering structures as well.

Page 128:

- Maintain a single nomenclature for concrete batching and strength.

Page 130:

- In point C) put “samples” in place of “cylinders”.

IV. Conclusion

Considering the above, BTC encourages the different working groups that have participated in preparation of this manual and hopes that the various remarks and suggestions will be taken into account for objective improvement of the manual.

Kinshasa, February 15, 2018

(seal)
Bureau Technique de Contrôle
Director General *ad interim*
(signed)
Joseph KISAKA AMAY
Construction Civil Engineer

REPUBLIQUE DEMOCRATIQUE DU CONGO
MINISTERE DES INFRASTRUCTURES, TRAVAUX PUBLICS ET RECONSTRUCTION
BUREAU D'ETUDES D'AMENAGEMENT ET D'URBANISME

COMMENTS FOR FINAL APPROVAL OF THE DRAFT OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

Bureau d'Etudes
d'Aménagement
et d'Urbanisme

FEBRUARY 2018

COMMENTS ON FORM

No.	Pages	Comments	Proposals/Corrections
1.	9	BEAU	BEAU : Bureau d'Etudes d'Aménagement et d'Urbanisme
2.	81	- Fig. - last §, last line: (the greater of the values D1 and D2	Fig. 6.16 Measurement of Offset (the larger value between D1 and D2)
3.	88	6.7.4 Selection of Repair Method 1st §, 2nd line: "referring to formula 6.3 and …	Question: Is it formula 6.3 or Table 6.3?
4.	90	Fig. 6.20 illegible (in the annex)	Fig. 6.20 makes that visible (in the annex)
5.	91	5th §, 2nd bullet point … in the bases… and the	… in the bases and the subgrade;
6.	110	§1…their asphalt pavement	§1…asphalt pavements
7.	111	9.3., 1st bullet point (asphalt mixes, emulsions, crushed materials, concrete, etc.), impacts	(asphalt mixes, emulsions, crushed materials, concrete, etc.)
8.	116	e) subbase layer and shoulder consisting of crushed materials The materials for … are to be natural crushed materials with …	… crushed materials … natural crushed materials
9.	130	last §, 3rd line 28 days the Contractor must…	28 days, the Contractor…
10.	141	11.3 the management cycle 1st line: cycle indicated	Cycle indicated
11.	142	(in the annex)	(in the annex)

COMMENTS ON CONTENT

No.	Pages	Comments	Proposals/Corrections
1.	44	2.5.2 Personnel, last bullet point	2.5.2 Personnel, to be added: a mechanic/machine repair man
2.	94	7.4 Surface Treatment	7.4 Surface Treatment Add the following § after the 1st §: "If roughness decreases, it is advisable to carry out chipping by laying a carpet of rough asphalt mixes with 0/14, for example (source: suggestion by Direction des Ponts et Chaussées)
3.	96	Table 7.1 Title of the 3rd column: Work implementation method	Table 7.1 Replace the title by: "Work implementation method guidelines for the work" Source: suggestion by Direction des Ponts et Chaussées)
4.	107	Table 8.7 Title of 3rd column	Table 8.7 Title of 3rd column : as above (Table 7.1)

(5) Recycling

Planning → Development → Control → Action (P→D→C→A) is a cycle that requires continual repetition.

The diagram of supervision of the work is given in Fig. 4 below.

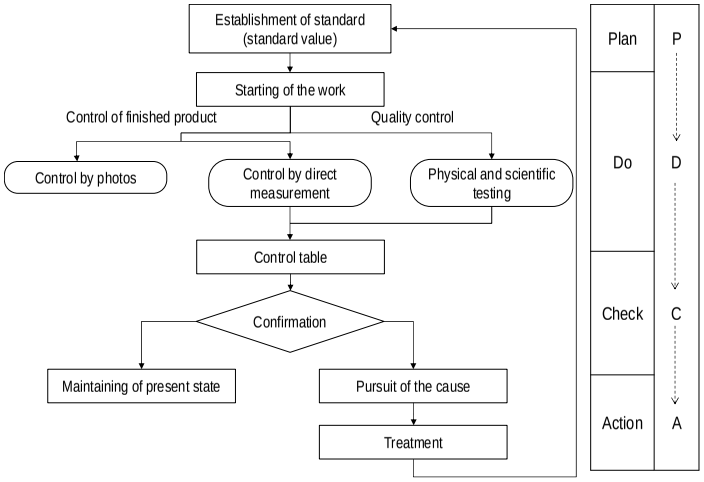


Figure 11.2 Diagram of Supervision of the Work

11.4 The Components of Supervision of the Work

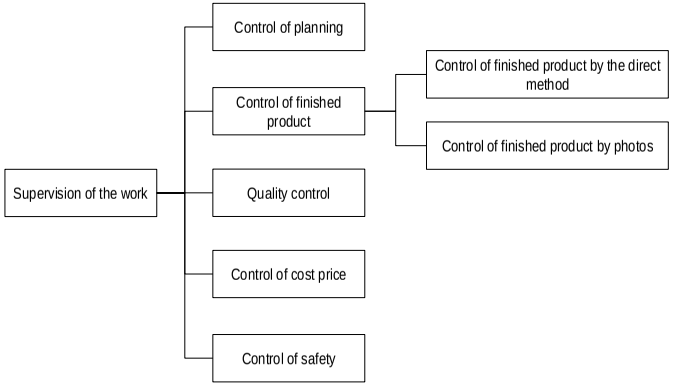


Figure 11.3 The Components of Supervision of the Work

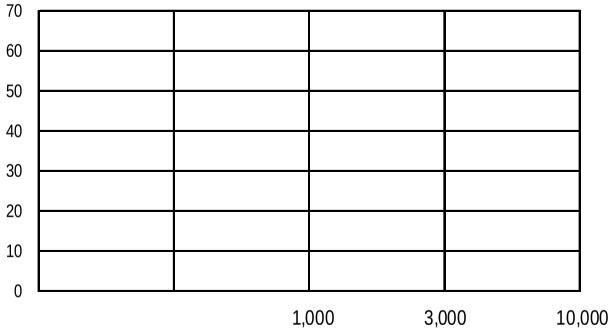


Figure 6.20 Typical Example of a Maintenance and Repair Technique According to Rate of Cracking and Present Traffic Volume

6.8 Classification and Evaluation of Deterioration of Road Drainage Structures

6.8.1 Presentation and Classification of Usual Road Drainage Structures

Road drainage structures are generally made of rubble wall masonry, solid blocks and ordinary or reinforced concrete.

The usual drainage structures used for Congolese paved roads are:

- longitudinal and transverse ditches (drainage channels)
- box culverts
- metal or concrete barrel culverts
- main sewers
- catch pits

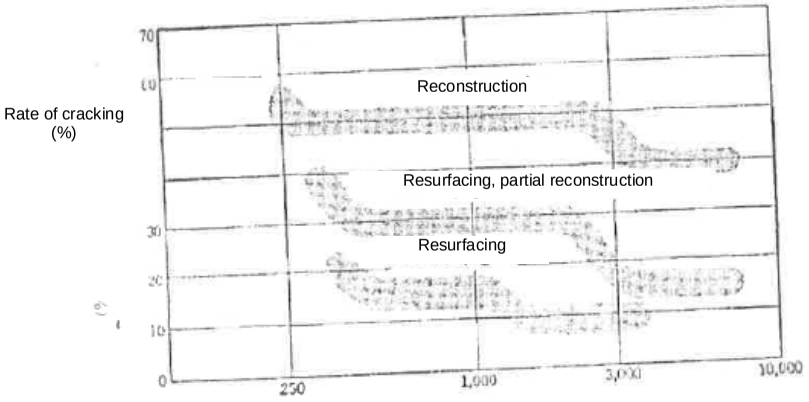
6.8.2 Deterioration of Road Drainage Structures

Road drainage structures are subject to the following common types of deterioration:

- Cracking of the walls
- Coat detachment
- Damage to foundation raft
- Broken or detached solid blocks
- Sheet schistosity of the rubble
- Wear of pavement
- Damage to mortar by acid water

Table 6.7 Maintenance Techniques According to Rate of Cracking (250 trucks per road a day)

Rate of cracking (%)	Maintenance and repair method
5-10%	Partial seal coat
11-30%	Requires a seal coat over the whole surface or partial patching or both
31% or more	Resurfacing, cutout and reconstruction, or reconstruction



Present traffic volume (truck traffic volume) (trucks/road/day)

Figure 6.20 Typical Example of a Maintenance and Repair Technique According to Rate of Cracking and Present Traffic Volume

6.8 Classification and Evaluation of Deterioration of Road Drainage Structures

6.8.1 Presentation and Classification of Usual Road Drainage Structures

Road drainage structures are generally made of rubble wall masonry, solid blocks and ordinary or reinforced concrete.

The usual drainage structures used for Congolese paved roads are:

- longitudinal and transverse ditches (drainage channels)
- box culverts
- metal or concrete barrel culverts
- main sewers
- catch pits
- slope drainage channel (water diverter)

COMMENTS OF THE FONDS NATIONAL D'ENTRETIEN ROUTIER "FONER" ON THE DRAFT OF THE ASPHALT PAVED ROAD MAINTENANCE AND REPAIR MANUAL

A. GENERAL OPINION

Generally, this draft is very well structured, and, once it is validated, it will make it possible for the RDC to have a reference practical guide for carrying out asphalt paved road maintenance and repair work.

B. SPECIFIC COMMENTS

Some misprints and inaccuracies that need to be corrected were noted, including the following:

1) Page 2: paragraph 1: correct "Fonds d'Entretien Routier" to "Fonds National d'Entretien Routier".

2) Page 9: please delete one "PRCMR", which was mentioned twice, and correct RATPK (Régie d'Assainissement des Travaux Publics de Kinshasa), which was confused with RDC in the list of acronyms and abbreviations.

3) Page 10: concerning the list of tables, it is necessary to bring "characteristic" into line with "classes" on the line of Table 8.1.

4) Page 11: concerning the list of figures, please capitalize "v" in "vue" in figures 4.2 and 4.3.

5) Page 13: in paragraph 1 of the text it is necessary to correct "role capitale" to "role capital".

6) Page 14: before point 0.2, "Scope of Application of the Manual" it is necessary to state that the le Projet pour le Renforcement de Capacités en maintenance des Routes (PRCMR) is piloted by the CI on the basis of financing by JICA and FONER as the counterpart representing the Government of the RDC.
   Also on page 14: at the bottom of the page it is necessary to mention the fact that the RDC has a coastline of about 40 km on the Atlantic Ocean.

7) Page 15: in paragraph 4 it says the length of OVD's road network is not more than 7,400 km but rather 8,213.31 km. Need to identify the source of that change.

8) Page 17: in Table 0.2 it says regarding the total of the length of paved roads and the length of earth roads that there was variation of the total length from 2,162.72 km in 2010-2012, to 2,111.43 km in 2013, 2,109.26 km in 2014-2015 and 2,662.43 in 2016. The difference in length between 2010 and 2016 is 499.71 km, i.e. about 500 km. That variation over time should be explained.

9) Page 20: in paragraph 1 we propose adoption of the following formulation: "Roads constitute one of the main factors of economic and social development of a country. They are a part of social capital at the most elementary level in the sense that they serve as links between centers of production and centers of consumption, …"

10) Page 31: paragraph 3 of point 1.3.6: it is necessary to correct "il s'en suit une evaluation" to "il s'ensuit une evaluation…".

11) Page 35: concerning the organizational chart of Ministère des Infrastructures, Travaux Publics et Reconstruction, it is important to show the links existing respectively between FONER and BTC regarding budget and between BTC and DVDA regarding quality management as well as the administrative and technical link existing between BTC and MITPR.

12) Page 61: Table 4.2: need to say: "…precautions to be taken in connection with asphalt mix laying operations.

13) Page 67: point 5.4.3 on planning and implementation of inspections: please correct "s'en suivre" to "s'ensuivre" in the fourth bullet point.

14) Page 71: point 6.3 on classification of pavement deterioration: concerning surface deterioration it is necessary to correct the text to "…sont essentiellement dues aux mauvaises propriétés et/ou à une mauvaise mise en oeuvre de l'enrobé".

15) Page 88: Table 6.5 concerning the target values for evaluation of the need for maintenance or repairs: what about interpretation of the values of that table?

16) Page 91: point 6.8.3 on maintenance of road drainage structures: it is necessary to correct "les assises" in the third bullet point of the third paragraph.

17) Page 96: please correct "Table 7.1" to "Table 7".

18) Page 98: point 7.7 on maintenance methods of road drainage structures, paragraph 2, first bullet point, first hyphen: please complete with "(unless the aim is to momentarily store the water: peak control stormwater ditch)".

19) Page 103: point 8.2.2 on classes of deflection and traffic: Shouldn't Table 8.2 on that page be reconsidered to take into account the current regulations in the RDC on control of vehicle load, particularly Interministerial Decree No. CAB/ECO&COM/002/2014, No. CAB/MIN-ATUHITPR/009/2014, No. CAB/MIN/TVC/001/2014, No. CAB/MIN/FINANCES/027/2014 of April 29, 2014, modifying and completing the Interministriel Decree of June 3, 2011, on measures for protection of national road assets, since for any vehicle, articulated or not, including the trailer, the axle load is presently set at an average of 9 tons per axle and no longer 13 tons per axle?

20) Page 118: point 9.4.1 concerning control of laying of the asphalt mix: we think a "slip of the pen" made it say that the Owner reserves the right to take at least one core sample per 1,000 m2 of asphalt concrete laid or ***at most*** (instead of "at least") 4 core samples per day of laying work.

21) Page 122: point 9.4.4 on height allowances: the allowances for the slope of the layer has not been indicated. Was that forgotten?

22) Page 142: concerning the recycling diagram: it is necessary to correct "essai phisique" to "essai physique et scientifique".

23) Page 142: point 11.4 on the components of work supervision: it is necessary to correct "priduit ou produi fini" to "***produit*** fini".

Kinshasa, February 22, 2018

For FONER
Robert LENDO LENDO
(signed)
Technical Director

ANNEX 5: Monitoring Sheet (copy)

01 Monitoring Sheet – Version 1

TO CR of JICA D. R. Congo Office

PROJECT MONITORING SHEET

Project Title: The Project for Capacity Development of Road Maintenance Management
Version of the Sheet: Ver.1（Term: 6 June-6 July 2016 ）

Name: Mr. Nobuharu SHIMIZU
Title: Leader/Road Maintenance Plan
Prepared on July 7, 2016, Submission Date: July 13,2016

I. Summary

1. Progress

1-1 Progress of Inputs

(1) The DRC Side

1) **Counter personne**l were identified. The Chairperson from the Ministry of Infrastructures and Public Works (MIPW), the Coordination Secretary from the Cellule Infrastructures, MIPW, and the Vice Chairperson from Fonds National d'Entretien Routier (FONER) were officialy positioned. Also the Project Managers and the Deputy Project Managers as well as the administrative personnel of both sides are in position. Moreover, an official who is in charge of monitoring and evaluation for Cellule Infrastructures was assigned to oversee monitoring and evaluation for the Project, and will work with the JICA expert;

2) **Furnished office space** was provided with necessary utilities;

3) **Administrative and operational costs** were shouldered as required, specifically during the initial stage:

(2) The Japanese Side

1) Total seven **JICA experts** were deployed as planned for this particular target period;

2) **Office set-up** has been almost completed.

1.2. Progress of Activities

(0) Activities for the general issues:

1. A Kick-off meeting was held on 8th June 2016 in order to obtain more understandings of JICA technical cooperation project and to comprehend function of the concerned parties of the DRC side.

2. - The counterparts (C/Ps) and the JICA experts conducted several site visits, for instance, RN 1, RN 43 and RP 118 which are under the supervision of OR. Likewise, Av.Victoire, Av. Gambela, Bld. Sendwe, Av.Poids Lourds, and etc. were visited by the JICA exerts guided by the OVD C/Ps. These exercises led the JICA experts to understand the actual situation on the ground.

3. A preparatory meeting for the 1st Joint Coordination Committee (JCC) and several other follow up meetings were held starting from 29th June 2016 till right before the 1st JCC.

4. The 1st JCC was held on 6th July 2016 and the participants for that meeting were;

The Ministry of Infrastructures and Public Works (MIPW):
Legal Advisor of Minister of MITP, representing the *Director of Cabinet;*
Advisor of Minister of MITP in Charge of Roads and Bridges, (Head of JCC),

JICA :
Resident Representive of JICA in RDC
Deputy Resident Representive of JICA in RDC
Deputy Director of Programs

Cellule Infrastructures :
Coordinator (Secretary of JCC)
Head of Road Section,
Official in Charge of Communication

Founds National d'Entretien Routier (FONER) :
Technical Director

Office des Routes (OR):
Technical Coordinator,
Director of Training

Office des Voiries et Drainage (OVD):
General Director,
Assistant of the General Director,
Officials from Planning and Program Division,
Logistic and Equipment Manager

Bureau Technique de Contrôle (BTC)
Technical Director
Head of Analysis and Expertis Division

Direction des Ponts et Chaussées (DPC :
Director
*Chief of Divi*sion

Donor Agency:
Belgian Development Agency

-The Project Work Plan was approved by the 1st JCC, and the Project will be implemented in accordance with this Plan which also has annual based plans.
-Current situation has been carefully observed so as to identify the contents of the baseline survey to fix the Performance Indicators, which remain unset in the Project Design Matrix (PDM). Once the contents were determined, the baseline survey will be conducted and the survey results will be analyzed accordingly.

(1) Activities for OP1:

-"1.1 Review of the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD" has been jointly done by the C/Ps and the JICA experts having series of discussions and site visits. The major findings are as follows;
1.Majority of the staff who are involved in the AP road maintenance work have not enough working experiences and knowledge,
2. The existing inspection system for the road damage has room for improvement,
3.Similarly the inspection reporting format has room for improvement.

-"1.2 The most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD" have been gradually identified based on the analysis of the above findings (problems), and those will be applied throughout the project period.

-"1-3 The road network to be covered by the Project will be defined" by the end of September 2016.

(2) Activities for OP2:

-"2.1 Review the current AP road maintenance works of OR and OVD" has been carried out partially by interviewing the concerned officials, and the actual observation on the ground will be done by mid- August. The progress of this activity is slightly delayed due to the delay of the DRC side response for the questionnaires. The answers for the questionnaires will be submitted to JICA expert team shortly.
-The major findings at this stage are as follows;
1. Most of the officials explained that lack of budget is a critical obstacle to prevent them from doing their maintenance work properly and regularly.
2. The inspection is carried out visually,
3. Data base has not been updated, and so forth.

-"2-2 Collection and review of the current AP road maintenance manuals and technical guidelines" have been conducted partially, and these will be continued till the end of July 2016.

-"2-3 The Working Group (WG) for developing technical guidelines on AP road maintenance" will be established around mid-July 2016. Currently it is in a process of identifying the appropriate members for the WG.

-"2.4Developing and drafting technical guidelines on AP road maintenance" have been commenced. At this stage, series of observation and information gathering have been taken place in order to start drafting the guidelines, and the guideline contents have been gradually set.

(3) Activities for OP3:

-OP 3 related activities will be commenced around September 2016.

1-3 Achievement of the Outputs

-N.A.

1-4 Achievement of the Project Purpose

-N.A.

1-5 Changes of Risks and Actions for Mitigation

- As per the JICA Risk Management Check List, no risks have been observed during the initial month of the Project. Also other events and issues that may become a risk to the Project were not recognized during this reporting period. However, it should be taken note that careful observation on the Presidential election related movements is required (current President's assignment will be expiring on 20 December 2016). The JICA experts will follow the guidance given by JICA as well as the Embassy of Japan in the DRC for any foreseeable circumstances.

1-6 Progress of Actions undertaken by JICA

- The official procedures taken by the DRC side for dispatching the experts have been supported for smooth implementation.

1-7 Progress of Actions undertaken by Gov. of the DRC

-In line with the inputs by the DRC side, the photocopies of the official documents to appoint C/P personnel have been submitted to the JICA expert team. Also actual participation of the said personnel to the Project has been well secured.

1-8 Other remarkable/considerable issues related/affect to the project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs, etc.)

-N.A.

2 Delay of Work Schedule and/or Problems (if any)

-The JICA expert team (1st batch) was finally arrived in Kinshasa on 5th June 2016 with 2 months delay due to the official documentation procedure in the DRC, which took longer than expected. However, the JICA experts will be able to manage the Project progress not to be affected by such incident. Thus no major delay has been seen during the initial month of the Project, and the 1st JCC was held on 6th July 2016 as scheduled.

-No major problems faced so far.

3 Modification of the Project Implementation Plan

-The Project proposed some modifications of the PDM from which outlined in the RD (signed in December 2015) to better correspond to the circumstances of the Project. The basic ideas for such modifications are; 1) More specific, 2) More details, and 3) Both quantative and qualitative aspects to be considered (if applicable) The proposal of a set of modifications mentioned above was approved by the 1st JCC and reported to JICA DRC Office and the JICA HQs (ref. to the attached Monitoring Sheet I; red marked parts have been modified).

3-1 PO

-Based on the delay of the Project commencement as explained above, the PO (Monitoring Sheet II) was altered accordingly. However, no negative impact is foreseeable in terms of the Project progress at this stage.

3-2 Other modifications on detailed implementation plan

-N.A.

4 Preparation of Gov. of the DRC toward after completion of the Project

-N.A.

II. Project Monitoring Sheet I & II

See attached.

Project Monitoring Sheet I （Revision of Project Design Matrix）

version 1

Dated: 7 July, 2016

Project Title: The Project for Capacity Development of Road Maintenance Management

Inputs		Plan / Actual	2016 Ⅱ	2016 Ⅲ	2016 Ⅳ	2017 Ⅰ	2017 Ⅱ	2017 Ⅲ	2017 Ⅳ	2018 Ⅰ	2018 Ⅱ	2018 Ⅲ	2018 Ⅳ	2019 Ⅰ	Remarks	Monitoring: Issue	Monitoring: Solution
Expert																	
Leader / Road Maintenance Plan 1	9.60	Plan															
		Actual															
Sub-Leader/ Road Maintenance Plan 2	10.50	Plan															
		Actual															
Road Inspection	9.90	Plan															
		Actual															
Pavement Repair	12.00	Plan															
		Actual															
Road Inspection (Databese)	10.07	Plan															
		Actual															
Pavement Repair (Construction Supervision)	5.80	Plan															
		Actual															
Coordinator	10.43	Plan															
		Actual															
Monitoring and Evaluation	3.10	Plan															
		Actual															
Training Plan	0.60	Plan															
		Actual															
Equipment																	
Equipment for database system		Plan															
		Actual															
Training in Japan																	
Training for Counterpart Personnel		Plan															
		Actual															

Activities / Sub-Activities	Plan / Actual	2016 Ⅱ	2016 Ⅲ	2016 Ⅳ	2017 Ⅰ	2017 Ⅱ	2017 Ⅲ	2017 Ⅳ	2018 Ⅰ	2018 Ⅱ	2018 Ⅲ	2018 Ⅳ	2019 Ⅰ	Responsible Organization: Japan	Responsible Organization: GoDRC	Achievements	Issue & Countermeasures
Output 1: Asphalt paved (AP) road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites.																	
1.1 Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites	Plan													JICA	OR/OVD	Completed:it had taken a bit more time than expected due to the preparation.	No major issues.
	Actual																
1.2 Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites	Plan													JICA	OR/OVD	In progress	
	Actual																
1.3 Define the road network to be covered by the project	Plan													JICA	OR/OVD		
	Actual																
1.4 Conduct traffic volume survey on some sections of the defined road network	Plan													JICA	OR/OVD		
	Actual																
1.5 Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites	Plan													JICA	OR/OVD		
	Actual																
1.6 Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request	Plan													JICA	OR/OVD		
	Actual																
Output 2: Technical guidelines on AP road maintenance are developed.																	
2.1 Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites	Plan													JICA	OR/OVD	In progress:the questionnaires was sent to the DRC side and due date was 24 June 2016	The answers for the questionnaires will be submitted to the JICA experts shortly
	Actual																
2.2 Collect and review the existing AP road maintenance manuals and technical guidelines	Plan													JICA	OR/OVD	In progress: continued till the end of July 2016	
	Actual																
2.3 Establish the Joint Working Group for developing technical guidelines on AP road maintenance	Plan													JICA	OR/OVD	In progress: it's in a stage of identifying the WG members	
	Actual																
2.4 Develop and draft technical guidelines on AP road maintenance	Plan													JICA	OR/OVD	In progress: Guideline contents have been gradually set	
	Actual																
2.5 Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group meetings etc. and revise the drafted technical guidelines	Plan													JICA	OR/OVD		
	Actual																
2.6 Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection	Plan													JICA	OR/OVD		
	Actual																
2.7 Develop a database for accumulating the AP road inspection results	Plan													JICA	OR/OVD		
	Actual																
2.8 Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works	Plan													JICA	OR/OVD		
	Actual																
2.9 Finalize the technical guidelines	Plan													JICA	OR/OVD		
	Actual																

Activity														
2.10 Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations	●	●	○	○	○	○				Plan / Actual	JICA	OR/OVD		
2.11 Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW	●	○					○			Plan / Actual	JICA	OR/OVD		
Output 3: AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites.														
3-1.Training plan for AP road inspection and APm repair works														
3.1.1 Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works	○	○	●	●	○	○	○			Plan / Actual	JICA	OR/OVD		
3.1.2 Plan the trainings on AP road inspection and APm repair works	○	○	●	●	○	○	○			Plan / Actual	JICA	OR/OVD		
3.1.3 Select candidate sites for the trainings on AP road inspection and APm repair works	○	●	●	●	○	○				Plan / Actual	JICA	OR/OVD		
3-2. Trainings on AP road inspection														
3.2.1 Conduct baseline survey on the training participants' skills and knowledge of AP road inspection	○	○	●	○	●	○		○	○	Plan / Actual	JICA	OR/OVD		
3.2.2 Conduct lectures on AP road inspection	○	○	●	○	●				○	Plan / Actual	JICA	OR/OVD		
3.2.3 Conduct OJTs on AP road inspection at the selected sites in the project sites	○	○	●	○	●				○	Plan / Actual	JICA	OR/OVD		
3.2.4 Conduct endline survey on the training participants' skills and knowledge of AP road inspection	○	○	●	○	●			○	○	Plan / Actual	JICA	OR/OVD		
3.2.5 Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines	●	○	●	○	●	○	○		○	Plan / Actual	JICA	OR/OVD		
3.3 Training on APm Repair Works														
3.3.1 Conduct baseline survey on the training participants' skills and knowledge of APm repair works	○	○	○	●	○	●		○	○	Plan / Actual	JICA	OR/OVD		
3.3.2 Conduct lectures on APm repair works	○	○	○	●	○	●			○	Plan / Actual	JICA	OR/OVD		
3.3.3 Conduct OJTs on APm repair works at the selected sites in the project sites	○	○	○	●	○	●			○	Plan / Actual	JICA	OR/OVD		
3.3.4 Conduct endline survey on the training participants' skills and knowledge of APm repair works	○	○	○	●	○	●		○	○	Plan / Actual	JICA	OR/OVD		
3.3.5 Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines	●	●	●	○	○	○	○		○	Plan / Actual	JICA	OR/OVD		
Duration / Phasing										Plan / Actual				

Monitoring Plan	Plan / Actual	2016 (II, III, IV)	2017 (I, II, III, IV)	2018 (I, II, III, IV)	2019 (I)	Remarks	Issue	Solution
Monitoring								
Joint Coordination Committee	Plan / Actual					1st JCC was organized on 6 July 2016		
Set-up the Detailed Plan of Operation	Plan / Actual					Completed		
Baseline Survey for Target Figures	Plan / Actual					In progress: it's in a preparatory stage		
Set-up the Target Figures within 6 months after the commencement of the project	Plan / Actual					In progress		
Submission of Monitoring Sheet	Plan / Actual					Version 1 has been completed		
Reports/Documents								
Inception Report (Work Plan)	Plan / Actual					Submitted to the 1st JCC		
Draft Project Completion Report	Plan / Actual							
Project Completion Report	Plan / Actual							
Public Relations								
Establishment and Operation of web Site	Plan / Actual							
	Plan / Actual							

Activities with fixed period
Activities to be continously condected, or with tentative schedule

02 Monitoring Sheet - Version 2

TO CR of JICA D. R. Congo Office

PROJECT MONITORING SHEET

Project Title: The Project for Capacity Development of Road Maintenance Management

Version of the Sheet: Ver.2（Term: 8 July-8 November 2016 ）

Name: Mr. Nobuharu SHIMIZU

Title: Leader/Road Maintenance Plan

Prepared on November 10, 2016, Submission Date: December 19, 2016

**The contents of the below issues are based on the planned activities during the target period of this particular monitoring (ref. to the Monitoring Sheet II for the timeframe of the respective activities).*

I. Summary

1 Progress

1-1 Progress of Inputs

(1) The Japanese Side 1) A total of eight JICA experts have been assighned for a sum of approximately 19.82 Man/Month (M/M) out of 69.60M/M, which will be the Project total assignment in the DRC. The target period for this assignment is from the commencement of the Project till November 10, 2016.

(2) The DRC Side 1) Members of two (2) Working Groups (WG, 1: Development of technical guidelines on AP road maintenance, 2: Conducting training on AP road inspection and APm repair works) have been identified and commenced respective activities as explained in "1-2 Progress of Activities (2) 2-3 and (3) 3-1-1."

(3) Because of the budget constraint of the OR (Office des Route) where the Project office locates, the electricity has been cut off. Since 25th October till 4th November 2016, the Project team had forced to work at one of the Infrastructure Unit's small meeting rooms for a temporary basis. This had certainly caused inconvenience for the Project team due to the fact that the team has not been able to secure proper working space and conditions, etc.

At the same time, the budget to run the WG activities as well as JCC has not been secured by the Congolese side, and the Project has been paying for those running costs temporarily.

1-2 Progress of Activities

(0) Activities for the general issues:

-Over all progress of the project activity is more or less as planned.

-2nd JCC was organized on 8 November 2016 having the Working Group members, and total number of the participants for the 2nd JCC was 47. The Congolese side took initiative to lead the meeting and discussions went on. However, there may be some room for improvement in terms of time management.

-A series of meetings in line with each activity had been organized for outputs 1, 2 and 3 during this target period of the monitoring.

-Establishment and operation of the web site are in progress. Project site of JICA HP and Infrastructure Unit HP have been updated from time to time. Project Newsletter recorded 2nd edition so far. On the other hand, the Project has issued a request letter to OR in Aug. 2016 to include the Project information on their website. However, so far no response has been made by the OR. The Project will follow it up with this matter and try to materialize it in near future.

1st Edition of News Letter


PROJET POUR LE RENFORCEMENT DE CAPACITE DE MAINTENANCE DE ROUTES EN REPUBLIQUE DEMOCRATIQUE DU CONGO

Lettre d'Information du PRCMR

Lettre d'information N°01 du 18 Juillet 2016

Ce qu'il faut retenir du Projet « PRCMR »

Démarrage du Projet

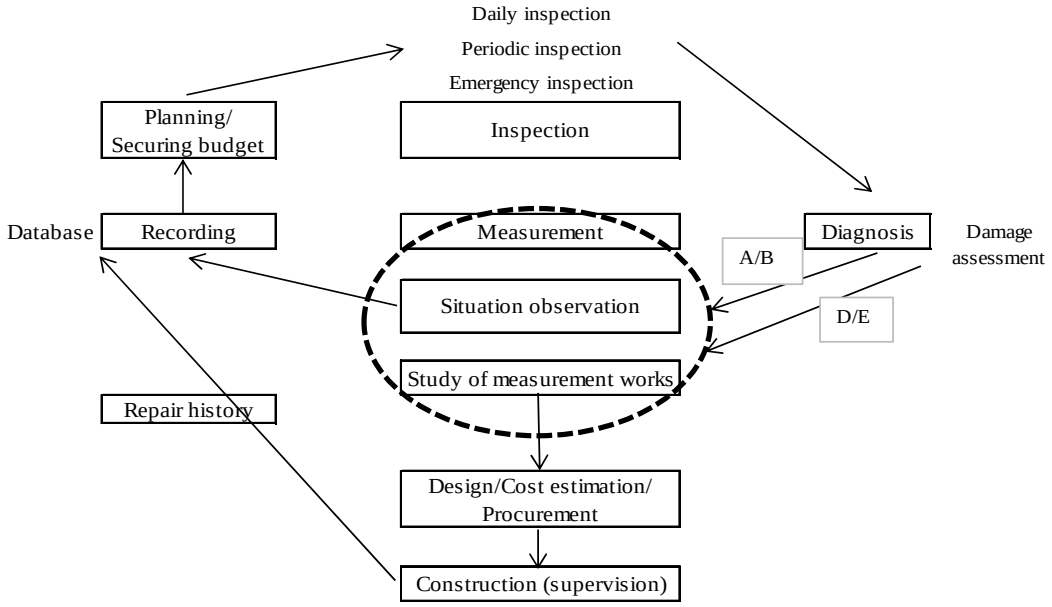
Visite de quelques artères de la ville de Kinshasa

Résultats attendus

(1) Activities for OP1: Asphalt paved (AP) road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites

-"1-2: The most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD (Office des Voiris et des Drainages) in the project sites" have been identified and those will be continuously applied throughout the Project period. Needless to say, OR and OVD are the main actors for this particular Project while Infrastructure Unit oversees the overall implementation, and Fonds National d'Entretine Routier (FONER) is a road maintenance budget authority. All concerned parties play respective roles in line with the AP road maintenance cycle.

Assessment	Condition of damage
A	Fine condition (no damage)
B	Minor damage but no problem for smooth traffic
C	Minor damage but no hindrance to the traffic (repair works required within 5 years)
D	Large-scale damage but no hindrance to the traffic (repair works required within 1 year)
E	Large-scale damage to hinder the traffic (emergency restoration required)



-"1-3: The C/Ps and the Project team have been trying to grasp the actual situation on the ground in order to define the road network to be covered by the Project". They have conducted site observation at the OR roads and OVD roads respectively. This task is aimed to be completed sometime in between January to March 2017.

-"1-4: The traffic volume survey on some sections of the defined road network" is currently suspended. The C/Ps are facing difficulty to deal with such activity because of the budget constraint. The Project has inquired this issue to the Infrastructure Unit seeking for support to materialize the survey. Currently, the Infrastructure Unit is considering sending a request letter to Agence Congolais des Grands Travaux (ACGT) to secure some funds. However, in order to do so, determination of target area for the survey is required.

(2) Activities for OP2: Technical guidelines on AP road maintenance are developed

-"2-1: Review the current AP road maintenance works of OR and OVD and analyze their problems in the Project sites" has been carried out based on the result of the interview, site observation and observation of the road maintenance as well as road repair sites. The major findings from those are below;

		Findings
Budget	Road Inspection	-Young officials have insufficient knowledge on the road inspection
		-Detailed assessment of the road damage is insufficient
		-Daily and periodic inspections have not been conducted
		-Evaluation criteria is based on the subjective data
		-Inspection has been conducted only the area that the damage is severe. Minor damage (cracks, etc.) is not recorded (Repar works are done only when the roads get bad)
	Maintenance Plan	-Database has not been updated
	Budget Allocation	-Insufficient budget
Budget Execution	Budget Execution	-Allocated badget amount is significantly reduced from the requested amount and thus maintenance works have been relatively limited
		-Budget allocation takes time and damage gets worse. Consequently, it makes the situation worse
	Work/Construction Preparation	-Insufficient construction management technology
	Repair works	-Lessons for the pavement repair works have not been organized but the offcials learn at the OJT. However, OJT is not conducted in a regular basis

-"2-2: Collection and review of the current AP road maintenance manuals and technical guidelines" have been completed. The Project team has collected and reviewed the existing manual.

- Accordingly, "2-3: The Working Group (WG) for developing technical guidelines on AP road maintenance (WG 1)" has been established. The members consist of the following officials;

	Name	Position	Institute
1	M. Jean-Pierre MUTAMBA NENE	Chief of Road Section	Infrastructure Unit
2	M. Balayi KADIMA	Coordinator	OR
3	M. Sangana MALONDA	Director of Training	OR
4	M. Joshua MUTIA	Head of Research Dept. / Laboratory	OR
5	M. Pierre WANET MUTUMOSI	Chief of Brigade 901 / Kinshasa	OR
6	M. Richard MATANDA MWAMB	Logistic Director	OVD
7	M. Leon MUTOMBO	Chief of Section of Monitoring and Evaluation	OVD
8	M. Timothée SUMAHILI	Technical Director / Provincial Direction of Kinshasa (PDK)	OVD
9	M. Pela WASAMA C.	Studies & Analysis	OVD
10	M. Jimmy NKULA	Studies & Analysis	OVD
11	M. Zico NSIALA MPUNGI	Studies & Analysis	OVD
12	M. Pascal BULONGO	Provincial Director	FONER
13	M. Patou MWA ILUNGA	Chief of Division	BTC
14	M. Willy MONDA TONA	Chief of Division	BTC
15	M. Fils ZENGA MBALA	Chief of Service	BTC
16	M. Michel DINGANGA	Chief of Road Section	ACGT

*BTC=Bureau des traveaux et construction

-Starting from late August 2016, the members gather together regularly (every Thursday) in order to "2-4: Develop and draft technical guidelines on AP road maintenance".

-Kick off meeting for "2-5: explanation and discussion for the contents of the drafted technical guidelines" was held on 24 August 2016. And the draft version of the technical guidelines has been distributed during the course of the said meeting. The table of contents is shown below;

Chapter 1: Overview
Chapter 2: Work implementation structure
Chapter 3: Work planning and implementation
Chapter 4: Schedule of work implementation and road safety measures
Chapter 5: Diurnal and nocturnal visual patrol
Chapter 6: Maintenance and reparation plan
Chapter 7: Maintenance method
Chapter 8: Reconditioning method
Chapter 9: Quality control
Chapter 10: Database

-So far, the WG meetings have been held seven times having proactive participation from majority of the members, and continue working on the draft technical guidelines. Specifically, the members have been sharing respective working experiences as well as views on the road maintenance to contribute to the discussions. Currently the draft technical guidelines are half a way. Expected timeframe for the completion of draft version will be January to February 2016;

-"2-7: Development of a database for accumulating the AP road inspection results" has been gradually taken up. It has started from interviewing with OR regarding their database which is under way. And also OVD has been interviewed. Recommended equipment for inspection/database was introduced and demonstration was organized during the WG meeting. Once those are approved by the 2nd JCC, the equipment will be purchased sometime in 2017 (expecting to be by April 2017).

(3) Activities for OP3: AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites

-"3-1-1: The members of the WG for conducting trainings on AP road inspection and APm repair works (WG 2)" have been selected, and the kick off meeting was organized 9 November 2016. The WG 2 was joined by the Chief of Road Section of Infrastructure Unit, Logistic Director of OVD,
The below list shows the selected members;

	Name	Position	Institute
1	M. Jean-Pierre MUTAMBA NENE	Chief of Road Section	Infrastructure Unit
2	M. Balayi KADIMA	Coordinator	OR
3	M. Sangana MALONDA	Director of Training	OR
4	M. Jean Paul MAVUNGU SOKANA	Database Chief	OR / HQ
5	M. Pierre WANET MUTUMOSI	Chief of Brigade 901 / Kinshasa	OR
6	M. Jonathan MAYAMBA UMBI	Site Chief	DPK Brigade
7	M. Albert MUINDILE MUTSHIPAYI	Site Chief	DPK Brigade
8	M. Guylain LUZOLO TUKITALO	Site Chief	DPK Brigade
9	M. Victor KALONDA Ka KALONDA	Site Chief	DPK Brigade
10	M. Richard MATANDA MWAMB	Logistic Director	OVD
11	M. Leon MUTOMBO	Evaluation Chief of Service	OVD
12	M. Lobo LOBO MPUMFA	Study and Project Section	OVD / HQ
13	M. Christ NSIMBULU MASAMBA	Road Section	OVD / HQ
14	M. Timothée SUMAHILI	Technical Director / DPK	OVD
15	M. Dominique NZUZI MASSAMBA	Chief of Service	BTC
16	M. Willy MONDA TONA	Chief of Division	BTC
17	M. Pascal BULONGO	Provincial Director	FONER
18	M. Joseph MASISA	Chief of Monitoring, Works, and Equipment Section	FONER
19	M. Mao NTUMBA MULUME	Chief of Service	ACGT
20	M. Michel DINGANGA	Chief of Road Section	ACGT
21	Rudy ALONDA kyatangalwa	Chemical Engineer	OR(Laboratory)
22	Romina NDINGA MAKWENA	Engineer	BTC/OR(Laboratory)
23	Christophe TSHIDIBI TSHIMBOMBO	Chemical Engineer	OR(Laboratory)
24	Eric DIOMBA PAMBU	Geologist	OR(Laboratory)

- The members will be meeting once a week, every Wednesday. During the course of the next WG 2 meeting, some of the representatives from WG 1 will be performing TOT to share their knowledge and understandings of the concept of maintenance, etc. to the WG 1 members. Then, the following week, baseline survey will be conducted.

-“3-1-2: The plan of the trainings on AP road inspection and APm repair works” is under preparation. It will be completed in January 2017. Trainings on the road inspection and repair works are scheduled to be organized three times respectively.

The below shows the sample training programs;

Sample Training Program for the AP Road Inspection

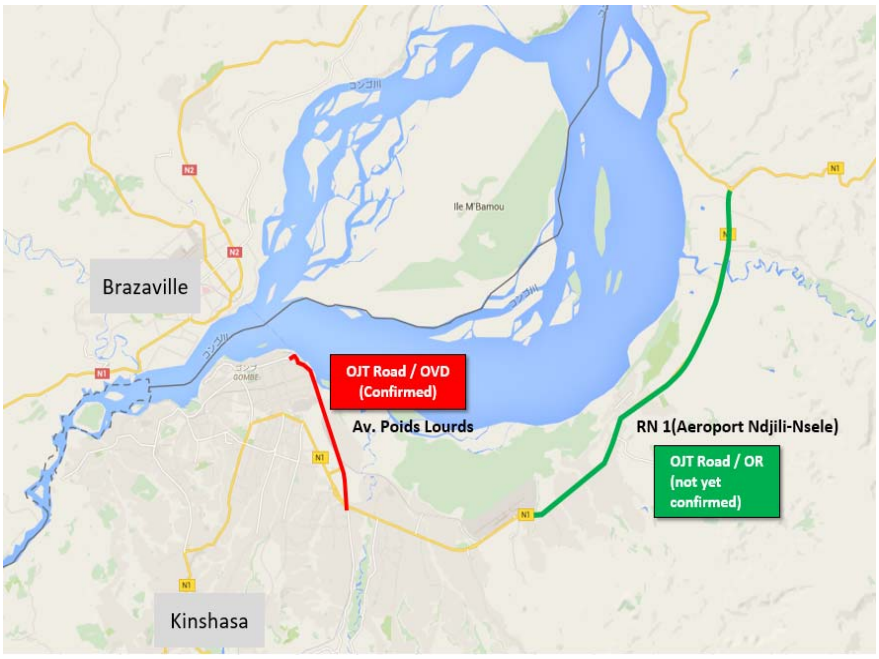
Day	Type of training	am (10:00-12:00)	pm (14:00-16:00)	Venue
1	Lecture	Introduction (baseline survey included)	Group discussion on the condition of the road maintenance, issues, etc.)	Training room at OR laboratory
2		Overview of the road maintenance		
3		Road inspection method		
4		Recording and evaluation of the road inspection results		
5		Summary of lecture		
6	Hands-on training at the site	Implementation of general visual inspection	Recording and evaluation of the road inspection results	Training target road (site) / Training room at OR laboratory
7		Implementation of visual inspection by the forward image acquisition		
8		Implementation of the detailed visual inspection (cracks, quantity measurement of the ruts, etc.)		
9		Implementation of the detailed inspection (quantity measurement of the deflection, etc.)		
10		End line survey / Development of the action plan	Presentation of the action plan / Assessment	Training room at OR laboratory

Sample Training Program for the APm repair works

Day	Type of training	am (10:00-12:00)	pm (14:00-16:00)	Venue
1	Lecture	Introduction (baseline survey included)	Group discussion on the condition of the road maintenance, repair method, issues, etc.)	Training room at OR laboratory
2		Overview of the road maintenance		
3		AP road damage and cause, maintenance, repair method		
4		Quality management, safety management measures, construction record		
5		Summary of lecture, group discussion		
6	Hands-on training at the site	Safety management measures		Training target road (site) / Training room at OR laboratory
7		APm material	Quality management	
8		APm repair works	Quality management	
9		APm repair works	Construction record	
10		End line survey / Development of the action plan	Presentation of the action plan / Assessment	Training room at OR laboratory

-The WG will determine the actual contents of the training programs and other necessary issues having in-depth dialogues as they organize the weekly meetings.

-“3-1-3: Some candidate sites for the trainings on AP road inspection and APm repair works” were selected or proposed as shown below (OJT sites);



-The OJT candidate site on the OVD road (red-marked part) has been confirmed while that of OR road (green-marked part) has been slightly pending due to the BTC maintenance budget related matter. Once the WG activity has been commenced, this issue will be solved in due course.

1-3 Achievement of the Project Purpose and Outputs

-Achievements are shown in the achievement column of the Monitoring Sheet I.

1-4 Changes of Risks and Actions for Mitigation

-Further to the issues raised during the 1st monitoring period, only the concern remains in the Presidential election related matter. Considering the foreseeable unstable situation in the country in line with the said matter, dispatch of the JICA experts will be suspended during the period from mid-December 2016 till mid-January 2017.

1-5 Progress of Actions undertaken by JICA

-Necessary support to the Project has been rendered in a timely fashion.

1-6 Progress of Actions undertaken by Gov. of the DRC

-Minister of the Ministry of Infrastructures and Public Works (MIPW) has issued a letter to FONER with regard to the Project Budget.

-The Project team had an occasion to pay curtesy call to His Excellency M. Fridolin Kasweshi Musoka, Minister

of MIPW on the 9th November 2016.

1-7 Progress of Environmental and Social Considerations (if applicable)

-These issues are not directly applicable to the Project. However, the contents of the draft technical guidelines include environmental issues. For instance, consideration of roadside environment, specifically noise and vibration matters.

1-8 Progress of Considerations on Gender/Peace Building/Poverty Reduction (if applicable)

-These issues are also not directly applicable to the Project, however, roads are for the entire citizens of DRC which certainly includes men and women, and they have different economical background (rich or poor, etc.).

1-10 Other remarkable/considerable issues related/affect to the project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs, etc.)

-The JICA expert team visited Matadi Bridge which completed in 1983 as a Japanese Official Development Loan Project. The Organization for Equipment of Banana-Kinshasa (OEBK) is responsible for Matadi Bridge in terms of maintenance. The officials of OEBK and the Project team (OR, OVD and JICA experts) will remain in close contact to exchange information and experiences.

-One of the donor agencies participated in the 1st and 2nd JCC, namely, Belgian Development Agency (BTC). The representative of the said agency contacted the Project after the 1st JCC and since then both parties remain in contact and share the issues. The Project also expects the World Bank and African Development Bank to be well communicated with the Project to exchange information and experiences.

2. Delay of Work Schedule and/or Problems (if any)

-As described in the Monitoring Sheet II, some of the activities delayed including dispatch of JICA experts. One of the main reasons was in line with the security matter. However, at this point, the Project should be able to manage the remaining activities whiten the given time.

3. Modification of the Project Implementation Plan

-Some of the Objectively Verifiable Indicators which required determining the target figures and timeframe have been set. To be specific, Output 2-1～2-3, Output 3-1～3-3, 3-5～ 3-7, and 3-9. The Project team together with the WG member will work on the other remaining parts (Overall Goal, Project Purpose, Output 1-1, Output 3-4 and 3-8), and those will be completed by the 3rd JCC.

3-1 PO

-N.A.

3-2 Other modifications on detailed implementation plan

-N.A.

4 Preparation of Gov. of the DRC toward after completion of the Project

-N.A.

II. Project Monitoring Sheet I & II

See attached.

version 2

Project Monitoring Sheet I （Revision of Project Design Matrix）

Dated: 8 November, 2016

Project Title: The Project for Capacity Development of Road Maintenance Management

Inputs		Plan/Actual	2016 Ⅱ	2016 Ⅲ	2016 Ⅳ	2017 Ⅰ	2017 Ⅱ	2017 Ⅲ	2017 Ⅳ	2018 Ⅰ	2018 Ⅱ	2018 Ⅲ	2018 Ⅳ	2019 Ⅰ	Remarks	Monitoring: Issue	Monitoring: Solution
Expert																	
	Leader / Road Maintenance Plan 1 (Mr. Shimizu)	9.60 Plan	■	■	■	■	■	■	■	■	■	■	■			Due to unstable condition of the country, specifically from late September till early October 2016, dispatch of JICA experts had been suspended (namely, "Road Inspection" of Mr. Takahashi and "Road Inspection (Database) of Mr. Sakai.).	Alternative dispatch schedule have been or will be considered to fulfill the entire assignments of the said experts.
		Actual	■	■	■												
	Sub-Leader/ Road Maintenance Plan 2 (Mr. Saito)	10.50 Plan	■	■	■	■	■	■	■	■	■	■	■				
		Actual	■	■	■												
	Road Inspection (Mr.Takahashi)	9.90 Plan	■	■	■	■	■	■	■	■	■	■	■				
		Actual	■	■	■												
	Pavement Repair (Mr.Shishido)	12.00 Plan	■	■	■	■	■	■	■	■	■	■	■				
		Actual	■	■	■												
	Road Inspection (Database) (Mr.Sakai)	10.07 Plan	■	■	■	■	■	■	■	■	■	■	■				
		Actual	■	■	■												
	Pavement Repair (Construction Supervision) (Mr. Mukai)	5.80 Plan			■	■		■		■		■	■				
		Actual			■												
	Coordinator (Mr.Yamagishi)	10.43 Plan	■	■	■	■	■	■	■	■	■	■	■				
		Actual	■	■	■												
	Monitoring and Evaluation (Ms.Taguchi)	3.10 Plan		■			■				■						
		Actual		■													
	Training Plan	0.60 Plan				■					■						
		Actual															
Equipment																	
	Equipment for database system	Plan													Equipment is planned to be procured in 2017.	Refer to "Output2-7"	
		Actual															
Training in Japan																	
	Training for Counterpart Personnel	Plan													Either mid April, 2017 or mid May, 2017 to be scheduled.	Target participants will be determined by the WG.	Draft training plan will be developed by the end of Nov. 2016.
		Actual															

Activities / Sub-Activities		Plan/Actual	2016 Ⅱ	2016 Ⅲ	2016 Ⅳ	2017 Ⅰ	2017 Ⅱ	2017 Ⅲ	2017 Ⅳ	2018 Ⅰ	2018 Ⅱ	2018 Ⅲ	2018 Ⅳ	2019 Ⅰ	Responsible Organization: Japan	Responsible Organization: GoDRC	Achievements	Issue & Countermeasures
Output 1: Asphalt paved (AP) road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites.																		
1.1 Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites	●●●●●○	Plan	■	■											JICA	OR/OVD	Completed: it had taken a bit more time than expected due to the preparation.	No major issues.
		Actual	■	■														
1.2 Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites	●●○○○○	Plan		■	■	■	■	■	■	■	■	■	■		JICA	OR/OVD	Identification stage has been completed. Currently, it is in an application stage.	
		Actual		■	■													
1.3 Define the road network to be covered by the project	●●●○○	Plan		■	■										JICA	OR/OVD	In progress. The Project team & C/Ps have been trying to grasp the issue carefully.	Target timeframe will be in between Jan. to Mar. 2017.
		Actual		■	■													
1.4 Conduct traffic volume survey on some sections of the defined road network	●●●○	Plan			■										JICA	OR/OVD	Traffic volume data has been obtained. However, due to budget constraint of C/Ps, the survey has been suspended.	Seeking for feasible measurements from Infrastructure Unit.
		Actual			■													
1.5 Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites	●●○○○○	Plan			■	■	■	■	■	■	■	■	■		JICA	OR/OVD		
		Actual																
1.6 Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request	●●○○○	Plan							■	■	■				JICA	OR/OVD		
		Actual																
Output 2: Technical guidelines on AP road maintenance are developed.																		
2.1 Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites	●●●●●○○	Plan	■	■											JICA	OR/OVD	Completed.	
		Actual	■	■														
2.2 Collect and review the existing AP road maintenance manuals and technical guidelines	●●●●●○○	Plan		■	■										JICA	OR/OVD	Completed.	
		Actual		■	■													
2.3 Establish the Joint Working Group for developing technical guidelines on AP road maintenance	●●○○○○○	Plan		■	■										JICA	OR/OVD	Completed: It had taken a bit more time than expected in order to conduct several interviews with the candidates.	No major issues.
		Actual		■	■													
2.4 Develop and draft technical guidelines on AP road maintenance	●●●●○	Plan		■	■	■									JICA	OR/OVD	In progress: Draft Guideline has been distributed to WG.	Planning to be completed in Jan. 2017.
		Actual		■	■	■												
2.5 Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group meetings etc. and revise the drafted technical guidelines	●●○○○○	Plan			■	■									JICA	OR/OVD	Kick off meeting for the WG was organized 24 Aug..2016. Either Jan. or Feb. 2017 will be a target period for actual discussion, etc.	Slight delay is foreseen however, it can be managed within the given time.
		Actual			■													

2.6 Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection	○	○	●		○					Plan								JICA	OR/OVD		
										Actual											
2.7 Develop a database for accumulating the AP road inspection results	○	○	○		●					Plan								JICA	OR/OVD	Recommended equipment for inspection / database has been introduced, and demonstration has also been organized at the WG meetings.	Once approved by the 2nd JCC, equipment will be purchased some time in 2017 (April or so).
										Actual											
2.8 Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works	○	○	○	●	○	●				Plan								JICA	OR/OVD		
										Actual											
2.9 Finalize the technical guidelines	●	○	●	●	○	○	○			Plan								JICA	OR/OVD		
										Actual											
2.10 Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations	●	●	○	○	○	○				Plan								JICA	OR/OVD		
										Actual											
2.11 Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW	●	○					○			Plan								JICA	OR/OVD		
										Actual											
Output 3: AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites.																					
3-1.Training plan for AP road inspection and APm repair works																					
3.1.1 Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works	○	○	●	●	○	○	○			Plan								JICA	OR/OVD	Completed: More time required due to several interviews as well as certain period of work suspension due to unstable condition of the country.	No major issues regarding the target activity.
										Actual											
3.1.2 Plan the trainings on AP road inspection and APm repair works	○	○	●	●	○	○	○			Plan								JICA	OR/OVD	In progress.	Scheduled to be completed in Jan. 2017.
										Actual											
3.1.3 Select candidate sites for the trainings on AP road inspection and APm repair works	○	●	●	●	○	○				Plan								JICA	OR/OVD	In progress: The sites have been selected.	The 1st WG meeting will be organized 9 Nov. 2016.
										Actual											
3-2. Trainings on AP road inspection																					
3.2.1 Conduct baseline survey on the training participants' skills and knowledge of AP road inspection	○	○	●	○	●	○		○	○	Plan								JICA	OR/OVD		
										Actual											
3.2.2 Conduct lectures on AP road inspection	○	○	●	○	●				○	Plan								JICA	OR/OVD		
										Actual											
3.2.3 Conduct OJTs on AP road inspection at the selected sites in the project sites	○	○	●	○	●				○	Plan								JICA	OR/OVD		
										Actual											
3.2.4 Conduct end line survey on the training participants' skills and knowledge of AP road inspection	○	○	●	○	●			○	○	Plan								JICA	OR/OVD		
										Actual											
3.2.5 Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines	●	○	●	○	●	○	○		○	Plan								JICA	OR/OVD		
										Actual											
3.3 Training on APm Repair Works																					
3.3.1 Conduct baseline survey on the training participants' skills and knowledge of APm repair works	○	○	○	●	○	●		○	○	Plan								JICA	OR/OVD		
										Actual											
3.3.2 Conduct lectures on APm repair works	○	○	○	●	○	●			○	Plan								JICA	OR/OVD		
										Actual											
3.3.3 Conduct OJTs on APm repair works at the selected sites in the project sites	○	○	○	●	○	●			○	Plan								JICA	OR/OVD		
										Actual											
3.3.4 Conduct end line survey on the training participants' skills and knowledge of APm repair works	○	○	○	●	○	●		○	○	Plan								JICA	OR/OVD		
										Actual											
3.3.5 Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines	●	●	●	○	○	○	○		○	Plan								JICA	OR/OVD		
										Actual											
Duration / Phasing										Plan											
										Actual											

Monitoring Plan		2016			2017				2018				2019	Remarks	Issue	Solution
		II	III	IV	I	II	III	IV	I	II	III	IV	I			
Monitoring																
Joint Coordination Committee	Plan													2nd JCC is scheduled on 8 November 2016.		
	Actual															
Set-up the Detailed Plan of Operation	Plan													Completed		
	Actual															
Baseline Survey for Target Figures	Plan													In progress.	It will be continued till Feb. 2017.	
	Actual															
Set-up the Target Figures within 6 months after the commencement of the project	Plan													In progress.	Discussions will be continued.	Some of the targets will be submitted to the 2nd JCC. And the remaining target figures will be proposed to the 3rd JCC.
	Actual															
Submission of Monitoring Sheet	Plan													Version 2 has been submitted to the 2nd JCC.		
	Actual															

Item		Schedule	Remarks	Issue	Solution
Reports/Documents					
Inception Report (Work Plan)	Plan		Submitted to the 1st JCC		
	Actual				
Draft Project Completion Report	Plan				
	Actual				
Project Completion Report	Plan				
	Actual				
Public Relations					
Establishment and Operation of web Site	Plan		Project site of JICA HP and Infrastructure Unit HP have been updated from time to time. Project Newsletter recorded 2nd edition so far.	Project issued a request letter to OR in Aug. 2016 to include the Project information on their website.	Project will follow it up with the issue.
	Actual				
	Plan				
	Actual				

Activities with fixed period
Activities to be continuously conducted, or with tentative schedule

03 Monitoring Sheet - Version 3

TO CR of JICA D. R. Congo Office

PROJECT MONITORING SHEET

Project Title: The Project for Capacity Development of Road Maintenance Management

Version of the Sheet: Ver.3（Term: 11 November 2016 –25 May 2017）

Name: Mr. Nobuharu SHIMIZU

Title: Leader/Road Maintenance Plan

Prepared on 25 May 2017, Submission Date: 26 June 2017

**The contents of the below are based on the planned activities during the target period of this particular monitoring (ref. to the Monitoring Sheet II for the timeframe of the respective activities).*

I. Summary

1 Progress

1-1 Progress of Inputs

(1) The Japanese Side 1) A total of 9 JICA experts have been assighned for a sum of 35.77 Man/Month (M/M) out of 69.60 M/M, which will be the Project total assignment in the DRC. The target period for this assignment is from the commencement of the Project till the end of May 2017. An Expert has been added as a “Road Inspection (Database 2)” to set up the equipment as well as to conduct trainings on how to use it. The Expert shares the assignment duration with another Expert in charge of Road Inspection (Database). Thus total assignments will remain the same.

(2) Members of 2 Working Groups (WG 1: Development of technical guidelines on the Asphalt-Paved (AP) road maintenance, WG 2: Conducting training on AP road inspection and Asphalt Pavement (APm) repair works) have been contributing to carry out the respective activities. The WG 1 had 31 meetings in total while the WG 2 had a kick off meeting in early November 2016 followed by 6 other meetings (as of 25 May 2017. Refer to “1-2 Progress of Activities (2) 2-4 and (3)”).

WG 1 meeting

WG 2 meeting

(3) Training for the counterparts (C/Ps) was held in Japan from 4 May 2017 till 22 May 2017 (including traveling time and weekends). 8 personnel were dispatched to Japan to participate in the training program as shown below;

Participants:

	Name	Title	Organization
1	Mr. Pierre WANET MUTUMOSI	Head of Brigade 901 (Kinshasa)	OR
2	Mr. Jean Paul MAVUNGU SOKANA	Database Expert	OR/Headquarters
3	Mr. Timothee SUMAHILI	Technical Director, Kinshasa Province	OVD
4	Mr. Leon MUTOMBO	Head of Evaluation	OVD
5	Mr. Pascal BULONGO	Provincial Director	FONER (Fonds National d'Entretine Routier)
6	Mr. Willy MONDA TONA	Head of Division	BTC (Bureau des traveaux et construction)
7	Mr. Fils ZENGA MBALA	Head of Service	BTC
8	Mr. Chocquet N'DOBE di SOKI	Coordinator	PRCMR (Projet de renforcement de capacités sur la maintenance de routes)

Training Program:

May	a.m.	p.m.	Remarks
8 (Mon.)	Briefing	Orientation, Visit to ISEC office	-
9 (Tue.)	Road maintenance method	Safety management measures	Lecture
10 (Wed.)	*Move to Osaka*	Outline of Hanshin Expressway	Lecture
11 (Thur.)	General road maintenance	Maintenance information management	Lecture
12 (Fri.)	Akashi Kaikyo Bridge, Akashi Kaikyo Bridge Exhibition Center, Maiko Marine Promenade	*Return to Tokyo*	Site visit
13 (Sat.)	*Preparation on the training report*		-
14 (Sun.)	*Off*		-
15 (Mon.)	Pavement restoration work, Kayama District, Saitama		Lecture, site visit
16 (Tue.)	Road inspection method	Demonstration on the road	Lecture, site visit

May	a.m.	p.m.	Remarks
		inspection	
17 (Wed.)	Construction machine factory	Construction machinery	Site visit, lecture
18 (Thur.)	JICA technical cooperation projects	Preparation on the training report	Lecture
19 (Fri.)	Presentation on the training report	Training evaluation	-

Some feedback from the participants:

-In general, the training program was well received by the participants. Particularly, majority of the participants considered the lecture on the “safety management measures” was the most useful subject amongst others followed by the “database” (lecture on the “road inspection method”). At the same time, the participants have become fully aware of the importance of the safety for the workers at the construction site to conduct road maintenance properly.

-On the other hand, considering the actual situation back home, the participants commented the following subjects to be included in order to make the training more appropriate and meaningful;

-Monitoring on the road projects

-Quality control, etc.

-The participants have committed action to be taken as follows;

-Report to the senior managements what they have learned and experienced through the training so as to strengthen the partnership with JICA, and improve the situation of the DRC

-Implement AP road maintenance by utilizing the technical guidelines which have drafted by the Project

-Share what they have learned with the other engineers, and train them

-Organize workshops/seminars

-Comply with the methods, etc.

Photos from the training in Japan:

Lecture

Vehicle with a camera to measure road surface

(4) The budget for the traffic volume survey was finally approved by the Congolese side however, budget execution has been taking rather too long and timing of it is very much uncertain, which may affect the activity of the Project. In view of smooth implementation of the project, the Project has proposed collaboration with "Project for Urban Transport Master Plan in Kinshasa City (Master Plan Project)" under JICA, which has a plan to conduct traffic volume survey for about 40 sections (Refer to "1-2 Progress of Activities (1) 1-4").

1-2 Progress of Activities

(0) Activities for the general issues:

-A key activity, which is to develop a draft version of technical guidelines, has been marked approximately 6 months delay. Series of activities had planned in accordance with the said guidelines which had affected the progress of the other related activities. The Project had reviewed the planned schedule and proposed modification of the concerned activity plans. The proposal was approved by the 3rd Joint Coordinating Committee (JCC) meeting. Currently, the Project has clear picture of the progress management and activity implementation.

-3nd JCC meeting was organized on 25 May 2017. Totally, 44 participants attended this meeting, having African Development Bank, and Transporters Association, etc.

Main topics of the 3rd JCC:

- Presentation of the draft technical guidelines on the AP road maintenance (by the WG 1 leader)
- Discussion on the above
- Report on the training in Japan (by the representative of the training participants)
- Presentation of the up-coming activities till next JCC (by the Project leader)

-A series of meetings in line with the respective activity of the outputs 1, 2 and 3 had been organized for this target period of the monitoring lead by the WGs.

-Activities of the public relations (PR) have been on going. 2 radio stations came to report on the 3rd JCC. The 3rd edition of the Project Newsletter is under preparation while JICA project site (website) of this Project has been updated on a regular basis. The 6th edition of the Project News of the JICA website was uploaded in April 2017.

-The Project has secured a link to the website of Infrastructure Unit of Ministry of Infrastructures, Public Works and Reconstruction (former Ministry of Infrastructures and Public Works). The Project Newsletters of 1st and 2nd edition are going to be uploaded shortly.

(1) Activities for OP1: AP road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites

-"1-2: The most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD (Office des Voiries et des Drainages) in the project sites" have been in an application stage. The identified roles, responsibilities and work procedures for AP road maintenance of OR and OVD will be continuously applied throughout the Project period.

-"1-3: The road network to be covered by the Project" has been defined having lists of the respective target areas from OR and OVD. It was initially planned to complete it by the end of September 2016. In an actual situation, it had prolonged till May 2017. Involving 2 different organization (OR and OVD) takes much more time than expected. And coordination between them is also a demanding issue. This is one of the "lessons learned", and the Project has taken notes on this matter.

-"1-4: The traffic volume survey on some sections of the defined road network" is expected to be conducted by the end of July 2017, having collaboration with the "the Master Plan Project", as explained in "(4), 1-1 Progress Inputs, I Summary". The Project C/Ps from OR and OVD together with the Japanese Experts will be joining the Master Plan workshop on induction of the traffic volume survey followed by the actual survey on the ground. Accordingly, collected data from the survey will be analyzed. OR and OVD C/Ps will take parts in the whole set of traffic volume survey, and the C/Ps are expected to acquire knowledge and skills on this. Out of total target sections of the said survey under the Master Plan Project, at least 2 sections (one for OR and the other for OVD) for the Project related sites will be covered.

- Upon completion of the draft guidelines, "1-5: An AP road maintenance plan FY 2018 of OR and OVD in the project sites" has started to be developed. Initial plan was to begin this activity from November 2016. Therefore, the Project proposed modification of the activity schedule (Refer to the Monitoring Sheet II).

(2) Activities for OP2: Technical guidelines on AP road maintenance are developed

-"2-4: Technical guidelines on AP road maintenance have been drafted and developed". To start with, introduction session concerning the WG 1 activities required sufficient time to secure members' proper comprehension. Once the concept was understood by the WG 1 members, they had heated discussions for developing the guidelines. The Project reviewed the plan of this activity and came up with a proposal to modify it respecting the strong initiative of the WG 1 members (which led much more discussions than expected). (Refer to Monitoring Sheet II).

-The WG1 members did final review of the draft technical guidelines, and technical inputs by the Japanese Experts have been incorporated into the guidelines by the end of April 2017. The WG 1 members reported the progress made so far, and the draft version of the guidelines were distributed to the 3rd JCC.

-The objectively verifiable indicator in the Project Design Matrix (PDM) for this activity was once set as "Technical guidelines on AP road maintenance are drafted by January 2017". However, after the 2nd JCC, the Project reviewed the indicator considering the Experts' assignment suspension period from December 2016 till mid-January 2017. Thus, in between the 2nd and the 3rd JCC, the Project had considered modification of the target timeframe as follows;
"Technical guidelines on AP road maintenance are drafted by April 2017".

-"2-5: The contents of the draft technical guidelines will be explained and discussed" at the Technical Advisory Group (TAG) meeting starting from July 2017. This activity was once commenced in November 2016, however, the Project recognized the necessity to organize TAG meetings for several times, and proposed modification of the plan of this activity (Refer to the Monitoring Sheet II). The draft version of the said guidelines will be reviewed and revised based on the shared views and technical inputs by the TAG, as well as the results of the trial application on the ground to observe whether the guidelines are suitable and practical in the actual situation. The re-planned process is shown below;

Step 1: Development of the draft technical guidelines
↓
Step 2: Discussion with the TAG
↓
Step 3: Revision of the draft technical guidelines based on the given technical inputs
↓
Step 4: Trial application on site
↓
Step 5: Necessary revision based on the situation on the ground
↓
Repeat Step 2 – Step 5

The below list indicates the members of the TAG;

Title	Organization
Professors (2 people)	Polytechnic Faculty, University of Kinshasa
Head of Operation	Polytechnic Faculty, University of Kinshasa
Professors (2 people)	National Institute of Building and Public Works
Assistant	National Institute of Building and Public Works

-"2-6: Concerning the AP road inspection in accordance with the drafted and revised technical guidelines", the inspection plan is expected to be submitted to the Project by the end of May 2017. Consequently, inspection will be conducted by using the camera to measure the road surface (Refer to the below "2-7").
-This activity was initially planned to commence in December 2016. However, given the progress of the draft technical guidelines, also the delay of the procurement procedure, the Project proposed modification of the

activity schedule (Refer to the Monitoring Sheet II).

-“2-7: In order to “develop a database for accumulating the AP road inspection results”, the equipment (a camera to measure the road surface) was purchased and shipped to the DRC. As mentioned in the above “2-6”, it was arrived with some delay in Kinshasa on the 23 April 2017. The equipment has been utilized since then having trained by the Japanese Expert. On the other hand, a vehicle, which will be granted by JICA, to carry the said equipment is under tax exemption procedure. Meanwhile, an existing vehicle has been temporary used in order to organize the training on how to operate the camera, as well as to conduct inspection. The granted vehicle is expected to be in use around mid-July 2017. The fuel will be covered by the Congolese side, and the maintenance will be handled by the same.

-The Project proposed the modification of the activity plan due to the fact that the arrival of the equipment and the progress of the draft technical guidelines had been delayed (Refer to the Monitoring Sheet II).

-The below shows the camera with temporary vehicle;

-“2-8: With regard to the AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines”, the WG 2 is planning to discuss this matter in line with the training starting from late May 2017. “The evaluation” of the procedure and outcomes of these works will be followed in due course.

-The Project proposed modification of the activity schedule considering the progress of the draft technical guidelines (Refer to the Monitoring Sheet II).

(3) Activities for OP3: AP road maintenance skills and knowledge of OR’s and OVD’s technical staffs are improved in the project sites

-The Project proposed modification of the entire activity schedule of OP 3 (except "3.1.1") considering the progress of the draft technical guidelines, the Experts' assignment suspension period and the readiness of the Congolese side. (Refer to the Monitoring Sheet II).

3-1: Training plan for AP road inspection and APm repair works

-"3-1-2: The plan of the trainings on AP road inspection and APm repair works" had been completed by the end of April 2017.

-Similar to the above mentioned "2-4", the objectively verifiable indicator in the PDM for this activity was once set as "Training plan is developed by January 2017". However, after the 2nd JCC, the Project reviewed it in a view of required time for induction to the WG members, etc. In between the 2nd and the 3rd JCC, the Project considered modification of the target timeframe as follows;

"Training plan is developed by April 2017".

The developed plan is shown below;

Training Plan for AP road maintenance

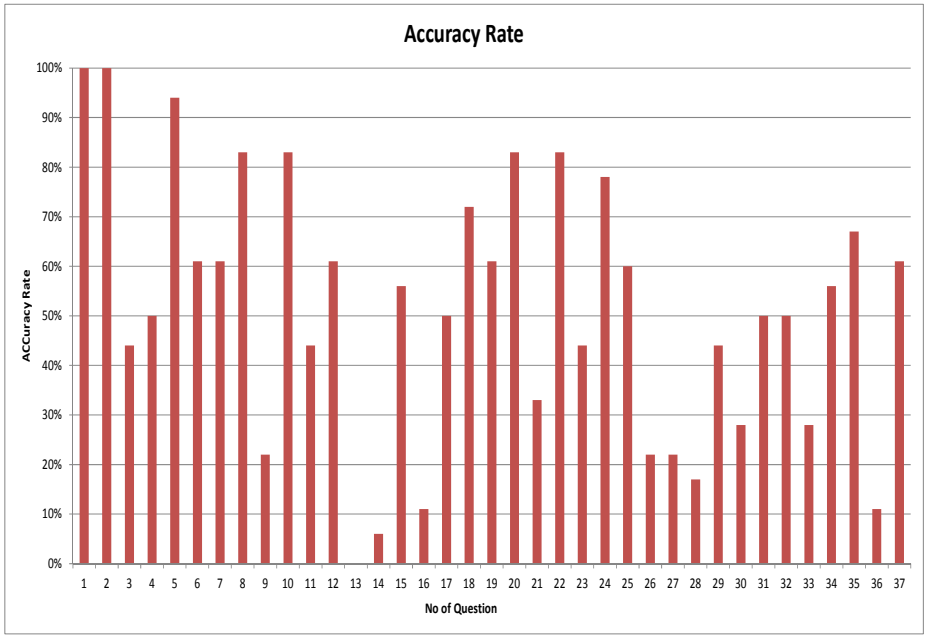
N°	Trainer (Japanese Expert)	Subject of the Practical Training	Training Content (module)
			Training on Inspection
1	Mr. Sakai	Inspection	**1) Purpose and role of surface inspection**
			2) Types of surface inspection
			3) Inspection Equipement (OJT)
			Training on Database
2	Mr. Sakai	Database	**1) Purpose of creating Database**
			2) Shewhart Cycle (PDCA)
			3) Inspection Equipement : OJT(analyse)
			4) Operating Database (Road Maintenance Plan)
			Training on Evaluation (classification and Damage Causes)
3	Mr. Takahashi	Training on Evaluation (Classification and Damage Causes)	**1) Structure and Function of Asphalt Surrface**
			2) Purpose of Surface Evaluation
			3) Overview of Surface Damage and its Causes
			§ Types Surfaace Damage
			§ Surface Degradation and Deterioration Mechanism
			4) Analysis for Deterioration Causes (non-destructive Analysis, Open Excavation Analysis)
			Training on Repair (Method of Work, Quality Control)
4	Mr. Shishido	Repair (Method of Work, Quality Control)	**1) Purpose of the Pavement Repair**
			§ Potholes
			§ Cracks
			§ Treatment of Surface
			§ Partial Reconstruction
			Overlay (after cutting)
			2) Purpose of Quality Control
			§ Test required for the specified mixture formula
			§ Tests required until delivery of hydrocarbon asphalt mix
			§ Daily tests of the asphalt mixing plant
			§ Tests required at the construction site
			Training on Quality Control (Works Plan, Safety Measures)
5	Mr. Mukai	Quality Control (Works Plan, Safety Measures)	**1) Work Plan**
			§ Method of Repair Works
			Patching, crack sealing, surface treatment, partial reconstruction, overlay (after cutting)
			2) Safety Measure
			§ Safety Measures Principles
			§ Shewhart Cycle (PDCA) Safety
			§ Prevention of dangers
			§ Traffic Control

-Currently, the target officials for this particular training are almost confirmed. Considering the time that the Japanese Experts are absent, Congolese trainers need to be trained. This training of trainers (ToT) is aiming to be introduced. The training has been gradually commenced since March 2017. Feasibility to conduct ToT will be observed while conducting training. Once the Project confirms the feasibility, the trainers are to be selected from the WG 2 members and/or from the trainees.

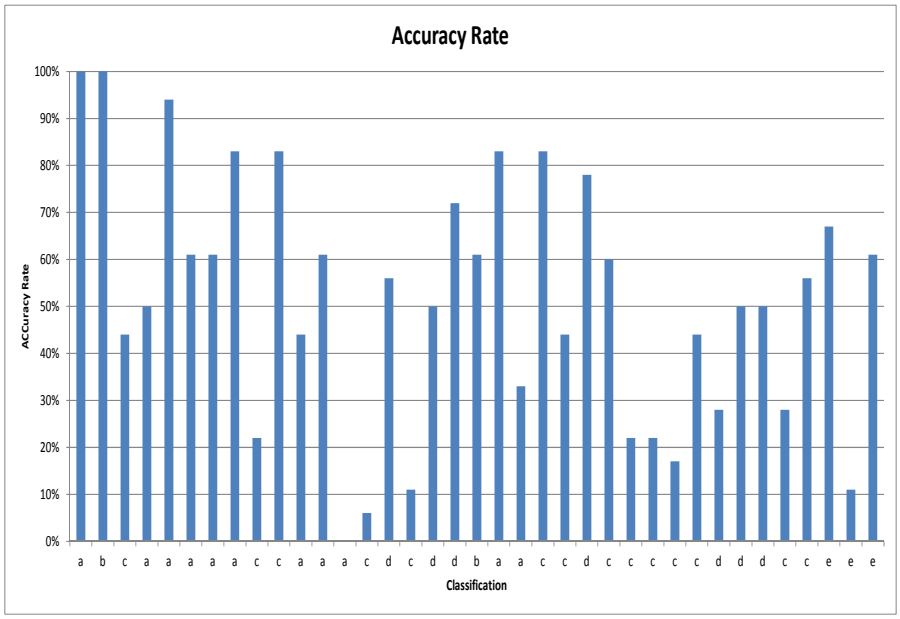
-"3-1-3: Candidate sites for the trainings on AP road inspection and APm repair works" on the OVD road had been confirmed as reported in the previous monitoring summary. On the other hand, that of OR road was pending since the BTC maintenance budget related matter needed to be cleared. Currently it has determined that the National Route 1 will be the training site for OR.

3-2: Trainings on AP road inspection：

-"3-2-1: Initial baseline survey on the training participants' skills and knowledge of AP road inspection was conducted in December 2016. Out of 37 questions, only 2 questions marked 100% as correct answers. The average rate of correct answer was 49.8%, and the worst rate was 0% followed by 6 %. The most difficult question was the following; "How many percent is the crack rate? (1 mesh =0.5 m x 0.5 m, target range of the survey: 5m x 3m)"



Accuracy rate based on each question (total 37 questions)



Legend: a=inspection, b=data base, c=evaluation (type of deterioration, cause), d=repair work (method, construction), e=security measurement

Accuracy rate based on the classification of the questions

The Project proposed modification of the second and the third round of baseline surveys in accordance with the progress of the other related activities, specifically development of the draft technical guidelines.
The second round of the said survey is planning to be organized February 2018.

-"3-2-2: Lectures on AP road inspection" are to be implemented in between April and June 2017 for the initial stage based on the modified schedule. The first lecture has been conducted since mid-April 2017.

-"3-2-3: OJTs on AP road inspection at the selected sites in the project sites" will be conducted from June to July 2017.

-"3-2-4: First round of the end line survey on the training participants' skills and knowledge of AP road inspection" will be organized in early August 2017.

-"3-2-5: AP road inspection through trial implementation of the drafted technical guidelines by the training participants" will be initially conducted from late July 2017 for 3.5 months.

3-3 Training on APm Repair Works

-"3-3-1 The baseline survey on the training participants' skills and knowledge of APm repair works" was organized in November 2016 to start with. The next one will be held in February 2018.

-"3-3-2 Lecture on APm repair works" of the 1st session was conducted in May 2017.

-"3-3-3 OJTs on APm repair works at the selected sites in the project sites" is scheduled to be implemented from August 2017.

-"3-3-4 The initial end line survey on the training participants' skills and knowledge of APm repair works" will be implemented in November 2017.

-"3-3-5 APm repair works through trial implementation of the drafted technical guidelines by the training participants" is scheduled to be handled from late August till whole November 2017 for the first round of this activity. The evaluation of the procedure and outcomes for revising the guidelines will be done accordingly.

1-3 Achievement of the Project Purpose and Outputs

-Achievements are shown in the achievement column of the Monitoring Sheet I.

1-4 Changes of Risks and Actions for Mitigation

-After the 2nd monitoring, the similar concern remains in the Presidential election related matter. Depending on the situation in the country, the Experts' assignments may be effected as experienced last year. Although some activity schedule has marked delay and required modification of the plan, the Project has been trying to implement the activities ahead of the schedule whatever feasible to do so.

1-5 Progress of Actions undertaken by JICA

-Necessary support and suggestions to the Project have been provided from time to time.

1-6 Progress of Actions undertaken by the Gov. of the DRC

-As mentioned earlier, though actual execution remains an issue, a certain amount of budget to conduct the traffic volume survey was approved. The Project will discuss the issue on the budget execution/ allocation with the relevant officials concerned in order to clarify the reasons behind of the issue, and measures to be taken.

1-7 Progress of Environmental and Social Considerations (if applicable)

-These issues are not directly applicable to the Project. However, the contents of the draft technical guidelines include environmental issues. For instance, consideration of roadside environment, specifically noise and

vibration matters.

1-8 Progress of Considerations on Gender/Peace Building/Poverty Reduction (if applicable)

-These issues are also not directly applicable to the Project, however, roads are for the entire citizens of the DRC, which certainly includes men and women, children, economically vulnerable people and so on.

1-10 Other remarkable/considerable issues related/affect to the project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs, etc.)

-The Project has met with the Organization for Equipment of Banana-Kinshasa (OEBK), which is responsible for Matadi Bridge in terms of maintenance. The Project has been utilizing the shared experiences of OEBK as a reference for its implementation.

-The World Bank and the African Development Bank showed their interests in our draft technical guidelines. Particularly, the latter joined the 3rd JCC and provided us some comments on their willingness to have a look at the draft guidelines and share with us their views on those. The Project is planning to set up a discussion forum with them and expect to have their feedback.

-As stated in "(4), 1-1 Progress Inputs, I Summary" and "(1-4), (1), Progress of Activities", currently, JICA's Master Plan Project is ongoing. Under the said project, traffic volume survey for more than 40 sections will be conducted. As the Master Plan Project and the Project have similar activities on the traffic volume survey having OR and OVD as C/Ps,, those 2 projects will be sharing the relevant information, activity process, data and so forth in order to manage the projects in an effective and efficient manner. Moreover, collaboration between those 2 JICA projects is expected to be strengthened, and this holistic approach is expected to contribute to the improvement of Road Transport Sector of DRC as a whole.

2. Delay of Work Schedule and/or Problems (if any)

-Given a set of modifications on the planned schedule as explained above, the Project trusts that the remaining activities should be able to be completed within the given time. However this requires a condition of security stability in the country. If the security situation worsen, the OJT and the other activities on sites may be suspended, which will certainly affect the progress of the Project.

3. Modification of the Project Implementation Plan

3-1 PDM and PO

-The following Objectively Verifiable Indicators in the PDM, which required determining the target figures and timeframe, have been set; Overall Goal, Project Purpose (1～4), Output 1 (1-1) and Output 3 (3-4, 3-8).

-On the other hand, the Project reviewed target timeframe of 2-1 and 3-1, which had been set once. It was

because of the suspension time for the Japanese Experts' assignments from December 2016 till mid-January 2017. The Project proposed modification of the said target timeframe from "January 2017" to "April 2017". The proposal was accepted by the 3rd JCC.

- The Project discussed with the C/Ps regarding the clarification of the "officials concerned (JCC members and Kinshasa provincial officials)" in the Project Design Matrix. Even the Project and the C/Ps had once agreed on the "officials concerned", the C/Ps reconsidered and suggested the Project to include some representatives of the users such as Drivers Association, etc. In line with the discussion, it was agreed to revise as "people concerned (*JCC members (selected), Kinshasa provincial officials and other relevant people listed in the attachment)" The attachment shows the following members;

	Title	Organization
1	Vice Cabinet Secretary	Ministry of Infrastructure, Public Works and Reconstruction
2	Coordinator, Infrastructures Unit	
3	Director General	FONER (Fonds National d'Entretine Routier)
4	Director General	Office des Routes (OR)
5	Director General	Office des Voiries et Drainage (OVD)
6	Director General	Bureau des travaux et construction (BTC)
7	Director General, Public Works and Water Supply (RATPK)	Kinshasa Province
8	Technical Advisor, Provincial Minister of Budget and Public Works (Ministre Provincial du Budget et Travaux Publics)	
9	President (Association Congolaise des Ingenieurs Civils du Congo)	Association of Civil Engineers of Congo
10	President (Corporation Nationale des Ingenieurs, BTP)	National Construction Corporation
12	Professor x 2 people	University of Kinshasa
14	Assistant Professor	
15	Professor x 2 people	National Institute of Building and Public Works
16	Assistant Professor	
17	President	Drivers Association
18	President	Transporters Association
19	President	Congo Enterprise Federation

Concerning the user side, Drivers Association, Transporters Association, and Congo Enterprise Federation were invited to the 3rd JCC and will be done so for the rest of the JCC meetings.

-As explained above, the Project proposed modifications of the following activity plans (Refer to the Monitoring

Sheet II);

Output 1: 1.5

Output 2: 2.4, 2.5, 2.6, 2.7, 2.8

Output 3: 3.1.2, 3.1.3, 3.2.1, 3.2.2, 3.2.3, 3.2.4, 3.2.5,
3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.3.5

All those modifications were approved by the 3rd JCC.

3-2 Other modifications on detailed implementation plan

-N.A.

4 Preparation of Gov. of the DRC toward after completion of the Project

-N.A.

II. Project Monitoring Sheet I & II

See attached.

Project Monitoring Sheet I （Revision of Project Design Matrix）

version 3

Dated: 25 May, 2017

Project Title: The Project for Capacity Development of Road Maintenance Management

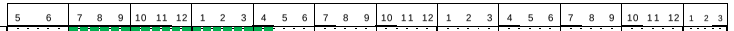
Inputs		Plan / Actual	2016 II	2016 III	2016 IV	2017 I	2017 II	2017 III	2017 IV	2018 I	2018 II	2018 III	2018 IV	2019 I	Remarks	Monitoring: Issue	Monitoring: Solution
Expert																In order to procure the equipment for road surface measurement, a Japanese Expert (Road Inspection: Database 2, Mr.Maeda) has been deployed. Database 2 Expert is to set up the said equipment as well as to conduct trainings to the relevant C/Ps.	Mr. Maeda shares the assignments with Mr. Sakai. Thus no additional assignments to be made, and total duration of the entire assignments of all Experts will not require any modification.
	Leader / Road Maintenance Plan 1 (Mr. Shimizu)	9.60 Plan															
		Actual															
	Sub-Leader/ Road Maintenance Plan 2 (Mr. Saito)	10.50 Plan															
		Actual															
	Road Inspection (Mr.Takahashi)	9.90 Plan															
		Actual															
	Pavement Repair (Mr. Shishido)	12.00 Plan															
		Actual															
	Road Inspection (Database) (Mr. Sakai)	10.07 Plan															
		9.34 Actual															
	Road Inspection (Database 2) (Mr. Maeda)	0.73 Plan															
		Actual															
	Pavement Repair (Construction Supervision) (Mr. Mukai)	5.80 Plan															
		Actual															
	Coordinator (Mr. Yamagishi)	10.43 Plan															
		Actual															
	Monitoring and Evaluation (Ms.Taguchi)	3.10 Plan															
		Actual															
	Training Plan	0.60 Plan															
		Actual															
Equipment																	
	Equipment for database system	Plan													A camera to measure the road surface has been procured with slight delay.	A vehicle to carry the camera is under procurement.	Tax exemption procedure for the vehicle requires certain time prior to be used by the Project.
		Actual															
Training in Japan																	
	Training for Counterpart Personnel	Plan													Training was held 4- 22 May 2017 (including traveling time and weekends).	Feedback from the participants was presented at the 3rd JCC.	
		Actual															

Activities / Sub-Activities		Plan / Actual	2016 II	2016 III	2016 IV	2017 I	2017 II	2017 III	2017 IV	2018 I	2018 II	2018 III	2018 IV	2019 I	Responsible Organization: Japan	Responsible Organization: GoDRC	Achievements	Issue & Countermeasures
Output 1: Asphalt paved (AP) road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites.																		
1.1 Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites	●●●●● ○	Plan													JICA	OR/OVD	*Completed: It had taken a bit more time than expected due to the preparation.*	*No major issues.*
		Actual																
1.2 Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites	●●○○○ ○	Plan													JICA	OR/OVD	*Identification stage has been completed. Currently, it is in an application stage.*	
		Actual																
1.3 Define the road network to be covered by the project	●●●○○	Plan													JICA	OR/OVD	In progress. Took more time than scheduled as to define the framework of the road network to be covered by the Project.	Lessons learned: Since the Project involves 2 different organizations, coordination between them requires relatively large amount of time.
		Actual																
1.4 Conduct traffic volume survey on some sections of the defined road network	●●●○	Plan													JICA	OR/OVD	In progress. Traffic volume survey will be conducted by the end of July 2017 for 2 sections.	The Project will collaborate with the Master Plan Project under JICA for this activity.
		Actual																
1.5 Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites	●●○○○ ○	Plan													JICA	OR/OVD	In progress. This activity was able to be commenced upon completion of the draft guidelines.	The Project proposed modification of the activity schedule.
		Modification																
		Actual																
1.6 Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request	●●○○ ○	Plan													JICA	OR/OVD		
		Actual																
Output 2: Technical guidelines on AP road maintenance are developed.																		
2.1 Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites	●●●●● ○○	Plan													JICA	OR/OVD	*Completed.*	
		Actual																
2.2 Collect and review the existing AP road maintenance manuals and technical guidelines	●●●●● ○○	Plan													JICA	OR/OVD	*Completed.*	
		Actual																
2.3 Establish the Joint Working Group for developing technical guidelines on AP road maintenance	●●○○○ ○○	Plan													JICA	OR/OVD	*Completed: It had taken a bit more time than expected in order to conduct several interviews with the candidates.*	*No major issues.*
		Actual																
2.4 Develop and draft technical guidelines on AP road maintenance	●●●●○	Plan													JICA	OR/OVD	Completed. Required certain time for activity introduction. Once the concept was understood, WG members had heated discussions. Draft's completed once in Feb	Even the time the Experts were absent from the country, Congolese WG 1 members organized meetings and
		Modification																

Project Monitoring Sheet I （Revision of Project Design Matrix）

Project Title: The Project for Capacity Development of Road Maintenance Management

Dated: 25 May, 2017



					Monitoring	
	Actual				completed since FY Jan 2017, and the Experts' comments incorporated in April 2017.	continued their activities.
2.5 Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group (TAG) meetings etc. and revise the drafted technical guidelines	Plan	JICA	OR/OVD	In progress. The Project proposed additional activities; series of discussions with the TAG and revisions based on the said discussions.	TAG's technical inputs are essential to develop appropriate guidelines (draft). Cycle of the activities; Draft Guidelines →TAG→Revision of Guidelines→Traial application→Revision of draft→*repeat the same*
	Modifi-cation				
	Actual				
2.6 Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection	Plan	JICA	OR/OVD	In progress. Project proposes modification of the schedule for this activity in line with the progress of the draft guidelines.	Inspection plan is expected to be developed by the end of May 2017
	Modifi-cation				
	Actual				
2.7 Develop a database for accumulating the AP road inspection results	Plan	JICA	OR/OVD	In progress. Project proposes modification of the schedule in line with the progress of the draft guidelines and the delay of arrival of the equipment.	Equipment has been procured and training been done. A vehicle to carry the camera to measure road surface will be in use around July 2017. Temporary vehicle has been prepared and utilized.
	Modifica tion				
	Actual				
2.8 Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works	Plan	JICA	OR/OVD	In progress. Project proposed modification of the schedule in line with the progress of the draft guidelines.	WG 2 will discuss on this activity in line with the training for AP road inspection and APm repair works.
	Modifi-cation				
	Actual				
2.9 Finalize the technical guidelines	Plan	JICA	OR/OVD		
	Actual				
2.10 Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations	Plan	JICA	OR/OVD		
	Actual				
2.11 Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW	Plan	JICA	OR/OVD		
	Actual				
Output 3: AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites.					
3-1.Training plan for AP road inspection and APm repair works					
3.1.1 Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works	Plan	JICA	OR/OVD	*Completed: More time required due to several interviews as well as certain period of work suspension due to unstable condition of the country.*	*No major issues regarding the target activity.*
	Actual				
3.1.2 Plan the trainings on AP road inspection and APm repair works	Plan	JICA	OR/OVD	Completed. Required certain time for activity introduction, and schedule modification needed.	WG 2 members came up with an idea of ToT, and Congolese trainers are expected to train the others.
	Modifi-cation				
	Actual				
3.1.3 Select candidate sites for the trainings on AP road inspection and APm repair works	Plan	JICA	OR/OVD	In progress. Project proposed modification of the schedule based on the progress of the planning.	Earlier, OVD sites had been selected but those of OR took some time to be determined. Finally it's done.
	Modifi-cation				
	Actual				
3-2. Trainings on AP road inspection					
3.2.1 Conduct baseline survey on the training participants' skills and knowledge of AP road inspection	Plan	JICA	OR/OVD	Initial survey has been conducted. Project proposed modification of the schedule.	This activity needs to be in line with the guidelines.
	Modifi-cation				
	Actual				
3.2.2 Conduct lectures on AP road inspection	Plan	JICA	OR/OVD	Project proposed modification of the schedule in line with the progress of the draft guidelines as well as the delay of the procurement of the equipment. At the same time, the Project learned the necessity to provide sufficient time for the WG members to secure proper comprehension and readiness prior to move on to the next stage.	2 Experts will conduct respective lectures.
	Modifi-cation				
	Actual				
3.2.3 Conduct OJTs on AP road inspection at the selected sites in the project sites	Plan	JICA	OR/OVD		As the other activities, frequency of each activity will remain 3 times.
	Modifi-cation				
	Actual				
3.2.4 Conduct end line survey on the training participants' skills and knowledge of AP road inspection	Plan	JICA	OR/OVD		
	Modifi-cation				
	Actual				
3.2.5 Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines	Plan	JICA	OR/OVD		
	Modifi-cation				
	Actual				

PM Form 3-3 Monitoring Sheet II

Project Monitoring Sheet I (Revision of Project Design Matrix)

Project Title: The Project for Capacity Development of Road Maintenance Management

Dated: 25 May, 2017

														Monitoring	
3.3 Training on APm Repair Works															
3.3.1 Conduct baseline survey on the training participants' skills and knowledge of APm repair works	○	○	○	●	○	○	●		○	○	Plan / Modification / Actual	JICA	OR/OVD	Initial survey has been conducted. Project proposed modification of the schedule.	This activity needs to be in line with the guidelines.
3.3.2 Conduct lectures on Am repair works	○	○	○	●	○	○	●			○	Plan / Modification / Actual	JICA	OR/OVD	Project proposed modification of the schedule in line with the progress of the draft guidelines. Referring to "3-2" activities, the same condition applies to these activities for the Project to secure proper comprehension and readiness amongst WG 2 members so as to carry out the activities smoothly.	As the other activities, frequency of these activities will remain 3 times.
3.3.3 Conduct OJTs on APm repair works at the selected sites in the project sites	○	○	○	●	○	○	●			○	Plan / Modification / Actual	JICA	OR/OVD		
3.3.4 Conduct end line survey on the training participants' skills and knowledge of APm repair works	○	○	○	●	○	○	●		○	○	Plan / Modification / Actual	JICA	OR/OVD		
3.3.5 Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines	●	●	●	○	○	○	○	○		○	Plan / Modification / Actual	JICA	OR/OVD		
Duration / Phasing											Plan / Actual				

Monitoring Plan	Plan / Actual	Remarks	Issue	Solution
Monitoring				
Joint Coordination Committee	Plan / Actual	3rd JCC was held on 25 May 2017.		
Set-up the Detailed Plan of Operation	Plan / Actual	*Completed*		
Baseline Survey for Target Figures	Plan / Actual	Completed.		
Set-up the Target Figures within 6 months after the commencement of the project	Plan / Actual	Completed.	Project had proposed target timeframe at the 2nd JCC. However, review required considering the Experts' assignment suspension from Dec. 2016 till mid-Jan. 2017.	Project proposed modification of the target timeframe for 2-1 and 3-1 in the PDM.
Submission of Monitoring Sheet	Plan / Actual	Version 3 was submitted to the 3rd JCC.		All the proposals were accepted by the 3rd JCC.
Reports/Documents				
Inception Report (Work Plan)	Plan / Actual	*Submitted to the 1st JCC*		
Draft Project Completion Report	Plan / Actual			
Project Completion Report	Plan / Actual			
Public Relations				
Establishment and Operation of web Site, and other relevant PR activities	Plan / Actual	Project site of JICA HP has been updated on a regular basis. The Project News letters wii be linked to the website of Infrastructure Unit.	The 3rd edition of Newsletter is under preparation.	Further PR activities will be implemented having different approaches. Eg., media, website, provision of newsletter,etc.

Timeline: 2016 (II, III, IV; months 5–12), 2017 (I–IV; months 1–12), 2018 (I–IV; months 1–12), 2019 (I; months 1–3)

Activities with fixed period

Activities to be continuously conducted, or with tentative schedule

04 Monitoring Sheet - Version 4

TO CR of JICA D. R. Congo Office

PROJECT MONITORING SHEET

Project Title: The Project for Capacity Development of Road Maintenance Management
Version of the Sheet: Ver.4 （Term: 26 May 2017 –16 November 2017）
Name: Mr. Nobuharu SHIMIZU
Title: Leader/Road Maintenance Plan
Prepared on 16 November 2017, Submission Date: 15 December 2017

** The contents of the below are based on the planned activities during the target period of this particular monitoring (ref. to the Monitoring Sheet II for the timeframe of the respective activities).*

I. Summary

1. Progress

1-1 Progress of Inputs

(1) The Japanese Side 1) A total of 9 JICA experts have been assigned for a sum of 45.16 Man/Month (M/M) out of 69.60 M/M, which will be the Project total assignment in the DRC. The target period for this assignment is from the commencement of the Project till the end of November 2017. The Expert in charge of "Road Inspection (Database 2)", conducted a field monitoring for the equipment on his own initiative (the cost was borne by his company).

(2) Members of 2 Working Groups (WG 1: Development of technical guidelines on the asphalt-paved (AP) road maintenance, WG 2: Conducting training on AP road inspection and asphalt pavement (APm) repair works) have carried out the respective activities. The WG 1 had meetings to discuss countermeasures for the comments on the draft technical guidelines (21, 28 July 2017). While the WG 2 members received trainings as well as OJT on AP road inspection and APm repair works (Refer to "(2) 2-4 and (3) ", "1-2 Progress of Activities").

OJT on AP Road Inspection
(Patching on Bd. Congo-Japon)

OJT on APm Repair Works
RN43 (Sampling)

(3) In view of efficient implementation, the Project has proposed collaboration with “Project for Urban Transport Master Plan in Kinshasa City (Master Plan Project)” under JICA, which has been conducting the traffic volume survey for about 40 sections (Refer to “(1) 1-4”, “1-2 Progress of Activities”).

(4) Newspaper article (Le Pontentiel) on the road maintenance was published on 3 August 2017. The article says “Supervised by the “Office des Voiries et Drainage (OVD)”, the rehabilitation work was carried out for three days, from 24 to 26 July 2017.” This rehabilitation work was well received by the public and the article continues to mention the followings; “We are pleased after the rehabilitation of this section, and thank the authorities".

Voirie à Kinshasa : poursuite des travaux de réhabilitation

Les travaux de réhabilitation de la voirie de la ville de Kinshasa se poursuivent normalement par la suppression des bourbiers et des nids-de-poule sur certaines artères de cette ville.

Selon les chefs des chantiers ouverts à travers la ville, plusieurs projets de réhabilitation sont retenus par l'hôtel de ville, notamment sur les avenues Tabu Ley (ex-Tombalbaye), Kasa-Vubu, Wangata et Luambo Makiadi (ex-Bokassa) dans la commune de la Gombe et les avenues N'djoku et Mokali, dans la commune de Kimbanseke. Ces avenues sont en réhabilitation dans le cadre du programme visant à réhabiliter au maximum la voirie urbaine et des provinces pendant la saison sèche.

Sur l'avenue Tabu Ley, on attend la pose de l'asphalte sur les tronçons qui sont en train d'être réhabilités par l'Office des voiries et drainage (OVD). Entre-temps, ces tronçons sont rouverts à la circulation.

En province, la voirie de la ville de Kisangani est visée pour 11 km des routes à revêtir sur un financement du gouvernement et une autre partie importante dans le cadre du Programme de développement urbain (PDU) financé par la Banque mondiale (BM). Outre les routes, le gouvernement a entrepris également les travaux de lutte antiérosive à Kimbanseke, visant à réhabiliter la route N'djoku, coupée par des pluies diluviennes.

Par ailleurs, le projet de construction de la route périphérique de la ville de Kinshasa, à savoir la route Nzolana (à Malweka, commune de Ngaliema) a atteint la vitesse de croisière. Les travaux de construction d'un pont sur la rivière Binza sont déjà achevés.

Actuellement, la société chinoise CREC 7 est au stade de la construction des ouvrages d'assainissement et de la chaussée par le rechargement de la route. La construction de cette route doit résoudre le problème d'embouteillages observés sur la chaussée Mzee Laurent-Désiré Kabila (ex-route de Matadi) reliant l'Université pédagogique nationale (UPN) à la commune de Kintambo en passant par Binza-Ozone, dans la commune de Ngaliema, indique-t-on.

ACP/LP

Lemba : enfin, le tronçon Super Lemba-Terminus réhabilité

Après sa réhabilitation, l'axe routier Super-Lemba-Terminus a été rouvert à la circulation. Les usagers de cette artère ont poussé un ouf de soulagement, car le transport était pendant longtemps un casse-tête, les conducteurs de véhicules l'ayant désertée pour éviter des pannes de leurs engins.

NADINE AMBODIHELA (STAGIAIRE/UCC)

Les usagers de l'axe routier Super-Lemba-Terminus, dans la commune de Lemba, à Kinshasa, ont poussé un ouf de soulagement après la réhabilitation de cet axe routier. Car les véhicules peuvent à nouveau emprunter cette artère et permettre la mobilité de la population de cette partie de la municipalité.

La dégradation avancée de cette artère il y a quelques années a posé un sérieux problème aux conducteurs de véhicules, au point que la plupart d'entre eux avaient décidé de la déserter. Cela pour éviter des pannes des rotules, disques d'embrayage, amortisseurs, etc.

Seuls les conducteurs téméraires l'empruntaient encore. Cela au grand étonnement des gens qui avaient du mal à comprendre leur entêtement lorsque l'on sait qu'acheter un véhicule n'est pas à la portée de toutes les bourses dans la ville de Kinshasa. Il en est de même des pièces de rechange de véhicules, surtout par ces temps de basse conjoncture à laquelle sont confrontés les Kinois.

Il s'est avéré qu'un tel comportement n'était affiché que par des conducteurs de véhicules commis au transport en commun qui refusent de voir l'avenir, se contentant de vivre au jour le jour. C'est-à-dire prêts à abandonner les véhicules dès qu'ils tombent en panne et aller chercher un emploi auprès d'autres employeurs du secteur.

Dès que l'axe routier Super-Lemba-Terminus était devenu impraticable, les habitants de la commune de Lemba ont entrepris des démarches pour qu'il soit réhabilité. Cela en impliquant le bourgmestre de la commune de Lemba. Raison invoquée : la réhabilitation de cet axe routier allait rendre fluide la circulation sur cette artère qui connaît un mouvement ininterrompu des véhicules pendant la journée.

Selon les usagers de cet axe routier, le retard pris dans la réhabilitation de cette artère était dû à l'indifférence des autorités parce qu'elles n'habitent pas la commune de Lemba ou n'empruntent par cette artère. Sauf pendant des périodes électorales au cours desquelles elles promettent monts et merveilles à la population mais ne les réalisent pas, en retour, une fois au pouvoir.

Après la visite du Premier ministre, Bruno Tshibala, à Lemba, les travaux de réhabilitation ont débuté. Supervisés par l'Office des voiries et drainage (OVD), ils ont été effectués pendant trois jours, du 24 au 26 juillet 2017.

Interrogé, un taximan, trouvé au « Terminus » et qui a requis l'anonymat, a déclaré que la réhabilitation de ce tronçon a traîné pendant longtemps, faute de volonté politique. Et de poursuivre : « *Qu'à cela ne tienne. Nous sommes contents après la réhabilitation de cet axe routier et remercions tout de même les autorités qui ont pensé, bien que tardivement, à la réhabilitation de ce tronçon* ».

De son côté, Mme Christine, résidant sur l'avenue Kitongo, à Lemba, s'est dit ravie de la réhabilitation de cet axe routier. Car pendant longtemps, le transport a été un casse-tête dans cette partie de la commune de Lemba, suite à sa détérioration très avancée. Elle espère que cet axe routier sera entretenu régulièrement pour éviter qu'il ne soit vite détérioré.

(5) In order to enhance smooth operation and management of the Project, the Project monitoring in

charge, officials of the Congolese side and the Experts concerned gather to discuss the progress and the issues of the Project. The main representatives of the Congolese side are from Infrastructure Unit (Gestionnaire de Projet Transports, on behalf of Charge de Suivi-Evaluation), OR (Coordinator) and OVD (Logistic Director). With regard to the Project Design Matrix (PDM), several achievements (refer to the “1-2 Progress of Activities”), including the set timeframe, were reported while the rest of the indicators were reminded in order to fulfill those in a timely and proper manner.

1-2 Progress of Activities

(0) Activities for the General Issues:

- In line with the revised schedule for developing draft technical guidelines (prime activity of the Project), the Project activities have been marking a certain progress.

- The 4th JCC meeting was held on 15 November 2017. 40 participants attended this meeting in total. Those participants are including the Advisor to the Minister of the Ministry of Infrastructure, Public Works and Reconstruction (MoIPWR), Director General of FONER (Fonds National d'Entretien Routier), Chief Resident Representative of JICA, Professors of Institut National du Bâtiment et des Travaux Publics, officials from Bureau d'études d'aménagement et d'urbanisme, Infrastructure Unit of MoIPWR , OR/OVD and others.


The 4th JCC

Main topics presented in the 4th JCC:

- *Progress of the WG 1 and the Technical Advisory Group meetings on the technical guidelines on AP road maintenance*
- *Database related issues*
- *Outcomes of the trainings and OJTs*

- A series of meetings for the respective activities of the outputs 1, 2 and 3 had been arranged for this target period of the monitoring lead by each WG.

- Activities on the public relations (PR) have been continued. In line with this, RTNC (Radio-Television Nationale Congolaise), TELE 7 and ACP (Agence Congolaise de Presse) came to the 4th JCC and reported this event.

- The 3rd edition of the Project Newsletter has been uploaded on the JICA homepage (French version: https://www.jica.go.jp/project/drc/004/newsletter/index.html) while JICA project site (website) of this Project has been updated on a regular basis. The 9th edition of the Project News of the JICA website was uploaded (https://www.jica.go.jp/project/drc/004/news/index.html). The next update of the Project News is scheduled to be done in mid-November 2017.

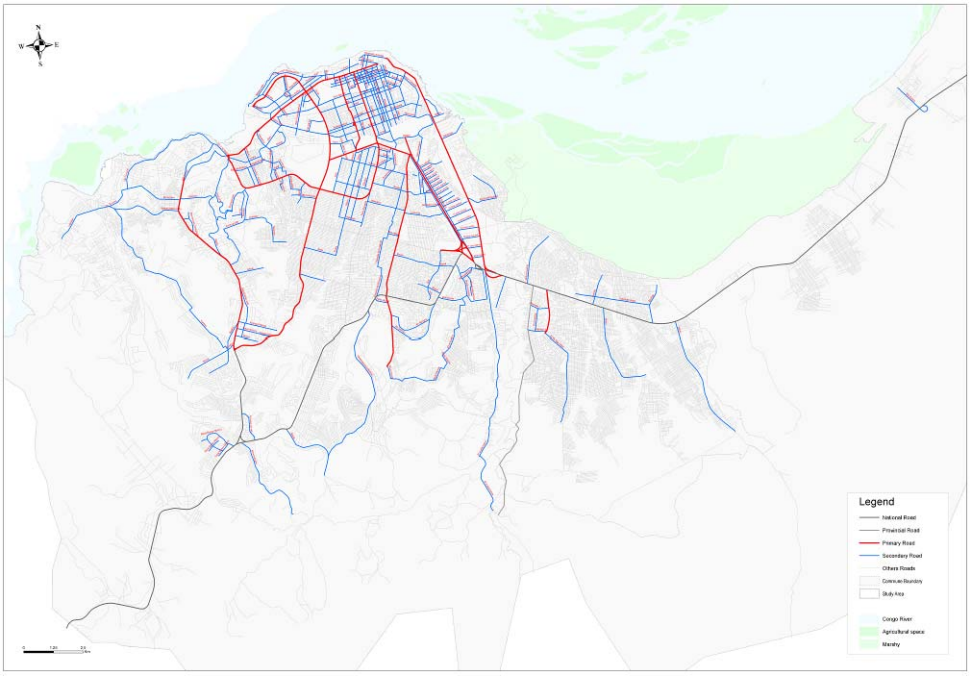
- The Project has secured a link to the website of Infrastructure Unit since May 2017. The Project Newsletters of up to the 3rd edition have been uploaded to this particular site. (http://www.celluleinfra.org/index.php/publications/lettre-mensuelle-d-information-du-projet-pro-routes).

(1) Activities for OP1: AP Road Maintenance Cycle is Established in OR and OVD with Clearly Defined Roles And Responsibilities in the Project Sites

- As reported in the 1st Monitoring Summary, "1.1 Review of the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD" has been jointly done by the Counterparts (C/Ps) and the JICA experts having series of discussions as well as site visits. This activity has been **completed** in July 2016.

- "1-2: The most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD (Office des Voiris et des Drainages) in the project sites" have been in an application stage. The identified roles, responsibilities and work procedures for AP road maintenance of OR and OVD will be continuously applied throughout the Project period.

- "1-3: The road network to be covered by the Project" has been defined (**completed**) as shown below.



Source: PDTK (Master Plan Project)

- "1-4: The traffic volume survey on some sections of the defined road network" was conducted on the 20 June 2017 to start with, having collaboration with the "the Master Plan Project". Prior to that, preparatory workshop (how to conduct the aforementioned survey) was organized on the 7 June

2017. Thereafter, some more traffic volume surveys with the Master Plan Project were implemented. To be specific, twice (3 sections) in July and six (6) times in August 2017. In July, traffic volume at Boulevard (Bd.) 30 juin, Bd. Congo-Japon and Bd. Matadi sections were surveyed. In total, 19 sections were covered. For each traffic volume survey, five (5) officials concerned of the Project were participated.

- One of the "Objectively Verifiable Indicators" of Monitoring Sheet I has been set as follows; "1-1: Traffic volume survey is conducted on 2 sections by July 2017 for one time throughout the project period." And this has been achieved (**completed**) as described above.

- With regard to "1-5: An AP road maintenance plan FY 2018 of OR and OVD in the project sites", OR and OVD have been preparing the respective FY 2018 plans, however, those plans, are not under the Project and have no base on the implementation/evaluation of the Project. For this, the priority should be given for them to acquire skills on how to obtain the data as well as to utilize it. Once the data is well utilized, economical operation of the road maintenance can be materialized, at the same time, the mid-term plan can be developed by predicting the road condition of near future.

- Concerning "1-6: Elaborate budget FY 2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request", the Project proposed modification of the plan to commence the activity in June 2018. And this proposal was accepted by the 4th JCC. Several delays such as developing database, which should be utilized for budget planning, etc. need to be overcome before this activity to be handled.

(2) Activities for OP2: Technical Guidelines on AP Road Maintenance are Developed

- "2-1: Review the current AP road maintenance works of OR and OVD and analyze their problems in the Project sites" has been carried out based on the result of the interview, site observation and observation of the road maintenance as well as road repair sites (as reported in the 2nd Monitoring Summary, it has been **completed**).

- As reported in the 2nd Monitoring Summary, "2-2: Collection and review of the current AP road maintenance manuals and technical guidelines" have been **completed**.

- Likewise, "2-3: Establishment of the WG for developing technical guidelines on AP road maintenance (WG 1)" has been **completed**.

- Regarding "2-4: Technical guidelines on AP road maintenance have been drafted and developed", as reported in the 3rd Monitoring Summary, the WG1 members did final review of the draft technical guidelines, and the technical inputs by the Japanese Experts have been incorporated into the guidelines by the end of April 2017 (**completed**).

- The WG 1 members reported the progress, and the draft guidelines were distributed in the 3rd JCC.

- The completion timeframe of this particular activity is described in the "Objectively Verifiable Indicators" of Monitoring Sheet I; "2-1 Technical guidelines on AP road maintenance are drafted by April 2017". Thus this activity has been **completed** within the given timeframe.

- "2-5: Comments on "the contents of the draft technical guidelines" were collected starting from June 2017 and continued till July 2017 with English translation. Accordingly the countermeasures have been discussed among the WG1 members. Then discussion with the Technical Advisory Group (TAG) was organized on 22 September 2017 followed by 19 October 2017 and 3 November 2017. This exercise will be continued for a couple of times thereafter.

  The TAG members are listed below;

Title	Organization
Professors (2 people)	Polytechnic Faculty, University of Kinshasa
Head of Operation	Polytechnic Faculty, University of Kinshasa
Professors (2 people)	National Institute of Building and Public Works
Assistant	National Institute of Building and Public Works

- The 1st TAG meeting: the countermeasures (revision) for the comments from the TAG and the other

concerned parties (The 3rd JCC invitees) on the 1st - 5th Chapters of the technical guidelines were presented by the WG1 members. The TAG and the WG1 members had detailed discussions in order to revise the draft technical guidelines.

- The 2nd TAG meeting: In view of the 1st TAG meeting discussion, draft version of the 1st, 2nd, 3rd, 4th and 5th Chapters of the technical guidelines has been finalized. The rest of the draft Chapters (6th – 11th) has been distributed to the TAG members.


Discussions with the TAG and the WG1 Members

- The 3rd TAG meeting: Prior to the 3rd meeting, the comments from the TAG members on the rest of the Chapters of the technical guidelines were shared with the WG1. During the course of the 3rd meeting, the countermeasures (revision) have been taken and they had further discussion on those. Accordingly, the draft technical guidelines from the 6th till 11th Chapters have been completed.

- "2-6: AP road inspection in accordance with the drafted and revised technical guidelines" is underway. Evaluation of the procedure as well as outcomes of AP road inspection will be implemented sometime in February or March 2018.

- "2-7: In order to "develop a database for accumulating the AP road inspection results", the equipment (a camera to measure the road surface) was purchased and shipped to the DRC. A vehicle, which will be granted by JICA, to carry the said equipment is still under tax exemption procedure. Meanwhile, the existing vehicle has been temporary used to conduct trainings as well as inspection. However, this temporary vehicle is not always available. Moreover, due to the security reason, it is required to be escorted by the police when conducting inspection, the arrangements with the police is another concern, which is not always easy.

- Database entry training has been provided, yet the data to process is lacking. Inspection and interpretation of data need to be improved. Currently the Expert is developing data input/analysis application of excel macro to follow up with these issues.

Database Entry Training

OJT to Obtain Data

- "2-8: With regard to the AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines", those works have been undertaken through OJT referring to the said guidelines. The training/OJT participants were listed below.

Participants List for Training on AP Road Inspection

#	Name	Institution
1	Christ NSIMBULU MASAMBA	OVD
2	Pierre WANET MUTUMOSI	OR
3	Jonathan MAYAMBA	OR
4	Albert MUINDILE MUTSHIPAYI	OR
5	Guylain LUZOLO TUKITALO	OVD
6	Victor KALONDA KAKALONDA	OVD
7	Chiristophe TSHIDIBI TSIMBOMBO	LABO
8	Eric DIOMBA PAMBU	LABO
9	Michel DINGANGA	ACGT
10	Pascal BULONGO PYANA	FONER
11	Dominique NZUZI MASSAMBA	BTC
12	Timothe SUMALI	OVD
13	FIMPADIO MAMPUYA	OVD
14	AGIGBA ZONO	OVD
15	EWMBE NANDO	OVD
16	IMBOTO MABILA	OVD
17	MVUEZOLO TOLOMBA	OVD
18	MUKUDI KAZADI	OR
19	MURHULA GWA KASHEMWA	OR
20	MAKANDA TRIKASE	OR
21	BUKASA MUKENDI	OR
22	MOIKA NGBOLIKO	OR

#	Name	Institution
23	NKENDA MATONDO	OR
24	Patrick MBILA ESONG	BTC
25	Corneille MADIMBA MADIMBA	BTC
26	ESRHER MATUTALA	LABO

Participants List for Training on APm Repair Works

#	Name	Institution
1	Rose BUKAWU KALUBI (Female)	OVD
2	Hélène SEKO MFUNDU (F)	OR
3	Déogratias NTAMBI KALULO	OR
4	Kady OLEKONYA KADIMA	OR
5	BWABWA MUKENDI	OR
6	LOMBOMBE NSUNDJU (F)	OR
7	Zacharie LANDAMO MADIATA	OR
8	Olivier MITSHABU KADIMA	OVD
9	Jean-Jacques KAWE LUMUMBA	OVD
10	NKUNGA MANSIANTIMA	OVD
11	Didier FATAKI KASONGO	LABO
12	DAKWA BEMBA	OR
13	Géorges MAKANDA TRIKASE	OR
14	Kevin BABAKA LELO	ACGT
15	Andy MPUTU ISSANZA	OR
16	Olga BANZA NGOIE (F)	OR
17	Eddy BONGONGO SOZANE	OVD
18	KYUNGU NTAMBI	OR
19	Jean BAWILI KAZINGUVU	OR
20	LOSHA KAZADI	OVD
21	MBOMA MAKASI	BTC
22	Jorluquin SANGI NKANZA	OVD
23	KHONDE MAKAYA	OVD
24	Narra KIMVULA MUDIMUNANGA	OVD

(3) Activities for OP3: AP Road Maintenance Skills and Knowledge of OR's and OVD's Technical Staffs are Improved in the Project Sites

3-1: Training Plan for AP Road Inspection and APm Repair Works

- "3-1-1: Establishment of the Joint Working Group for conducting trainings on AP road inspection and APm repair works" has been **completed** as reported in the 2nd Monitoring Summary.

- "3-1-2: The plan of the trainings on AP road inspection and APm repair works" had been **completed** by the end of April 2017, which was the revised target time frame (as reported in the 3rd Monitoring Summary).

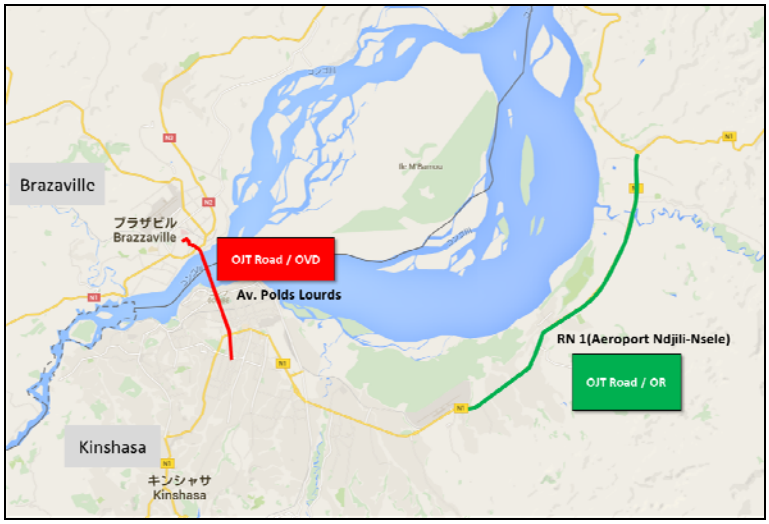
- The completion timeframe of this activity is described in the "Objectively Verifiable Indicators" of

Monitoring Sheet I; “3-1: Training Plan is developed by April 2017”. Thus this activity has been completed within a given timeframe.

- The Project considered introducing the training of trainers (ToT). The trainers of Congolese side have been nominated by the C/Ps. However, the results of the baseline survey were moreover similar scores for both the trainers and the trainees, even at some points, the scores of the trainees were higher than those of the trainers. Given the fact that the Congolese expected trainers’ huge challenges, the Project has re-considered the ToT scheme to be suspended, at least for the time being.

- “3-1-3: Candidate sites for the trainings on AP road inspection and APm repair works” on the OVD road had been confirmed as reported in the 3rd Monitoring Summary. On the other hand, that of OR road was pending since the BTC (Bureau des Travaux et Construction) maintenance budget related matter needed to be cleared. Currently it has been determined that the National Route (NR) 1 is the training site for OR as shown below.

- Different candidate sites for the remaining trainings may be identified so as to make the trainings more meaningful.



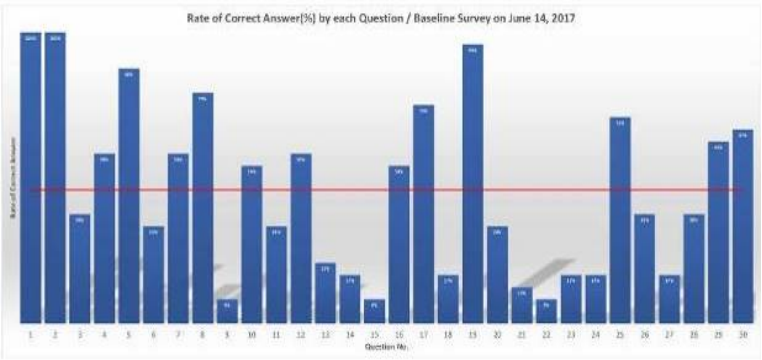
Candidate sites for trainings

3-2: Trainings on AP Road Inspection:

- “3-2-1: The initial baseline survey on the training participants’ skills and knowledge of AP road inspection” was conducted on the 14 June 2017. Prior to that, the baseline survey for the main C/Ps was organized last year for the trial basis. The said survey will be arranged 2 more times.

  Out of 30 questions, only 2 questions were marked 100% as correct answers for the initial baseline survey. The average rate of correct answers was 45.9%, and the worst rate was 8% followed by 13 %.

Baseline Survey



Accuracy Rate by Each Question

- "3-2-2: Lectures on AP road inspection" have been organized 3 times so far focusing on the inspection by using the equipment as explained below.
  1) The equipment was first used for the Project: May 2017
  2) Confirmation of the actual situation on the ground followed by the brush up training: August 2017
  3) The 2nd round of brush up training: October 2017

- The above 3) was conducted due to the fact that the trainings on how to use the equipment and crack interpretation have not been well acquired by the majority of the trainees.

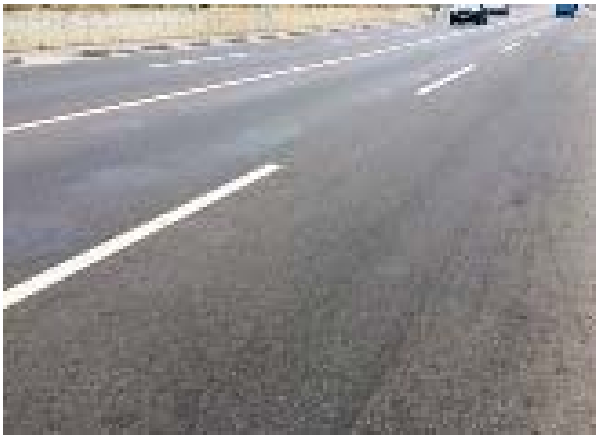
Lectures in August 2017

- "3-2-3: Initial OJTs on AP road inspection at the selected sites in the project sites" have been conducted on NR 1/NR 43 for OR and Poids-Lourds/30 Juin for OVD. However, given the situation addressed above 3-2-2, it requires inspection and crack interpretation trainings to be redone. The 2nd and the 3rd OJTs will be organized sometime during the 1st and the 2nd Quarters of 2018.

- The training received participants not only from the WG 2 members but others from OR, OVD, BTC, LABO, ACGT (Agence Congolaise des Grands Travaux) and FONER, which make up to

73 participants.

RN 43



Poids-Lourds

- "3-2-4: The initial end line survey on the training participants' skills and knowledge of AP road inspection" will be organized in between January and February 2018. The 2nd and the 3rd end line surveys will be implemented as scheduled (March 2018 and June 2018 respectively).

- "3-2-5: AP road inspection through trial implementation of the drafted technical guidelines by the training participants" has been pending since the inspection data is lacking (Refer to 2-7, (2), 1-2 Progress of Activities).

3-3: Training on APm Repair Works

- "3-3-1: The baseline survey on the training participants' skills and knowledge of APm repair works" was organized on the 11 September 2017 for the second time after the initial ones taken on the 17th/29th August 2017.

- "3-3-2: Lectures on APm repair works" of the second session were organized from August 2017 till September 2017.

Lectures

- “3-3-3: The OJTs on APm repair works at the selected sites in the project sites” were implemented in August, September and November 2017 for the initial stage. After 3-day OJTs held on 8-10 November, the review meeting was set on 14 November 2017.

OJT

Review Meeting

During the course of the OJTs, some LABO works were arranged. For instance, experiments on the relation between the density/temperature of the asphalt were implemented on 10 November 2017 for the purpose of the asphalt temperature control.

One of the LABO works (experiment on density/temperature of asphalt)

- “3-3-4: The end line survey on the training participants’ skills and knowledge of APm repair works” will be implemented in mid-November 2017.

- “3-3-5: In line with the APm repair works through trial implementation of the drafted technical guidelines by the training participants”, general review on the initial stage of the OJTs was done in September 2017. In view of the raised issues at the general review, the OJTs will be continued for the betterment of the current situation of the concerned officials.

1-3 Achievement of the Project Purpose and Outputs

- Achievements are shown in the achievement column of the Monitoring Sheet II.

1-4 Changes of Risks and Actions for Mitigation

- After the 2nd monitoring, the similar concern remains on the Presidential election related matter. Depending on the situation in the country, specifically in Kinshasa, the Experts' assignments may be affected as previously experienced.

- At the same time, rather minor yet disturbing movements have been frequently happening in Kinshasa. In fact, on the day that the 4th JCC was held, political demonstration was announced and it was assumed that organizing the 4th JCC might not be feasible. Fortunately, the said demonstration related matter did not affect the JCC; however, this kind of incidents may occur any time in this country. The Project needs to keep abreast of those issues.

- In spite of some delays and modification of the plans including the issues in line with the aforementioned situation, the Project as a whole has been putting efforts to complete the entire planned activities. At this stage, the Project expects to accomplish all those, but if the security situation worsens in coming months, there may be necessity to amend respective Experts' assignments, and also to reschedule the timing of organizing the remaining JCCs.

1-5 Progress of Actions undertaken by JICA

- Necessary support and suggestions to the Project have been continuously provided.

1-6 Progress of Actions undertaken by the Gov. of the DRC

- Even with a certain delay with consecutive reminder by the Project, the Gov. of the DRC side's responsive roles, including budget allocation, have been played gradually. The Project has been observing some improvements of the Congolese side actions.

1-7 Progress of Environmental and Social Considerations (if applicable)

- These issues are not directly applicable to the Project. However, the contents of the draft technical guidelines include environmental issues, for instance, consideration of the roadside environment, specifically noise and vibration matters.

- At the same time, the road maintenance itself is a significant source of environmental protection. The Project will support such initiative of the Congolese side throughout the Project.

1-8 Progress of Considerations on Gender/Peace Building/Poverty Reduction (if applicable)

- These issues are also not directly applicable to the Project, yet the roads are for the entire citizens, which certainly include men and women, children, economically vulnerable people and so on.

- On the other hand, the Project has been securing female participation of the Project as trainees. Their capacity will be also enhanced through the trainings/OJTs under the Project.

1-9 Other Remarkable/considerable Issues Related/affect to the Project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs, etc.)

- The Project has met with the Organization for Equipment of Banana-Kinshasa (OEBK), which is responsible for Matadi Bridge in terms of maintenance. The Project has been utilizing the shared experiences of OEBK as a reference for its implementation.

- As stated in "(3), 1-1 Progress Inputs, I Summary" and "(1-4), (1), Progress of Activities", collaboration between 2 JICA projects, namely Master Plan Project and this Project, have been strengthened, and such holistic approach is expected to contribute to the improvement of the Road Transport Sector of DRC as a whole.

2. Delay of Work Schedule and/or Problems (if any)

- As explained in "1-4" above, there are some foreseeable risks due to the security reason. If the security situation worsens, the OJTs and the other activities on sites may be suspended, which would affect the progress of the Project.

3. Modification of the Project Implementation Plan

3-1 PDM and PO

- As explained above "1-6 (1)", "1-2 Progress Activities", the Project proposed modification of the implementation schedule of the following activity (Refer to the Monitoring Sheet II);

  Output 1:1-6 "Elaborate budget FY 2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request"

- Initially it was planned to commence from October 2017 till mid-May 2018, and modified to do so from June till October 2018. And the said modification was approved by the 4th JCC.

3-2 Other Modifications on Detailed Implementation Plan

- N.A.

4. Preparation of Gov. of the DRC Toward after Completion of the Project

- N.A.

II. Project Monitoring Sheet I & II

See attached.

Project Monitoring Sheet I (Revision of Project Design Matrix)

Dated: 15 November, 2017

Project Title: The Project for Capacity Development of Road Maintenance Management

Inputs		Plan / Actual	2016 II	2016 III	2016 IV	2017 I	2017 II	2017 III	2017 IV	2018 I	2018 II	2018 III	2018 IV	2019 I	Remarks	Monitoring: Issue	Monitoring: Solution
Expert																	
Leader / Road Maintenance Plan 1 (Mr. Shimizu)	9.60	Plan														*In order to procure the equipment for road surface measurement, a Japanese Expert (Road Inspection: Database 2, Mr.Maeda) has been deployed. Database 2 Expert is to set up the said equipment as well as to conduct trainings to the relevant C/Ps.*	*Mr. Maeda shares the assignments with Mr. Sakai. Thus no additional assignments to be made, and total duration of the entire assignments of all Experts will not require any modification.*
		Actual															
Sub-Leader/ Road Maintenance Plan 2 (Mr. Saito)	10.50	Plan															
		Actual															
Road Inspection (Mr.Takahashi)	9.90	Plan															
		Actual															
Pavement Repair (Mr. Shishido)	12.00	Plan															
		Actual															
Road Inspection (Database) (Mr. Sakai)	10.07	Plan															
		Actual															
Road Inspection (Database 2) (Mr. Maeda)	0.73	Plan															
		Actual															
Pavement Repair (Construction Supervision) (Mr. Mukai)	5.80	Plan															
		Actual															
Coordinator (Mr. Yamagishi)	10.43	Plan															
		Actual															
Monitoring and Evaluation (Ms.Taguchi)	3.10	Plan															
		Actual															
Training Plan	0.60	Plan															
		Actual															
Equipment																	
Equipment for database system		Plan													Database 2 Expert conducted technical inspection on the procured equipment. This was planned and borne by the Database 2 side initiative.	A vehicle to carry the camera is still under procurement. Tax exemption procedure is a time-consuming source.	Currently a temporary vehicle from Infrastructure Unit has been used.
		Actual															
Training in Japan																	
Training for Counterpart Personnel		Plan													*Training was held 4- 22 May 2017 (including traveling time and weekends).*	*Feedback from the participants will be presented at the 3rd JCC.*	
		Actual															

Activities / Sub-Activities		Plan / Actual	2016 II	2016 III	2016 IV	2017 I	2017 II	2017 III	2017 IV	2018 I	2018 II	2018 III	2018 IV	2019 I	Responsible Organization: Japan	Responsible Organization: GoDRC	Achievements	Issue & Countermeasures
Output 1: Asphalt paved (AP) road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites.																		
1.1 Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites	●●●●●○	Plan													JICA	OR/OVD	*Completed: it had taken a bit more time than expected due to the preparation.*	*No major issues.*
		Actual																
1.2 Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites	●●○○○○	Plan													JICA	OR/OVD	*Identification stage has been completed.* Currently, it is in an application stage.	
		Actual																
1.3 Define the road network to be covered by the project	●●●○○	Plan													JICA	OR/OVD	In collaboration with Master Plan Project, it has been completed.	
		Actual																
1.4 Conduct traffic volume survey on some sections of the defined road network	●●●○	Plan													JICA	OR/OVD	Completed. Joint traffic volume surveys were conducted in collaboration with Master Plan Project.	Prior to the said survey, preparatory workshop was organized.
		Actual																
1.5 Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites	●●○○○○	Plan													JICA	OR/OVD	In progress. OR/OVD have been developing respective FY 2018 maintenance plans.	However, these plans are not based on the inspection/evaluation under the Project. Require follow ups.
		Modification																
		Actual																
1.6 Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request	●●○○○	Plan													JICA	OR/OVD	Project proposes modification of the plan.	Database will be utilized when developing budget plan. Considering such, it scheduled to be commenced sometime in June 2018.
		Modification																
		Actual																
Output 2: Technical guidelines on AP road maintenance are developed.																		
2.1 Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites	●●●●●○○	Plan													JICA	OR/OVD	*Completed.*	
		Actual																
2.2 Collect and review the existing AP road maintenance manuals and technical guidelines	●●●●●○○	Plan													JICA	OR/OVD	*Completed.*	
		Actual																
2.3 Establish the Joint Working Group for developing technical guidelines on AP road maintenance	●●○○○○○	Plan													JICA	OR/OVD	*Completed.*	
		Actual																
2.4 Develop and draft technical guidelines on AP road maintenance	●●●●○	Plan													JICA	OR/OVD	*Completed.*	
		Modification																
		Actual																
2.5 Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group (TAG) meetings etc. and revise the drafted technical guidelines	●●○○○○	Plan													JICA	OR/OVD	In progress. Comments on the draft guidelines have been gathered.	WG has been discussing on the given comments.
		Modification																
		Actual																
2.6 Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection	○○●○	Plan													JICA	OR/OVD	In progress. Currently, inspection is under way.	Evaluation of the procedure/outcomes of AP road inspection will be implemented sometime in Feb.or March 2018.
		Modification																
		Actual																

version 4

Project Monitoring Sheet I (Revision of Project Design Matrix)

Dated: 15 November, 2017

Project Title: The Project for Capacity Development of Road Maintenance Management

Inputs	Plan / Actual	Remarks		Monitoring: Issue	Monitoring: Solution
2.7 Develop a database for accumulating the AP road inspection results	Plan	JICA	OR/OVD	In progress. Database entry training has been provided. Data to process is lacking. There is some room for improvements on inspection/ interpretation.	Data input/analysis application of excel macro has been under developing.
	Modification				
	Actual				
2.8 Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works	Plan	JICA	OR/OVD	In progress.	AP road maintenance and APm repair works have been undertaken through OJT referring to the draft technical guidelines.
	Modification				
	Actual				
2.9 Finalize the technical guidelines	Plan	JICA	OR/OVD		
	Actual				
2.10 Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations	Plan	JICA	OR/OVD		
	Actual				
2.11 Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW	Plan	JICA	OR/OVD		
	Actual				
Output 3: AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites.					
3-1.Training plan for AP road inspection and APm repair works					
3.1.1 Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works	Plan	JICA	OR/OVD	*Completed*	
	Actual				
3.1.2 Plan the trainings on AP road inspection and APm repair works	Plan	JICA	OR/OVD	*Completed*	
	Modification				
	Actual				
3.1.3 Select candidate sites for the trainings on AP road inspection and APm repair works	Plan	JICA	OR/OVD	The candidate sites for the initial training have been selected.	The 2nd/3rd training sites may remain the same or be changed depending on the situation.
	Modification				
	Actual				
3-2. Trainings on AP road inspection					
3.2.1 Conduct baseline survey on the training participants' skills and knowledge of AP road inspection	Plan	JICA	OR/OVD	1st baseline survey was conducted in June 2017	Baseline survey conducted in 2016 was a trial one. Actual baseline survey commenced in June 2017.
	Modification				
	Actual				
3.2.2 Conduct lectures on AP road inspection	Plan	JICA	OR/OVD	The lectures were conducted 3 times so far. After 2nd lecture, it was found that majority of trainees have not acquired knowledge/ skills enough.	Experts conducted brush up training in Oct. 2017.
	Modification				
	Actual				
3.2.3 Conduct OJTs on AP road inspection at the selected sites in the project sites	Plan	JICA	OR/OVD	OJT has been conducted for both OR and for OVD. Issue remain as described in 3.2.2.	Trainings on inspection and interpretation of crack were given, and those will be repeated in due course.
	Modification				
	Actual				
3.2.4 Conduct end line survey on the training participants' skills and knowledge of AP road inspection	Plan	JICA	OR/OVD	Pending.	Initial end line survey will be conducted sometime in Jan. or Feb. 2018. Timing to be adjusted with experts in charge to be assigned.
	Modification				
	Actual				
3.2.5 Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines	Plan	JICA	OR/OVD	Pending. Inspection/ interpretation works require improvements (acking data).	Follow up witll be scheduled to be done sometime in Feb. 2017.
	Modification				
	Actual				
3.3 Training on APm Repair Works					
3.3.1 Conduct baseline survey on the training participants' skills and knowledge of APm repair works	Plan	JICA	OR/OVD	2nd survey was conducted in September 2017.	
	Modification				
	Actual				
3.3.2 Conduct lectures on APm repair works	Plan	JICA	OR/OVD	The lectures were conducted in August and September 2017.	
	Modification				
	Actual				
3.3.3 Conduct OJTs on APm repair works at the selected sites in the project sites	Plan	JICA	OR/OVD	OJTs were conducted in August, September and November 2017.	
	Modification				
	Actual				
3.3.4 Conduct end line survey on the training participants' skills and knowledge of APm repair works	Plan	JICA	OR/OVD	Pending.	End line survey will be conducted in mid-November 2017.
	Modification				
	Actual				
3.3.5 Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines	Plan	JICA	OR/OVD	In progress.	Through OJT, issues were found. Continue OJT for improvements.
	Modification				
	Actual				
Duration / Phasing	Plan				
	Actual				

Project Monitoring Sheet I （Revision of Project Design Matrix）

version 4

Dated: 15 November, 2017

Project Title: The Project for Capacity Development of Road Maintenance Management

Inputs	Plan / Actual	2016 II	2016 III	2016 IV	2017 I	2017 II	2017 III	2017 IV	2018 I	2018 II	2018 III	2018 IV	2019 I	Remarks	Monitoring: Issue	Monitoring: Solution
Monitoring Plan	Plan / Actual	2016 II	2016 III	2016 IV	2017 I	2017 II	2017 III	2017 IV	2018 I	2018 II	2018 III	2018 IV	2019 I	Remarks	Issue	Solution
Monitoring																
Joint Coordination Committee	Plan	■		■		■		■		■		■		4th JCC was held on 15 Nov. 2017.		
	Actual	■		■		■		■								
Set-up the Detailed Plan of Operation	Plan	■												*Completed*		
	Actual	■														
Baseline Survey for Target Figures	Plan		■											*Completed.*		
	Actual		■													
Set-up the Target Figures within 6 months after the commencement of the project	Plan		■	■										*Completed.*	*Project had proposed target timeframe at the 2nd JCC. However, review required considering the Experts' assignment suspension from Dec. 2016 till mid-Jan. 2017.*	*Project proposes modification of the target timeframe for 2-1 and 3-1 in the PDM.*
	Actual	■	■	■	■											
Submission of Monitoring Sheet	Plan		■			■		■		■		■		Version 4 was submitted to the 4th JCC.		
	Actual		■			■		■								
Reports/Documents																
Inception Report (Work Plan)	Plan	■												*Submitted to the 1st JCC*		
	Actual	■														
Draft Project Completion Report	Plan											■				
	Actual															
Project Completion Report	Plan											■				
	Actual															
Public Relations																
Establishment and Operation of web Site, and other relevant PR activities	Plan													Project news of JICA HP has been updated for 9 times so far. The Project News letters have been linked to the website of Infrastructure Unit since May 2017.	Project news of JICA HP will be updated mid-November 2017 while the news letter will be done so at the same timing.	Further PR activities will be implemented having different approaches. Eg., media, website, provision of newsletter,etc.
	Actual	■	■	■	■	■	■	■	■	■	■	■	■			

■ Activities with fixed period

▒ Activities to be continuously conducted, or with tentative schedule

05 Monitoring Sheet - Version 5

TO CR of JICA D. R. Congo Office

PROJECT MONITORING SHEET

Project Title:

The Project for Capacity Development of Road Maintenance Management

Version of the Sheet: Ver. 5 （Term: 17 November 2017 –8 June 2018）

Name: Mr. Nobuharu SHIMIZU

Title: Leader/Road Maintenance Plan

Prepared on 10 June 2018, Submission Date: 18 July 2018

The contents of the below are based on the planned activities during the target period of this particular monitoring (ref. to the Monitoring Sheet II for the timeframe of the respective activities).

0. General Information

0-1. Implementation Agency

Office des Routes (OR) and Office des Voiries et Drainage (OVD)

0-2. Target Group

Technical staffs of headquarters and Kinshasa provincial offices of OR and OVD

03. Project Period

June 2016 - October 2018→Jan. 2019

0-4. Project Site

Kinshasa city and the surrounding area

0-5. Overall Goal

Maintenance condition of the asphalt-paved (AP) roads is improved in the capital city, Kinshasa, and it's suburb

0-6. Project Purpose

AP road maintenance capacity of OR and OVD in the project sites is developed

0-7. Reporting

The following documents/reports will be developed under the Project.

	Report	Status	Notes
1	Monitoring Sheet Ver.1	Submitted on 13July 2016	1st JCC: 6 Jul. 2016
2	Monitoring Sheet Ver.2	Submitted on 19 December 2016	2nd JCC: 8 Nov.2016
3	Monitoring Sheet Ver. 3	Submitted on 26 June 2017	3rd JCC: 25 May 2017
4	Monitoring Sheet Ver. 4	Submitted on 15 December 2017	4th JCC: 15 Nov. 2017
5	Monitoring Sheet Ver. 5	*To be submitted*	5th JCC: 5 June 2018
6	Monitoring Sheet Ver. 6	*To be submitted*	6th JCC: 6 Nov. 2018 *(scheduled)*
7	Project Completion Report	*To be submitted*	By Mar. 2019 *(Draft Completion Report: by Feb 2019)*

I. Summary

1. Progress

1-1 Progress of Inputs

(1) JICA Experts

The Japanese Side 1) A total of 9 JICA experts have been assigned for a sum of 56.35 Man/Month (M/M) out of 69.60 M/M, which will be the Project total assignment in the DRC. The target period for this assignment is from the commencement of the Project till the mid-June 2018.

Ver. 5)

The Expert in charge of "Road Inspection (Database 2)", conducted a field monitoring and training for the equipment after arrival of the purchased vehicle.

Some assignments (1.66 MM) of Coordinator has been shared to Ms. Saito.

Below shows her schedule on site;)10 Feb.- 6 Mar. 2018, 2)16 Jul.- 9 Aug., 2018

Prevention of delay of respective activities is very much crucial, in particular, database development and OJT on construction supervision as key activities.

Adding an Expert (Ms. Saito), who has experiences on assisting counterparts under the similar circumstances, would help smooth implementation of the said activities. At the same time, coordination work should be handled in harmonized manner by both Experts.

(2) Congolese Side

Ver. 1)

1) Counter personnel were identified. The Chairperson from the Ministry of Infrastructures and Public Works (MIPW), the Coordination Secretary from the Cellule Infrastructures, MIPW, and the Vice Chairperson from Fonds National d'Entretien Routiter (FONER) were officially positioned. Also the Project Managers and the Deputy Project Managers as well as the administrative personnel of both sides are in position. Moreover, an official who is in charge of monitoring and evaluation for Cellule Infrastructures was assigned to oversee monitoring and evaluation for the Project, and will work with the JICA expert.
2) Furnished office space was provided with necessary utilities.
3) Administrative and operational costs were shouldered as required, specifically during the initial stage.

Ver. 2)

Members of two (2) Working Groups (WG, 1: Development of technical guidelines on AP road maintenance, WG 2: Conducting training on AP road inspection and APm repair works) have been identified and commenced respective activities as explained in "1-2 Progress of Activities (2) 2-3 and (3) 3-1-1."

Ver. 3)

1) Members of WG 1/WG 2 have been contributing to carry out the respective activities. WG 1 had 31 meetings in total while the WG 2 had a kick off meeting in early November 2016 followed by 6 other meetings (as of 25 May 2017. Refer to "1-2 Progress of Activities (2) 2-4 and (3)").
2) Training for the counterparts (C/Ps) was held in Japan from 4 May 2017 till 22 May 2017 (including traveling time and weekends). 8 personnel were dispatched to Japan to participate in the training program as shown below;

① Participants:

	Name	Title	Organization
1	Mr. Pierre WANET MUTUMOSI	Head of Brigade 901 (Kinshasa)	OR
2	Mr. Jean Paul MAVUNGU SOKANA	Database Expert	OR/Headquarters
3	Mr. Timothee SUMAHILI	Technical Director, Kinshasa Province	OVD
4	Mr. Leon MUTOMBO	Head of Evaluation	OVD
5	Mr. Pascal BULONGO	Provincial Director	FONER (Fonds National d'Entretine Routier)
6	Mr. Willy MONDA TONA	Head of Division	BTC (Bureau des traveaux et construction)
7	Mr. Fils ZENGA MBALA	Head of Service	BTC
8	Mr. Chocquet N'DOBE di SOKI	Coordinator	PRCMR (Projet de renforcement de capacités sur la maintenance de routes)

② Training Program:

May	a.m.	p.m.	Remarks
8 (Mon.)	Briefing	Orientation, Visit to ISEC office	-
9 (Tue.)	Road maintenance method	Safety management measures	Lecture
10 (Wed.)	*Move to Osaka*	Outline of Hanshin Expressway	Lecture
11 (Thur.)	General road maintenance	Maintenance information management	Lecture
12 (Fri.)	Akashi Kaikyo Bridge, Akashi Kaikyo Bridge Exhibition Center, Maiko Marine Promenade	*Return to Tokyo*	Site visit
13 (Sat.)	*Preparation on the training report*		-
14 (Sun.)	*Off*		-
15 (Mon.)	Pavement restoration work, Kayama District, Saitama		Lecture, site visit
16 (Tue.)	Road inspection method	Demonstration on the road inspection	Lecture, site visit
17 (Wed.)	Construction machine factory	Construction machinery	Site visit, lecture
18 (Thur.)	JICA technical cooperation projects	Preparation on the training report	Lecture
19 (Fri.)	Presentation on the training report	Training evaluation	-

③ Some feedback from the participants:

- In general, the training program was well received by the participants. Particularly, majority of the participants considered the lecture on the "safety management measures" was the most useful subject amongst others followed by the "database" (lecture on the "road inspection method"). At the same time, the participants have become fully aware of the importance of the safety for the workers at the construction site to conduct road maintenance properly.
- On the other hand, considering the actual situation back home, the participants commented the following subjects to be included in order to make the training more appropriate and meaningful;
  - Monitoring on the road projects
  - Quality control, etc.
- The participants have committed action to be taken as follows;
  - Report to the senior managements what they have learned and experienced through the training so as to strengthen the partnership with JICA, and improve the situation of the DRC
  - Implement AP road maintenance by utilizing the technical guidelines which have drafted by the Project
  - Share what they have learned with the other engineers, and train them
  - Organize workshops/seminars
  - Comply with the methods, etc.

3) The budget for the traffic volume survey was finally approved by the Congolese side however, budget execution has been taking rather too long and timing of it is very much uncertain, which may affect the activity of the Project. In view of smooth implementation of the project, the Project has proposed collaboration with "Project for Urban Transport Master Plan in Kinshasa City (Master Plan Project)" under JICA, which has a plan to conduct traffic volume survey for about 40 sections (Refer to "1-2 Progress of Activities (1) 1-4").

Ver. 4)

1) Several activities of the WG 1 and WG 2 have been carried out by each WG members. The WG 1 had meetings to discuss countermeasures for the comments on the draft technical guidelines (21, 28 July 2017). While the WG 2 members received trainings as well as OJT on AP road inspection and APm repair works (Refer to "(2) 2-4 and (3) ", "1-2 Progress of Activities").

2) In view of efficient implementation, the Project has proposed collaboration with "Project for Urban Transport Master Plan in Kinshasa City (Master Plan Project)" under JICA, which has been conducting the traffic volume survey for about 40 sections (Refer to "(1) 1-4", "1-2 Progress of Activities").

3) Newspaper article (Le Pontentiel) on the road maintenance was published on 3 August 2017. The article says "Supervised by the "Office des Voiries et Drainage (OVD)", the rehabilitation work was carried out for three days, from 24 to 26 July 2017." This rehabilitation work was well received by the public and the article continues to mention the followings; "We are pleased after the rehabilitation of this section, and thank the authorities".

4) In order to enhance smooth operation and management of the Project, the Project monitoring in charge, officials of the Congolese side and the Experts concerned gather to discuss the progress and the issues of the Project. The main representatives of the Congolese side are from Infrastructure Unit (Gestionnaire de Projet Transports, on behalf of Charge de Suivi-Evaluation), OR (Coordinator) and OVD (Logistic Director). With regard to the Project Design Matrix (PDM), several achievements (refer to the "1-2 Progress of Activities"), including the set timeframe, were reported while the rest of the indicators were reminded in order to fulfill those in a timely and proper manner.

Ver. 5)

1) WGs:

From December 2017 till May 2018, 21 WG 1 meetings were held. The below shows the number of participants for the respective meetings;

ST NO.	DATE	WG1	PARTICIPANTS
1	2017/12/1		6
2	2017/12/8		6
3	2017/12/14		9
4	2017/12/15		3
5	2017/12/18		3
6	2017/12/20		4
7	2017/12/21		4
8	2017/12/29		5
9	2018/1/22	Revision of manual in relation to the TAG comments	3
10	2018/1/23		3
11	2018/1/24		3
12	2018/1/25		3
13	2018/1/26		3
14	2018/1/29		3
15	2018/2/1		3
16	2018/2/6		3
17	2018/2/9		4
18	2018/2/21		3
19	2018/2/22		4
20	2018/4/26	Clarification and some	10
21	2018/5/3	observations on	8

Likewise, WG 2 organized meetings and implemented their activities as shown below;

ST NO.	DATE	WG2	PARTICIPANTS
1	2017/12/27	Inspection and database development	11
2	2018/12/28		8
3	2018/1/25		6
4	2018/1/26		7
5	2018/2/14	Inspection	17
6	2015/2/15	Inspection and datase development	23
7	2018/2/16	Inspection	22
8	2018/2/19	Inspection and datase development	8
9	2018/2/20		7
10	2018/2/21		10
11	2018/2/27		4
14	2018/3/5		7
15	2018/3/6		7
17	2018/3/8		8
18	2018/3/13		12
19	2018/3/14		14
20	2018/3/15		15
21	2018/3/16		10
22	2018/3/19		10
23	2018/3/20		8
24	2018/3/21		14
25	2018/3/22		13
26	2018/3/23		7
27	2018/3/26		5
28	2018/3/27		6
29	2018/3/28		10
30	2018/3/29		11
31	2018/3/30		15
32	2018/4/3	Inspection vehicle setting	14
33	2018/4/4		15
34	2018/4/5	Inspection vehicle setting and inspection	15
35	2018/4/6		14
36	2018/4/10	Inspection and database development	9
37	2018/4/11		10
38	2018/4/12	Palse line, destance calibration, inspection mannual development and data processing mannual development	14
39	2018/4/13		11
40	2018/4/14		11
41	2018/4/28	Inspection and database development	5
42	2018/4/29		5
43	2018/4/30		5
44	2018/5/3	Data processing	3
45	2018/5/4		4
46	2018/5/5		6
47	2018/5/6		3
48	2018/5/7	Inspection and database development	6
49	2018/5/8		6
50	2018/5/9		7
51	2018/5/11	Data processing	3
52	2018/5/14		4
53	2018/5/15		4
54	2018/5/16		3
55	2018/5/18		3
56	2018/5/19		3
57	2018/5/21	Inspection and database development	3

WG 1: Discussion on the Revision of Draft Technical Guidelines

WG 2: Road Inspection Data Processing

2) The second round of the training in Japan was held from 14 May 2018 till 25 May 2018. The participants of the said training were shown below;

① Participants:

	Name	Title	Organization
1	Mr. Jonathan MAYAMBA UMBI	Operation Manager	OR/DG
2	Mr. Albert MUINDILE MUTSHIPAYI	Site Supervisor	OR/DPK
3	Mr. Rudy ALONDA KYATANGALWA	Research Engineer	OR/LNTP
4	Mr. Guylain LUZOLO TUKITALO	Operation Manager	OVD/DPK
5	Mr. Victor KALONDA Ka KALONDA	Brigade Chief	OVD/DPK
6	Mr. Dominique NZUZI MASSAMBA	Head of Research and Expertise Department	BTC
7	Mr. Joseph MASISA	Monitoring, Works and Equipment Chief	FONER
8	Mr. Mao NTUMBA MULUME	Chief of Service	ACGT

It was very much meaningful to have the participants from several other concerned organizations apart from OR/OVD. For instance, with regard to the AP road maintenance plan, budget issue is crucial. Since the official from FONER has also participated in the training in Japan, information on the budget flow was shared with the Project smoothly. As such, communication amongst the concerned parties has been strengthened.

② Training Program:

May	a.m.	p.m.	Remarks
14 (Mon.)	Briefing	Orientation, Visit to ISEC office	-
15 (Tue.)	Road maintenance method	Safety management measures	Lecture
16 (Wed.)	Road administration	Road maintenance cycle	Lecture
17 (Thur.)	Pavement technology which contributes to environmental improvement	Road inspection method	Lecture
18 (Fri.)	System introduction	Demonstration on road inspection	Lecture, demonstration
19 (Sat.)	Off		-
20(Sun.)	Off		-
21 (Mon.)	Furukawa maintenance work	Site visits in Tokyo	Site visit
22 (Tue.)	Facility observation at Public Works Research Institute	Road conservation	Observation, lecture
23 (Wed.)	Factory/material observation	Construction machinery	Site visit, lecture
24 (Thur.)	Technical cooperation projects, Civil engineering session Q & A	Preparation on the training report	Lecture
25 (Fri.)	Presentation on the training report	Training evaluation	-

③ Some feedback from the participants:

- The training program was well received by the most of the participants. They consider the following subjects as very much useful amongst others; “Safety management measures”, “Road maintenance method”, “Road administration”, “Pavement technology which contributes to environmental improvement” and “Road inspection”.
  Some of the reasons behind of the above views were; 1) It can be directly applied back home; 2) It will be one of the main recommendations to the organization that the participants belong to; and 3) It can be a significant source to develop mid and long term maintenance/repair plans, and so forth.
- The participants commented the following subjects should have been included in the program; 1) Asphalt road pavement repair work (site inspection); 2) Quality management; and 3) Bridge maintenance and repair works, etc.
- The participants have committed action to be taken as follows;

- Sensitization and awareness raising on road maintenance
- Development and execution of maintenance plan
- Establishment of monitoring system on road maintenance
- Securing system that allows local governments' direct intervention on road maintenance, as well as to encourage private sector participation
- Recommendation on safety management training and work style reform


Training in Japan (at JICA Tokyo International Center)

3) As it has been done so, prior to the JCC, meetings with the C/Ps on the monitoring related issue were organized. Participants from the Congolese side were regular faces; a person in charge of monitoring (Infrastructure Unit), and representatives from OR (Coordinator) /OVD (Logistic Director). Discussion on the progress (achievements) made so far, challenges and issues as well as un-achieved activities, etc. were held. At the same time, the Project Design Metrix (PDM) was reviewed and reminded the remaining indicators which needs to be fulfilled. The details are explained in below "Progress of Activities".

Congolese Side Representatives

Presentation on the Monitoring Results

1-2 Progress of Activities

(0) Activities for the General Issues:

Ver. 1)

1) A Kick-off meeting was held on 8th June 2016 in order to obtain more understandings of JICA project and to comprehend function of the concerned parties of the DRC side.
   - A preparatory meeting for the 1st Joint Coordination Committee (JCC) and several other follow up meetings were held starting from 29th June 2016 till right before the 1st JCC.
2) Current situation has been carefully observed so as to identify the contents of the baseline survey to fix the Performance Indicators, which remain unset in the Project Design Matrix (PDM). Once the contents were determined, the baseline survey will be conducted and the survey results will be analyzed accordingly.
3) The counterparts (C/Ps) and the JICA experts conducted several site visits, for instance, RN 1, RN 4) and RP 118 which are under the supervision of OR. Likewise, Av.Victoire, Av. Cambela, Bld. Sedwe, Av.Poids Lourds, and etc. were visited by the JICA exerts guided by the OVD C/Ps. These exercises led the JICA experts to understand the actual situation on the ground.

Ver. 2)

1) Over all progress of the project activity is more or less as planned.
2) 2nd JCC was organized on 8 November 2016 having the Working Group members, and total number of the participants for the 2nd JCC was 47. The Congolese side took initiative to lead the meeting and discussions went on. However, there may be some room for improvement in terms of time management.
3) A series of meetings in line with each activity had been organized for outputs 1, 2 and 3 during this target period of the monitoring.
4) Establishment and operation of the web site are in progress. Project site of JICA HP and Infrastructure Unit HP have been updated from time to time. Project Newsletter recorded 2nd edition so far. On the other hand, the Project has issued a request letter to OR in Aug. 2016 to include the Project information on their website. However, so far no response has been made by the OR. The Project will follow it up with this matter and try to materialize it in near future.

Ver. 3)

1) A key activity, which is to develop a draft version of technical guidelines, has been marked approximately 6 months delay. Series of activities had planned in accordance with the said guidelines which had affected the progress of the other related activities. The Project had reviewed the planned schedule and proposed modification of the concerned activity plans. The proposal was approved by the 3rd JCC meeting. Currently, the Project has clear picture of the progress management and activity implementation.
2) 3rd JCC meeting was organized on 25 May 2017. Totally, 44 participants attended this meeting, having African Development Bank, and Transporters Association, etc.
3) A series of meetings in line with the respective activity of the outputs 1, 2 and 3 had been organized for this target period of the monitoring lead by the WGs.
4) Activities of the public relations (PR) have been on going. 2 radio stations came to report on the 3rd JCC. The 3rd edition of the Project Newsletter is under preparation while JICA project site (website) of this Project has been updated on a regular basis. The 6th edition of the Project News of the JICA website was uploaded in April 2017.
5) The Project has secured a link to the website of Infrastructure Unit of Ministry of Infrastructures,

Public Works and Reconstruction (former Ministry of Infrastructures and Public Works). The Project Newsletters of 1st and 2nd edition are going to be uploaded shortly.

Ver.4)

1) In line with the revised schedule (initial schedule was revised at the time of the 3rd Monitoring) for developing draft technical guidelines (prime activity of the Project), the Project activities have been marking a certain progress.
2) The 4th JCC meeting was held on 15 November 2017. 40 participants attended this meeting in total. Those participants are including the Advisor to the MoIPWR, Director General of FONER, Chief Resident Representative of JICA, Professors of Institut National du Bâtiment et des Travaux Publics, officials from Bureau d'études d'aménagement et d'urbanisme, Infrastructure Unit of MoIPWR, OR/OVD and others
3) A series of meetings for the respective activities of the outputs 1, 2 and 3 had been arranged for this target period of the monitoring lead by each WG.
4) Activities on PR have been continued. In line with this, RTNC (Radio-Television Nationale Congolaise), TELE 7 and ACP (Agence Congolaise de Presse) came to the 4th JCC and reported this event.
5) The 3rd edition of the Project Newsletter has been uploaded on the JICA homepage (French version: https://www.jica.go.jp/project/drc/004/newsletter/index.html) while JICA project site (website) of this Project has been updated on a regular basis. The 10th edition of the Project News of the JICA website was uploaded (https://www.jica.go.jp/project/drc/004/news/index.html). The next update of the Project News is scheduled to be done in mid-November 2017.
6) The Project has secured a link to the website of Infrastructure Unit since May 2017. The Project Newsletters of up to the 3rd edition have been uploaded to this particular site. (http://www.celluleinfra.org/index.php/publications/lettre-mensuelle-d-information-du-projet-pro-routes).

Ver. 5)

1) With regard to the 4th JCC, newspaper article was uploaded on the website as below;

   https://www.digitalcongo.net/article/5a0d9838f84d560004a0cb4f
   The headline states "Government is satisfied with JICA's support for the elaboration of the manual of the road maintenance", and the article also covered overall project outlines including main concerned parties.
2) The 5th JCC, which dated 5 June 2018, had 55 participants in total.

   Apart from the main organizations concerned, such as OR, OVD, MIPW, FONER, etc., representatives from Delegation of the European Union (DUE), Office of Development Studies and Urban Planning(BEAU), Department of Road and Bridge (DEP), Public Works Infrastructure (TPI) and National Corporation of Building and Public Works Engineers (CNirs BTP) were joined.

   Main agenda of the JCC were 1) Progress of Road Inspection (current situation of database development included); 2) Training in Japan (Action Plan, etc.); and 3) Towards the final stage of the Project.

Presentation on the Progress of Road Inspection

Presentation on the Training in Japan

3) Project News of JICA HP has been uploaded for 12 times so far, and new article was submitted to the JICA Headquarters early May 2018. The 4th edition of News Letter (in French) was also submitted to JICA HQs in mid-March 2018. The next update of the Project News is going to be around mid-June 2018. The expected contents will be "Training in Japan" and "the 5th JCC".

Progress of the planned activities *is described as follows.*

(1) Activities for OP1: Asphalt paved (AP) Road Maintenance Cycle is Established in OR and OVD with Clearly Defined Roles And Responsibilities in the Project Sites

1.1 Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites: **Completed** in July 2016.

Ver. 1)

This Activity has been jointly done by the C/Ps and the JICA experts having series of discussions and site visits. The major findings are as follows; 1.Majority of the staff who are involved in the AP road maintenance work have not enough working experiences and knowledge, 2. The existing inspection system for the road damage has room for improvement, 3.Similarly the inspection reporting format has room for improvement.

1-2 Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites:

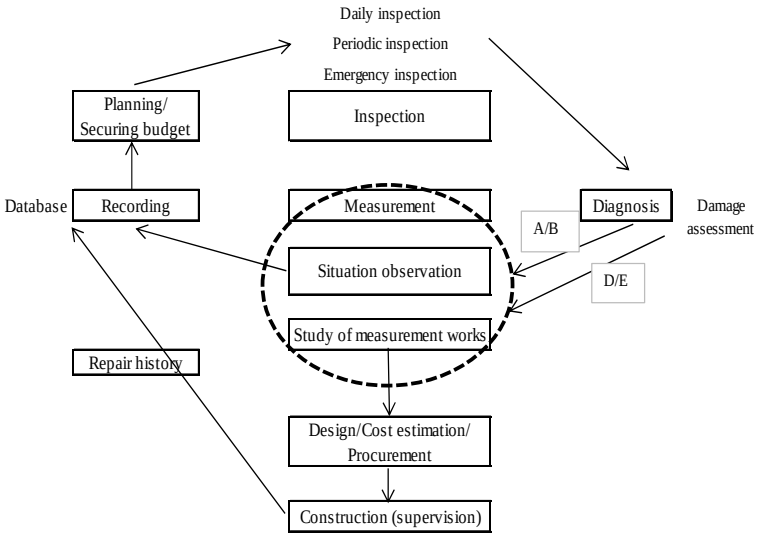
Ver. 1)

The above has been gradually identified based on the analysis of the above findings (problems), and those will be applied throughout the project period.

Ver. 2)

These activities have been **identified** and those will be continuously applied throughout the Project period. Needless to say, OR and OVD are the main actors for this particular Project while Infrastructure Unit oversees the overall implementation, and FONER is a road maintenance budget authority. All concerned parties play respective roles in line with the AP road maintenance cycle.

Assessment	Condition of damage
A	Fine condition (no damage)
B	Minor damage but no problem for smooth traffic
C	Minor damage but no hindrance to the traffic (repair works required within 5 years)
D	Large-scale damage but no hindrance to the traffic (repair works required within 1 year)
E	Large-scale damage to hinder the traffic (emergency restoration required)



Ver. 3)-5)

This activity has been in an application stage. The identified roles, responsibilities and work procedures for AP road maintenance of OR and OVD will be continuously applied throughout the Project period.

1-3 Define the road network to be covered by the project: **Completed** in August 2017.

Ver. 1)

Will be defined" by the end of September 2016.

Ver. 2)

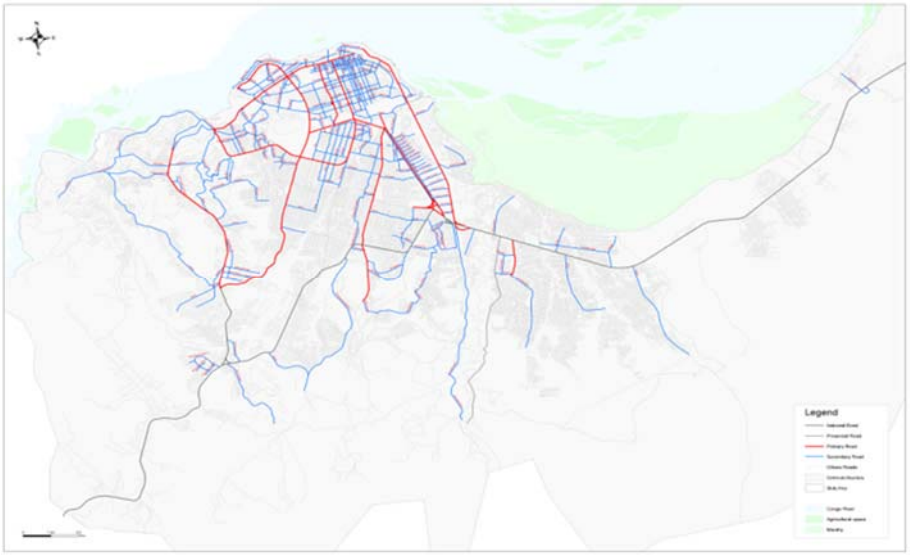
The C/Ps have conducted site observation at the OR roads and OVD roads respectively. This task is aimed to be completed sometime in between January to March 2017.

Ver. 3)

It has been defined having lists of the respective target areas from OR and OVD. It was initially planned to complete it by the end of September 2016. In an actual situation, it had prolonged till May 2017. Involving 2 different organization (OR and OVD) takes much more time than expected. And coordination between them is also a demanding issue. This is one of the "lessons learned", and the Project has taken notes on this matter.

Ver.4)

The road network to be covered by the Project" has been defined (**completed**) as shown below.



1-4 Conduct traffic volume survey on some sections of the defined road network: **Completed** in August 2017.

Ver. 1)

-

Ver. 2)

This activity is currently suspended. The C/Ps are facing difficulty to deal with such activity because of the budget constraint. The Project has inquired this issue to the Infrastructure Unit seeking for support to materialize the survey. Currently, the Infrastructure Unit is considering sending a request letter to Agence Congolais des Grands Travaux (ACGT) to secure some funds. However, in order to do so, determination of target area for the survey is required.

Ver. 3)

1) This activity is expected to be conducted by the end of July 2017, having collaboration with the "the Master Plan Project". The Project C/Ps from OR and OVD together with the Japanese Experts will be joining the Master Plan workshop on induction of the traffic volume survey followed by the actual survey on the ground. Accordingly, collected data from the survey will be analyzed. OR and OVD C/Ps will take parts in the whole set of traffic volume survey, and the C/Ps are expected to acquire knowledge and skills on this. Out of total target sections of the said survey under the Master Plan Project, at least 2 sections (one for OR and the other for OVD) for the Project related sites will be covered.
2) Upon completion of the draft guidelines, "1-5: An AP road maintenance plan FY 2018 of OR and OVD in the project sites" has started to be developed. Initial plan was to begin this activity from November 2016. Therefore, the Project proposed modification of the activity schedule.

Ver.4)

1) This activity was conducted on the 20th June 2017 to start with, having collaboration with the "the Master Plan Project". Prior to that, preparatory workshop (how to conduct the aforementioned survey) was organized on the 7th June 2017. Thereafter, some more traffic volume surveys with the Master Plan Project were implemented. To be specific, twice (3 sections) in July and 6 times in August 2017. In July, traffic volume at Boulevard (Bd.) 30 juin,

Bd. Congo-Japon and Bd.Matadi sections were surveyed. In total, 9 sections were covered. For each traffic volume survey, 5 officials concerned of the Project were participated.

2) One of the "Objectively Verifiable Indicators" of Monitoring Sheet I has been set as follows; "1-1. Traffic volume survey is conducted on 2 sections by July 2017 for one time throughout the project period." And this has been achieved (**completed**) as described above.

1-5 Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites:

Ver.1) ～Ver.3)

-

Ver. 4)

OR and OVD have been preparing the respective FY 2018 plans however, those plans were not under the Project which have no base on the implementation/evaluation of the Project. For this, the priority should be given to them to acquire skills on how to obtain the data as well as to utilize it. Once the data is well utilized, economical operation of the road maintenance can be materialized, at the same time, the mid-term plan can be developed by predicting the road condition in near future.

Ver. 5)

Not completed as planned.

1) The Project aims to utilize the database when developing maintenance plan. However, database development has been delayed, and currently it is expected to finish it in July 2018. Accordingly, AP road maintenance planning can be processed by using the said data in August 2018. That makes the plan for FY 2019 instead of FY 2018.

   Due to the delay of the budget allocation by FONER, development of the existing road maintenance plan of both OR and OVD has been also delayed.

2) In line with the above, one of the "Objectively Verifiable Indicators" of Monitoring Sheet I has been set as follows; "1-2. AP road maintenance plan FY 2018 is developed by OR and OVD". This has **not been achieved** as described above.

   Currently, the Project is trying to complete this activity by developing the AP road maintenance plan FY 2019 of OR and OVD in the project sites.

1-6 Elaborate budget FY 2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request:

Ver.1) ～Ver.3)

-

Ver.4)

The Project proposed modification of the plan to commence the activity in June 2018. And this proposal was accepted by the 4th JCC. Several delays such as developing database, which should be utilize for budget planning, etc. need to be overcome before this activity to be handled.

Ver.5)

Not completed as planned.

1) Elaboration of budget FY 2018 as well as budget request were not materialized due to the same reason described above 1-5.

2) An "Objectively Verifiable Indicator" of Monitoring Sheet I, which is in accordance with the above issue, is described as follows; "1-3. Budget request document FY 2018 for AP road maintenance is submitted by OR and OVD".

   This has also **not been achieved** as described above.

   In general, the budget request for the following FY is to be submitted to FONER in between March and April if a notification letter has been sent by FONER prior to that. However, at this stage it has not been done so yet. According to FONER, the budget request should be submitted by September this year for the next year, and they will be issuing the notification letter to OR/OVD in due course. Thus currently, the Project targets to complete this activity by **elaborating budget FY 2019, and proceeding a request for the said budget by September 2018**.

(2) Activities for OP2: Technical Guidelines on AP Road Maintenance are Developed

2-1: Review the current AP road maintenance works of OR and OVD and analyze their problems in the Project sites: **Completed** in June 2016.

Ver. 1)

1) This activity has been carried out partially by interviewing the concerned officials, and the actual observation on the ground will be done by mid- August. The progress of this activity is slightly delayed due to the delay of the DRC side response for the questionnaires. The answers for the questionnaires will be submitted to JICA expert team shortly.

2) The major findings at this stage are as follows; 1. Most of the officials explained that lack of budget is a critical obstacle to prevent them from doing their maintenance work properly and regularly. 2.The inspection is carried out visually, 3. Data base has not been updated, and so forth.

		Findings
Budget	Road Inspection	-Young officials have insufficient knowledge on the road inspection
		-Detailed assessment of the road damage is insufficient
		-Daily and periodic inspections have not been conducted
		-Evaluation criteria is based on the subjective data
		-Inspection has been conducted only the area that the damage is severe. Minor damage (cracks, etc.) is not recorded (Repar works are done only when the roads get bad)
	Maintenance Plan	-Database has not been updated
	Budget Allocation	-Insufficient budget
Budget Execution	Budget Execution	-Allocated badget amount is significantly reduced from the requested amount and thus maintenance works have been relatively limited
		-Budget allocation takes time and damage gets worse. Consequently, it makes the situation worse
	Work/Construction Preparation	-Insufficient construction management technology
	Repair works	-Lessons for the pavement repair works have not been organized but the offcials learn at the OJT. However, OJT is not conducted in a regular basis

Ver. 2)

This activity has been carried out (**completed**) based on the result of the interview, site observation

and observation of the road maintenance as well as road repair sites.

2-2 Collect and review the existing AP road maintenance manuals and technical guidelines: **Completed** in July 2016.

Ver. 1)

These activities have been conducted partially, and these will be continued till the end of July 2016.

Ver. 2)

These activities have been **completed**. The Project team has collected and reviewed the existing manual.

2-3 Establish the Joint WG for developing technical guidelines on AP road maintenance (WG 1): **Completed** in August 2016.

Ver. 1)

The WG will be established around mid-July 2016. Currently it is in a process of identifying the appropriate members for the WG.

Ver. 2)

The WG (WG 1) has been established. The members consist of the following officials;

	Name	Position	Institute
1	M. Jean-Pierre MUTAMBA NENE	Chief of Road Section	Infrastructure Unit
2	M. Balayi KADIMA	Coordinator	OR
3	M. Sangana MALONDA	Director of Training	OR
4	M. Joshua MUTIA	Head of Research Dept. / Laboratory	OR
5	M. Pierre WANET MUTUMOSI	Chief of Brigade 901 / Kinshasa	OR
6	M. Richard MATANDA MWAMB	Logistic Director	OVD
7	M. Leon MUTOMBO	Chief of Section of Monitoring and Evaluation	OVD
8	M. Timothée SUMAHILI	Technical Director / Provincial Direction of Kinshasa (PDK)	OVD
9	M. Pela WASAMA C.	Studies & Analysis	OVD
10	M. Jimmy NKULA	Studies & Analysis	OVD
11	M. Zico NSIALA MPUNGI	Studies & Analysis	OVD
12	M. Pascal BULONGO	Provincial Director	FONER
13	M. Patou MWA ILUNGA	Chief of Division	BTC
14	M. Willy MONDA TONA	Chief of Division	BTC
15	M. Fils ZENGA MBALA	Chief of Service	BTC
16	M. Michel DINGANGA	Chief of Road Section	ACGT

*BTC=Bureau des traveaux et construction

2-4 Develop and draft technical guidelines on AP road maintenance: ***Completed*** *in April 2017.*

Ver. 1)

At this stage, series of observation and information gathering have been taken place in order to start drafting the guidelines, and the guideline contents have been gradually set.

Ver. 2)

Starting from late August 2016, the WAG 1 members gather regularly (every Thursday) in order to handle these activities.

Ver. 3)

1) As reported in the 3rd Monitoring Summary, the WG1 members did final review of the draft technical guidelines, and the technical inputs by the Japanese Experts have been incorporated into the guidelines by the end of April 2017 (**completed**).
2) The WG 1 members reported the progress, and the draft guidelines were distributed in the 3rd JCC.
3) **The completion timeframe of this particular activity is described in the "Objectively Verifiable Indicators"** of Monitoring Sheet I; "2-1 Technical guidelines on AP road maintenance are drafted by April 2017". Thus this activity has been completed within the given timeframe.

2-5 Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group (TAG) meetings etc. and revise the drafted technical guidelines:

Ver. 1)

-

Ver. 2)

1) Kick off meeting was held on 24 August 2016. The draft version of the technical guidelines has been distributed during the course of the said meeting. The table of contents is shown below;

   Chapter 1: Overview
   Chapter 2: Work implementation structure
   Chapter 3: Work planning and implementation
   Chapter 4: Schedule of work implementation and road safety measures
   Chapter 5: Diurnal and nocturnal visual patrol
   Chapter 6: Maintenance and reparation plan
   Chapter 7: Maintenance method
   Chapter 8: Reconditioning method
   Chapter 9: Quality control
   Chapter 10: Database

2) So far, the WG meetings have been held seven times having proactive participation from majority of the members, and continue working on the draft technical guidelines. Specifically, the members have been sharing respective working experiences as well as views on the road maintenance to contribute to the discussions. Currently the draft technical guidelines are half a way. Expected timeframe for the completion of draft version will be January to February 2016;

Ver. 3)

This activity was once commenced in November 2016, however, the Project recognized the necessity to organize TAG meetings for several times, and proposed modification of the plan of this activity (Refer to the Monitoring Sheet II). The draft version of the said guidelines will be reviewed and revised based on the shared views and technical inputs by the TAG, as well as the results of the trial application on the ground to observe whether the guidelines are suitable and practical in the actual situation. The re-planned process is shown below;

Step 1: Development of the draft technical guidelines
↓
Step 2: Discussion with the TAG
↓
Step 3: Revision of the draft technical guidelines based on the given technical inputs
↓
Step 4: Trial application on site
↓
Step 5: Necessary revision based on the situation on the ground
↓
Repeat Step 2 – Step 5

The below list indicates the members of the TAG;

Title	Organization
Professors (2 people)	Polytechnic Faculty, University of Kinshasa
Head of Operation	Polytechnic Faculty, University of Kinshasa
Professors (2 people)	National Institute of Building and Public Works
Assistant	National Institute of Building and Public Works

Ver. 4)

1) Comments on "the contents of the draft technical guidelines" were collected starting from June 2017 and continued till July 2017 with English translation. Accordingly the countermeasures have been discussed among the WG1 members. Then discussion with the Technical Advisory Group (TAG) was organized on 22 September 2017 followed by 19 October 2017 and 3 November 2017. This exercise will be continued for a couple of times thereafter. The TAG members are listed below;

Title	Organization
Professors (2 people)	Polytechnic Faculty, University of Kinshasa
Head of Operation	Polytechnic Faculty, University of Kinshasa
Professors (2 people)	National Institute of Building and Public Works
Assistant	National Institute of Building and Public Works

2) The 1st TAG meeting: the countermeasures (revision) for the comments from the TAG and the other concerned parties (The 3rd JCC invitees) on the 1st - 5th Chapters of the technical guidelines were presented by the WG1 members. The TAG and the WG1 members had detailed discussions in order to revise the draft technical guidelines.

3) The 2nd TAG meeting: In view of the 1st TAG meeting discussion, draft version of the 1st, 2nd, 3rd, 4th and 5th Chapters of the technical guidelines has been finalized. The rest of the draft Chapters (6th – 11th) has been distributed to the TAG members.

4) The 3rd TAG meeting: Prior to the 3rd meeting, the comments from the TAG members on the rest of the Chapters of the technical guidelines were shared with the WG1. During the course of the 3rd meeting, the countermeasures (revision) have been taken and they had further discussion on those. Accordingly, the draft technical guidelines from the 6th till 11th Chapters have been completed.

Ver.5)

This activity has been implemented mainly at the TAG meetings.

The member of the TAG has been slightly changed. To be specific, one of the professors of UK has been withdrawn while another assistant of NIBPW has been added as shown below;

Name	Title	Organization
M. Paul TSHIULA	Professor	Polytechnic Faculty, University of Kinshasa (UK)
M. Patrick NDOLO	Head of Operation	
M. Evariste PHANZU	Professor	Polytechnic Faculty, National Institute of Building and Public Works (NIBPW)
M. Pierre MUZYUMBA	Professor	
M. Michel MISEKA	Assistant	
M. Papy KABADI	Assistant	

The last TAG meeting was held in January 2018, which should have been in March 2018. The TAG comments on the draft technical guidelines were not submitted to the WG 1 early enough, which prevented the WG 1 to discuss and revise the guidelines as planned.

Since the above mentioned professors have their own business at the respective university/institute, the Project related work tends to be pended. Sensitization and raising their motivation are necessary to maintain timely work.

2-6 Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection

Ver. 1) ～Ver. 2)

-

Ver. 3)

This activity was initially planned to commence in December 2016. However, given the progress of the draft technical guidelines, also the delay of the procurement procedure, the Project proposed modification of the activity schedule.

Ver. 4)

This activity is underway. Evaluation of the procedure as well as outcomes of AP road inspection will be implemented sometime in February or March 2018.

Ver. 5)

1) AP road inspection using the inspection vehicle was arranged in December 2017 and January 2018.
2) Prior to the commencement of the inspection, “Order de mission” is required for smooth operation of the activity. However, the issuance of it was delayed. For this, the Project was only able to conduct the inspection for a few days.
3) The data obtained through the inspection using the vehicle was not appropriate on the ground of the followings:
   - When operating the measurement equipment, there is no consistency between the position of the photos and the distance: and
   - During the inspection, test mode was used for obtaining the data instead of measurement

mode.

4) Vehicle for the inspection has been finally delivered in April 2018. It was handed over to Infrastructure Unit on the 10th April 2018.

5) The recent inspections were conducted in December 2017 and January 2018. However, some of the inspection data came out inaccurate. One of the reasons behind of this should be low level of PC skill, which requires some improvements.

6) Re-training on the calibration, data processing, interpretation of road surface condition, etc., will be conducted in June 2018.

2-7 Develop a database for accumulating the AP road inspection results

Ver. 1)

-

Ver. 2)

1) This activity has been gradually taken up. It has started from interviewing with OR regarding their database which is under way. And also OVD has been interviewed. Recommended equipment for inspection/database was introduced and demonstration was organized during the WG meeting. Once those are approved by the 2nd JCC, the equipment will be purchased sometime in 2017 (expecting to be by April 2017).

Ver. 3)

1) In order to "develop a database for accumulating the AP road inspection results", the equipment (a camera to measure the road surface) was purchased and shipped to the DRC. A vehicle, which will be granted by JICA, to carry the said equipment is still under tax exemption procedure. Meanwhile, the existing vehicle has been temporary used to conduct trainings as well as inspection. The granted vehicle is expected to be in use around mid-July 2017. The fuel will be covered by the Congolese side, and the maintenance will be handled by the same.

2) The Project proposed the modification of the activity plan due to the fact that the arrival of the equipment and the progress of the draft technical guidelines had been delayed

Ver. 4)

1) As to conduct the trainings and inspection, the Project faced challenges with unavailability of the temporary vehicle. Moreover, due to the security reason, it is required to be escorted by the police when conducting inspection, the arrangements with the police is another concern, which is not always easy.

2) Database entry training has been provided, yet the data to process is lacking. Inspection and interpretation of data need to be improved. Currently the Expert is developing data input/analysis application of excel macro to follow up with these issues.

Ver.5)

1) The Project received inspection equipment on the 23rd April, 2017.

2) Physical/technical constraints as well as security situation prevented it from implementing this activity as planned. For instance, ① when the Project was borrowing a vehicle from

Infrastructure, the procedure took much time, ②for the last one year, it was required to have a police officer on board for the inspection, it again took some time to arrange, specifically due to the cost involvement, ③data obtained from the inspection was found inaccurate.

3) It is pointed out that at least accuracy on data input/interpretation need to be enhanced for better implementation of the project.

2-8 Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works

Ver. 1) ～Ver. 2)

-

Ver. 3)

1) Concerning the said activity, the WG 2 is planning to discuss this matter in line with the training starting from late May 2017. “The evaluation” of the procedure and outcomes of these works will be followed in due course.

2) The Project proposed modification of the activity schedule considering the progress of the draft technical guidelines.

Ver. 4)

1) With regard to the AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines”, those works have been undertaken through OJT referring to the said guidelines. The training/OJT participants were listed below.

Participants List for Training on AP Road Inspection

#	Name	Institution
1	Christ NSIMBULU MASAMBA	OVD
2	Pierre WANET MUTUMOSI	OR
3	Jonathan MAYAMBA	OR
4	Albert MUINDILE MUTSHIPAYI	OR
5	Guylain LUZOLO TUKITALO	OVD
6	Victor KALONDA KAKALONDA	OVD
7	Chiristophe TSHIDIBI TSIMBOMBO	LABO
8	Eric DIOMBA PAMBU	LABO
9	Michel DINGANGA	ACGT
10	Pascal BULONGO PYANA	FONER
11	Dominique NZUZI MASSAMBA	BTC
12	Timothe SUMALI	OVD
13	FIMPADIO MAMPUYA	OVD
14	AGIGBA ZONO	OVD
15	EWMBE NANDO	OVD
16	IMBOTO MABILA	OVD
17	MVUEZOLO TOLOMBA	OVD
18	MUKUDI KAZADI	OR
19	MURHULA GWA KASHEMWA	OR

#	Name	Institution
20	MAKANDA TRIKASE	OR
21	BUKASA MUKENDI	OR
22	MOIKA NGBOLIKO	OR
23	NKENDA MATONDO	OR
24	Patrick MBILA ESONG	BTC
25	Corneille MADIMBA MADIMBA	BTC
26	ESRHER MATUTALA	LABO

Participants List for Training on APm Repair Works

#	Name	Institution
1	Rose BUKAWU KALUBI (Female)	OVD
2	Hélène SEKO MFUNDU (F)	OR
3	Déogratias NTAMBI KALULO	OR
4	Kady OLEKONYA KADIMA	OR
5	BWABWA MUKENDI	OR
6	LOMBOMBE NSUNDJU (F)	OR
7	Zacharie LANDAMO MADIATA	OR
8	Olivier MITSHABU KADIMA	OVD
9	Jean-Jacques KAWE LUMUMBA	OVD
10	NKUNGA MANSIANTIMA	OVD
11	Didier FATAKI KASONGO	LABO
12	DAKWA BEMBA	OR
13	Géorges MAKANDA TRIKASE	OR
14	Kevin BABAKA LELO	ACGT
15	Andy MPUTU ISSANZA	OR
16	Olga BANZA NGOIE (F)	OR
17	Eddy BONGONGO SOZANE	OVD
18	KYUNGU NTAMBI	OR
19	Jean BAWILI KAZINGUVU	OR
20	LOSHA KAZADI	OVD
21	MBOMA MAKASI	BTC
22	Jorluquin SANGI NKANZA	OVD
23	KHONDE MAKAYA	OVD
24	Narra KIMVULA MUDIMUNANGA	OVD

Ver.5)

1) Upon completion of the planned activity on the above 2.6 and 2.7, the result of the implementation will be explained at the WG 1.

2-9 Finalize the technical guidelines:

Ver1) – Ver.4)

-

Ver. 5)

Current this activity is to be implemented in July 2018.

2-10 Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations:

Ver.1) – Ver.4)

-

Ver.5)

Current this activity is to be implemented in September 2018.

2-11 Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW:

Ver1) – Ver.4)

-

Ver.5)

Current this activity is to be implemented in October 2018.

(3) Activities for OP3: AP Road Maintenance Skills and Knowledge of OR's and OVD's Technical Staffs are Improved in the Project Sites

3-1: Training Plan for AP Road Inspection and APm Repair Works

3-1-1 Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works: **Completed** in October 2016.

Ver. 1)

-

Ver. 2)

1) The members of the said WG (WG 2) have been selected, and the kick off meeting was organized 9 November 2016 (completed). The WG 2 was joined by the Chief of Road Section of Infrastructure Unit and Logistic Director of OVD.

   The below list shows the selected members of the WG 2;

	Name	Position	Institute
1	M. Jean-Pierre MUTAMBA NENE	Chief of Road Section	Infrastructure Unit
2	M. Balayi KADIMA	Coordinator	OR
3	M. Sangana MALONDA	Director of Training	OR
4	M. Jean Paul MAVUNGU SOKANA	Database Chief	OR / HQ
5	M. Pierre WANET MUTUMOSI	Chief of Brigade 901 / Kinshasa	OR
6	M. Jonathan MAYAMBA UMBI	Site Chief	DPK Brigade
7	M. Albert MUINDILE MUTSHIPAYI	Site Chief	DPK Brigade
8	M. Guylain LUZOLO TUKITALO	Site Chief	DPK Brigade
9	M. Victor KALONDA Ka KALONDA	Site Chief	DPK Brigade
10	M. Richard MATANDA MWAMB	Logistic Director	OVD
11	M. Leon MUTOMBO	Evaluation Chief of Service	OVD
12	M. Lobo LOBO MPUMFA	Study and Project Section	OVD / HQ
13	M. Christ NSIMBULU MASAMBA	Road Section	OVD / HQ
14	M. Timothée SUMAHILI	Technical Director / DPK	OVD
15	M. Dominique NZUZI MASSAMBA	Chief of Service	BTC
16	M. Willy MONDA TONA	Chief of Division	BTC

	Name	Position	Institute
17	M. Pascal BULONGO	Provincial Director	FONER
18	M. Joseph MASISA	Chief of Monitoring, Works, and Equipment Section	FONER
19	M. Mao NTUMBA MULUME	Chief of Service	ACGT
20	M. Michel DINGANGA	Chief of Road Section	ACGT

2) The members will be meeting once a week, every Wednesday. During the course of the next WG 2 meeting, some of the representatives from WG 1 will be performing TOT to share their knowledge and understandings of the concept of maintenance, etc. to the WG 1 members. Then, the following week, baseline survey will be conducted.

3-1-2 Plan the trainings on AP road inspection and APm repair works: **Completed** in April 2017.

Ver. 1)

-

Ver. 2)

1) This activity is under preparation. It will be completed in January 2017. Trainings on the road inspection and repair works are scheduled to be organized three times respectively.

The below shows the sample training programs;

Sample Training Program for the AP Road Inspection

Day	Type of training	am (10:00-12:00)	pm (14:00-16:00)	Venue
1	Lecture	Introduction (baseline survey included)	Group discussion on the condition of the road maintenance, issues, etc.)	Training room at OR laboratory
2		Overview of the road maintenance		
3		Road inspection method		
4		Recording and evaluation of the road inspection results		
5		Summary of lecture		
6	Hands-on training at the site	Implementation of general visual inspection	Recording and evaluation of the road inspection results	Training target road (site) / Training room at OR laboratory
7		Implementation of visual inspection by the forward image acquisition		
8		Implementation of the detailed visual inspection (cracks, quantity measurement of the ruts, etc.)		
9		Implementation of the detailed inspection (quantity measurement of the deflection, etc.)		
10		End line survey / Development of the action plan	Presentation of the action plan / Assessment	Training room at OR laboratory

Sample Training Program for the APm repair works

Day	Type of training	am (10:00-12:00)	pm (14:00-16:00)	Venue
1	Lecture	Introduction (baseline survey included)	Group discussion on the condition of the road maintenance, repair method, issues, etc.)	Training room at OR laboratory
2		Overview of the road maintenance		
3		AP road damage and cause, maintenance, repair method		
4		Quality management, safety management measures, construction record		
5		Summary of lecture, group discussion		
6	Hands-on training at the site	Safety management measures		Training target road (site) / Training room at OR laboratory
7		APm material	Quality management	
8		APm repair works	Quality management	
9		APm repair works	Construction record	
10		End line survey / Development of the action plan	Presentation of the action plan / Assessment	Training room at OR laboratory

2) The WG will determine the actual contents of the training programs and other necessary issues having in-depth dialogues as they organize the weekly meetings.

Ver. 3)

1) The plan of the trainings on AP road inspection and APm repair works" had been **completed** by the end of April 2017, which was the revised target time frame (as reported in the 3rd Monitoring Summary).

2) The completion timeframe of this activity is described in the "Objectively Verifiable Indicators" of Monitoring Sheet I; "3-1: Training Plan is developed by April 2017". Thus this activity has been completed within a given timeframe.

3) After the 2nd JCC, the Project reviewed it in a view of required time for induction to the WG members, etc. In between the 2nd and the 3rd JCC, the Project considered modification of the target timeframe as follows; "Training plan is developed by April 2017".

   The developed plan is shown below;

Training Plan for AP Road Maintenance

N°	Trainer (Japanese Expert)	Subject of the Practical Training	Training Content (module)
			Training on Inspection
1	Mr. Sakai	Inspection	**1) Purpose and role of surface inspection**
			2) Types of surface inspection
			3) Inspection Equipement (OJT)
			Training on Database
2	Mr. Sakai	Database	**1) Purpose of creating Database**
			2) Shewhart Cycle (PDCA)
			3) Inspection Equipement : OJT(analyse)
			4) Operating Database (Road Maintenance Plan)
			Training on Evaluation (classification and Damage Causes)
3	Mr. Takahashi	Training on Evaluation (Classification and Damage Causes)	**1) Structure and Function of Asphalt Surrface**
			2) Purpose of Surface Evaluation
			3) Overview of Surface Damage and its Causes
			§ Types Surfaace Damage
			§ Surface Degradation and Deterioration Mechanism
			4) Analysis for Deterioration Causes (non-destructive Analysis, Open Excavation Analysis)
			Training on Repair (Method of Work, Quality Control)
4	Mr. Shishido	Repair (Method of Work, Quality Control)	**1) Purpose of the Pavement Repair**
			§ Potholes
			§ Cracks
			§ Treatment of Surface
			§ Partial Reconstruction
			Overlay (after cutting)
			2) Purpose of Quality Control
			§ Test required for the specified mixture formula
			§ Tests required until delivery of hydrocarbon asphalt mix
			§ Daily tests of the asphalt mixing plant
			§ Tests required at the construction site
			Training on Quality Control (Works Plan, Safety Measures)
5	Mr. Mukai	Quality Control (Works Plan, Safety Measures)	**1) Work Plan**
			§ Method of Repair Works
			Patching, crack sealing, surface treatment, partial reconstruction, overlay (after cutting)
			2) Safety Measure
			§ Safety Measures Principles
			§ Shewhart Cycle (PDCA) Safety
			§ Prevention of dangers
			§ Traffic Control

4) Target officials for this particular training are almost confirmed. Considering the time that the Japanese Experts are absent, Congolese trainers need to be trained. This training of trainers (ToT) is aiming to be introduced. The training has been gradually commenced since March 2017. Feasibility to conduct ToT will be observed while conducting training. Once the Project confirms the feasibility, the trainers are to be selected from the WG 2 members and/or from the trainees.

Ver.4)

3) The Project considered introducing ToT. The trainers of Congolese side have been nominated by the C/Ps. However, the results of the baseline survey were moreover similar scores for both the trainers and the trainees, even at some points, the scores of the trainees were higher than those of the trainers. Given the fact that the Congolese expected trainers' huge challenges, the Project has re-considered the ToT scheme to be suspended, at least for the time being.

3-1-3 Select candidate sites for the trainings on AP road inspection and APm repair works:

Ver. 1)

-

Ver. 2)

1) As shown below, the OJT candidate site on the OVD road (red-marked part) has been confirmed while that of OR road (green-marked part) has been slightly pending due to the BTC maintenance budget related matter. Once the WG activity has been commenced, this issue will be solved in due course.

Ver. 3)

1) National Route (NR) 1 has been identified as a training site for OR.

Ver. 4)

1) Different candidate sites for the remaining trainings may be identified so as to make the trainings more meaningful.

Ver.5)

1) Candidate sites for the OJT in 2018 have been selected after discussing with the C/Ps as follows; ①Blv.du 30 juin, ②Blv.Lumumba and ③Rte.Congo-Japon.

3-2: Trainings on AP Road Inspection:

3-2-1 Conduct baseline survey on the training participants' skills and knowledge of AP road inspection:

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) The baseline survey for the main C/Ps was organized in December 2016. Out of 37 questions, only 2 questions marked 100% as correct answers. The average rate of correct answer was 49.8%, and the worst rate was 0% followed by 6 %. The most difficult question was the following; “How many percent is the crack rate? (1 mesh =0.5 m x 0.5 m, target range of the survey: 5m x 3m)”
2) The Project proposed modification of the second and the third round of the baseline surveys in accordance with the progress of the other related activities, specifically development of the draft technical guidelines. The second round of the said survey is planning to be organized February 2018.

Ver. 4)

1) The initial baseline survey on the training participants’ skills and knowledge of AP road inspection was conducted on the 14 June 2017. The said survey will be arranged 2 more times.
2) Out of 30 questions, only 2 questions were marked 100% as correct answers for the initial baseline survey. The average rate of correct answers was 45.9%, and the worst rate was 8% followed by 13 %.

Ver.5)

1) Recently, the baseline surveys were conducted in February and May 2018 (Ref. to 3.2.4).
2) The final baseline survey will be done in June 2018.

3-2-2 Conduct lectures on AP road inspection:

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) This activity is to be implemented in between April and June 2017 for the initial stage based on the modified schedule. The first lecture has been conducted since mid-April 2017.

Ver. 4)

1) Lectures on AP road inspection" have been organized 3 times so far focusing on the inspection by using the equipment as explained below:

   ① The equipment was first used for the Project: May 2017

   ② Confirmation of the actual situation on the ground followed by the brush up training: August 2017

   ④ The 2nd round of brush up training: October 2017

   The above ③was conducted due to the fact that the trainings on how to use the equipment and crack interpretation have not been well acquired by the majority of the trainees.

Ver.5)

1) The last session of the lectures was held in February 2018.
2) Remaining lectures will be organized in June 2018.

3-2-3 Conduct OJTs on AP road inspection at the selected sites in the project sites:

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) This activity will be conducted from June to July 2017.

Ver. 4)

1) Initial OJTs on AP road inspection at the selected sites in the project sites" have been conducted on NR 1/NR 43 for OR and Poids-Lourds/30 Juin for OVD. However, given the situation addressed above 3-2-2, it requires inspection and crack interpretation trainings to be redone. The 2nd and the 3rd OJTs will be organized sometime during the 1st and the 2nd Quarters of 2018.
2) The training received participants not only from the WG 2 members but others from OR, OVD, BTC, LABO, ACGT and FONER, which make up to 73 participants.

Ver.5)

1) Recent OJT was conducted in February 2018.
2) Following OJT is going to be arranged in June 2018.

3-2-4 Conduct endline survey on the training participants' skills and knowledge of AP road inspection:

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) This activity will be organized in early August 2017.

Ver. 4)

1) The initial endline survey on the training participants' skills and knowledge of AP road inspection" will be organized in between January and February 2018. The 2nd and the 3rd end line surveys will be implemented as scheduled (March 2018 and June 2018 respectively).

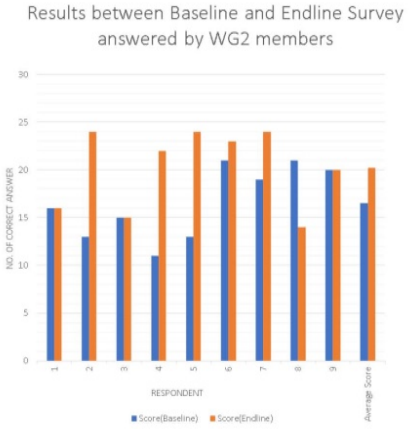
Ver. 5)

1) The recent endline survey was organized in February 2018 as the initial one.
2) The Expert tried to organize the initial endline survey as planned. However, the Project faced a challenge due to the time constraint. Thus the 2nd baseline survey is considered as the initial endline survey as well.
3) The comparison of the results of the baseline and endline surveys is shown below;

Survey Results (WG2 members)

Results of Survey answered by WG2 members

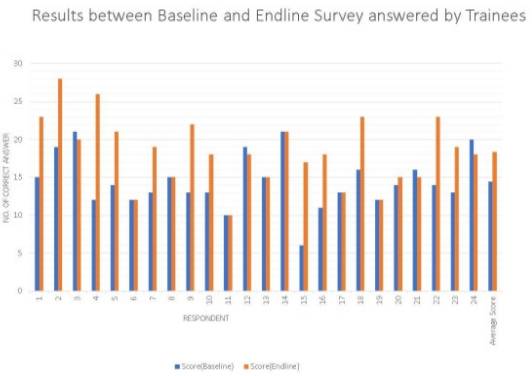
No.	Score(Baseline)	Score(Endline)	Comparison between Baseline Score and Endline Score
1	16	16	0%
2	13	24	85%
3	15	15	0%
4	11	22	100%
5	13	24	85%
6	21	23	10%
7	19	24	26%
8	21	14	-33%
9	20	20	0%
Average Score	16.56	20.22	22%
Average Rate of Correct Answer	55%	67%	22%



Survey Results (Trainees)

Result of Survey answered by Trainees

No.	Score(Baseline)	Score(Endline)	Comparison between Baseline Score and Endline Score
1	15	23	53%
2	19	28	47%
3	21	20	-5%
4	12	26	117%
5	14	21	50%
6	12	12	0%
7	13	19	46%
8	15	15	0%
9	13	22	69%
10	13	18	38%
11	10	10	0%
12	19	18	-5%
13	15	15	0%
14	21	21	0%
15	6	17	183%
16	11	18	64%
17	13	13	0%
18	16	23	44%
19	12	12	0%
20	14	15	7%
21	16	15	-6%
22	14	23	64%
23	13	19	46%
24	20	18	-10%
Average Score	14.46	18.38	27%
Average Rate of Correct Answer	48%	61%	27%



- Among 9 surveyees of the WG 2 members, more than a half showed improvement and the remarkable score increase was 100% (1 person) followed by 85% (2 persons). On the other hand, 2 of them had exactly the same score while one marked less score. The average rate of correct answer was 22 %.
- Likewise, as for 24 trainees, more than a half obtained higher scores than the baseline survey. The highest increase recorded as 183 % followed by 117%. However, the average rate of correct answer was 27 %.
- One of the reasons of the survey results, which were found relatively differ from one parson to another, was due to the different organizations that the surveyees belong to, which means they have different expertise area and background; OR, OVD, BTC, FONER, Laboratory, and ACGT.

4) It is indicated that “3-4. A percentage of correct answers of the endline survey on AP road inspection is increased by 60.0 % compared to that of the baseline survey” in “Objectively Verifiable Indicators” of Monitoring Sheet I.

It might be possible for some of the surveyees to mark the increase as above (60% increase) for the final endline survey, however, considering the past experiences as described above 3), surveyees as a whole to mark as such could be challenging.

Nonetheless, the important aspect is to lead them better understandings on the contents of the lectures/OJTs, and enhance their capacity to apply those at their respective work places continuously.

5) The final endline survey is going to be implemented in June 2018.

3-2-5 Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines:

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) The said activity will be initially conducted from late July 2017 for 3.5 months.

Ver. 4)

1) AP road inspection through trial implementation of the drafted technical guidelines by the training participants" has been pending since the inspection data is lacking (Refer to 2-7, (2), 1-2 Progress of Activities).

Ver.5)

1) The latest action on this activity was taken in February 2018, and it resumed in May 2018.
2) If there is any discrepancy between the draft technical guidelines and the actual situation on the ground, it should be pointed out and reflected in the guidelines for the improvement.

3-3: Training on APm Repair Works

3-3-1 Conduct baseline survey on the training participants' skills and knowledge of APm repair works:

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) This activity was organized in November 2016 to start with. The next one will be held in February 2018.

Ver. 4)

1) The baseline survey on the training participants' skills and knowledge of APm repair works" was organized on the 11 September 2017 for the second time after the initial ones taken on the 17th/29th August 2017.

Ver.5)

1) The 2nd baseline survey was implemented in March 2018.

   The below table shows the percentage of the correct answer from the 2nd baseline survey (segregated by the main subjects)

(%)

	Construction Supervision	Safety Management	Overall
OVD	30.36	24.29	26.98
OR	25.00	28.33	26.85
LABO	54.17	33.33	42.59
FONER	37.50	40.00	38.89
BTC	12.50	20.00	16.67

3-3-2 Conduct lectures on APm repair works:

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) The lecture on APm repair works of the 1st session was conducted in May 2017.

Ver. 4)

1) Lectures on APm repair works" of the second session were organized from August 2017 till September 2017.

Ver.5)

1) The recent lectures were conducted in February/March 2018.

   One of the sessions was highlighted the following aspect; Important point of vehicle inspection, and covered "role of operator, "role of driver", "operation at starting/ending point", "test mode", "check the route" and "communication".

2) The final session will be arranged in July/August 2018.

3-3-3 Conduct OJTs on APm repair works at the selected sites in the project sites:

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) The said activity is scheduled to be implemented from August 2017.

Ver. 4)

1) The OJTs on APm repair works at the selected sites in the project sites" were implemented in August, September and November 2017 for the initial stage. After 3-day OJTs held on 8-10

November, the review meeting was set on 14 November 2017.

2) During the course of the OJTs, some LABO works were arranged. For instance, experiments on the relation between the density/temperature of the asphalt were implemented on 10 November 2017 for the purpose of the asphalt temperature control.

Ver.5)

1) The 2nd OJT was conducted in between February to March 2018.

   One of the main themes of the said OJT was “crack sealing”.

2) The final OJT will be organized in between July to September 2018.

3-3-4 Conduct endline survey on the training participants' skills and knowledge of APm repair works:

Ver. 1) ~ Ver. 2)

-

Ver. 3)

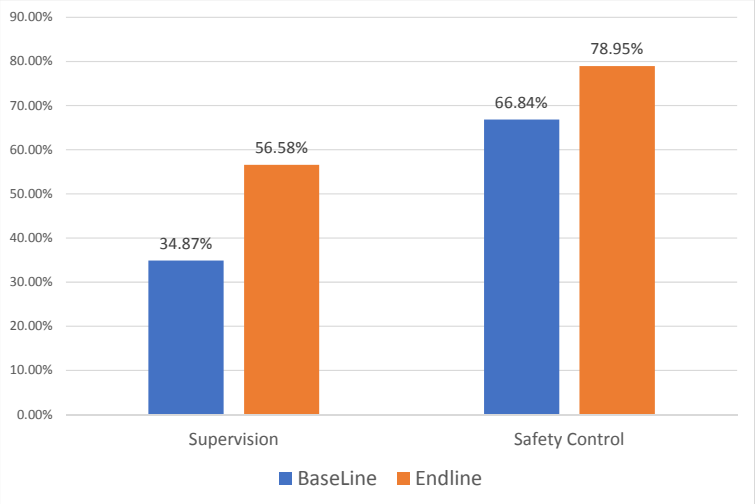
1) The initial end line survey on the training participants’ skills and knowledge of APm repair works” will be implemented in November 2017.

Ver. 4)

1) This activity will be implemented in mid-November 2017.

Ver.5)

1) The initial endline survey was conducted in December 2017.



Result Comparison between Baseline/Endline Surveys

Comparison of the results between the baseline survey and endline one, both supervision and safety control parts show improvements as indicated in the above graph.

As show below table, in case of the endline survey result, while respective organizations as well as the overall marked a certain increase of the points obtained from the baseline survey,

the said increase was under 60.0%, which the “Objectively Verifiable Indicator” targets.

(%)

	Baseline Overall	Endline Overall	B/E increase
OVD	55.1	71.8	30.3
OR	51.5	76.2	47.9
LABO	49.3	77.0	56.1
FONER	77.0	91.0	18.1
BTC	63.0	74.5	18.2
Overall	59.1	78.1	32.1

Moreover, as often the case, the surveys tend to be differ from the baseline and endline surveys, it is, in fact, rather difficult to compare the results.

The Project targeted such increase to start with, in an actual situation, materialization of it was rather challenging.

However, considering the unfamiliarity of taking examinations (surveys) on the newly introduced issues, most of them marked increase, that should be recognized and evaluated.

2) Due to the material constraint (crack sealing material) during the course of OJT, the 2nd round of endline survey has been pending. It will be organized at the time of the 3rd endline survey in August 2018.

3-3-5 Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines:

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) This activity is scheduled to be handled from late August till whole November 2017 for the first round of this activity. The evaluation of the procedure and outcomes for revising the guidelines will be done accordingly.

Ver. 4)

1) In line with the APm repair works through trial implementation of the drafted technical guidelines by the training participants”, general review on the initial stage of the OJTs was done in September 2017. In view of the raised issues at the general review, the OJTs will be continued for the betterment of the current situation of the concerned officials.

Ver.5)

1) The last action of this activity was taken in February 2018.
2) The final stage of this activity will be in between July to September 2018. Similar case as above 3-2-5, if there is any discrepancy between the draft technical guidelines and the actual situation on the ground, it should be pointed out and reflected in the guidelines for the improvement.

1-3 Achievement of the Project Purpose and Outputs

1) Apart from the aforementioned narrative explanation on the "Progress of Activities", achievements are shown in the achievement column of the Monitoring Sheet II.

2) Despite having rather negative results of the endline surveys, in general, the participants of the lectures and OJTs are proactive to raise questions and comments. It was not always the same during the initial stage. This kind of behavioral change is, indeed, a significant sign of improvements, and it should be strengthened.

3) After introducing the assessment rank of the damage condition, importance of the preventative measures has been gradually understood, and slowly those have been put into a practice.

4) Under the Project, upon completion of the trainings, review and evaluation meetings have been organized since the year 2017. The main C/Ps and the other trainees are the ones to gather and discuss any of the findings and views.

1-4 Changes of Risks and Actions for Mitigation

1) After the 2nd monitoring, the similar concern remains on the Presidential election related matter. Depending on the situation in the country, specifically in Kinshasa, the Experts' assignments may be affected as previously experienced.

2) At the same time, rather minor yet disturbing movements have been frequently happening in Kinshasa. In fact, on the day that the 4th JCC was held, political demonstration was announced and it was assumed that organizing the 4th JCC might not be feasible. Fortunately, the said demonstration related matter did not affect the JCC; however, this kind of incidents may occur any time in this country. The Project needs to keep abreast of those issues.

3) In spite of some delays and modification of the plans including the issues in line with the aforementioned situation, the Project as a whole has been putting efforts to complete the entire planned activities. At this stage, the Project expects to accomplish all those, but if the security situation worsens in coming months, there may be necessity to amend respective Experts' assignments, and also to reschedule the timing of organizing the remaining JCCs.

1-5 Progress of Actions undertaken by JICA

1) Necessary support and suggestions to the Project have been continuously provided.

1-6 Progress of Actions undertaken by the Gov. of the DRC

Even with a certain delay with consecutive reminder by the Project, the Gov. of the DRC side's responsive roles, including budget allocation, have been played gradually. The Project has been observing some improvements of the Congolese side actions.

Ver.5)

The following actions are to be taken by the Congolese side to enhance chances for the progress;

1) It is expected that the Congolese side to secure budget for the fuels in order to conduct inspections by using the procured vehicle under the Project (shared between OR/OVD).

2) It is indispensable for the C/Ps to enhance capacity on PC skills and improve data accuracy for inspection. In this regard, continuous efforts should be put by the Congolese side.

3) As the Project targets both OR and OVD as one to achieve mutual goals, it is also expected for both parties to take advantage of respective strengths (e.g. while OR has rich experiences on the road maintenance, OVD is a younger organization and has more flexibility to absorb new issues, etc.) and complement each other on their weakness to overcome challenges having joint efforts.

4) The Project has established a sound platform to gather different organizations, seniors and juniors, males and females, and etc., concerning the AP road maintenance, it is again expected that at least subcommittee or subject-based group level meetings or anything alike to be regularly as well as continuously organized to discuss issues, share challenges and consider measures to be taken, and improve the situation on the ground.

5) All those above issues are to be taken into consideration and put into practice, PDCA cycle can be smoothly implemented.

1-7 Progress of Environmental and Social Considerations (if applicable)

1) These issues are not directly applicable to the Project. However, the contents of the draft technical guidelines include environmental issues, for instance, consideration of the roadside environment, specifically noise and vibration matters.

2) At the same time, the road maintenance itself is a significant source of environmental protection. The Project will support such initiative of the Congolese side throughout the Project.

1-8 Progress of Considerations on Gender/Peace Building/Poverty Reduction (if applicable)

1) These issues are also not directly applicable to the Project, yet the roads are for the entire citizens, which certainly include men and women, children, economically vulnerable people and so on.

2) On the other hand, the Project has been securing female participation of the Project as trainees. Their capacity will be also enhanced through the trainings/OJTs under the Project.

1-9 Other Remarkable/considerable Issues Related/affect to the Project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs, etc.)

1) The Project has met with the Organization for Equipment of Banana-Kinshasa (OEBK), which is responsible for Matadi Bridge in terms of maintenance. The Project has been utilizing the shared experiences of OEBK as a reference for its implementation.

2) As stated in "(3), 1-1 Progress Inputs, I Summary" and "(1-4), (1), Progress of Activities", collaboration between 2 JICA projects, namely Master Plan Project and this Project, have been strengthened, and such holistic approach is expected to contribute to the improvement of the Road Transport Sector of DRC as a whole.

2. Delay of Work Schedule and/or Problems (if any)

1) As explained in "1-4" above, there are some foreseeable risks due to the security reason. If the security situation worsens, the OJTs and the other activities on sites may be suspended, which would affect the progress of the Project.

Ver.5)

1) As explained above, while some marks a certain progress as well as completion, remaining ones have not been achieved as initially targeted or it can be foreseen rather negative results (un-achievement) .

   In addition to the aforementioned matter, "Objectively Verifiable Indicators" of Project Purpose stipulated in the Monitoring Sheet I, the following indicators are to be checked in line with the existing AP road maintenance plan FY2018;

   1. More than 29.0 % of the AP roads are inspected based on the AP road maintenance plan FY2018
   3. More than 70.0 % of the APm repair works plan is implemented based on the AP road maintenance plan FY2018

   Given the Congolese C/Ps'culture, background and other aspects, progress can be relatively slow and take much time. In this regard, within the given timeframe of the Project duration, there may not be feasible to lead all concerned parties to a certain level in a same manner. However, steadiness should be respected, and step by step approach should be taken.

3. Modification of the Project Implementation Plan

3-1 <u>PDM and PO</u>

As explained above "1-6 (1)", "1-2 Progress Activities", the Project proposed modification of the implementation schedule of the following activity (Refer to the Monitoring Sheet II);

Output 1: 1-6 "Elaborate budget FY 2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request"

Initially it was planned to commence from October 2017 till mid-May 2018, and modified to do so from June till October 2018. And the said modification was approved by the 4th JCC.

3-2 <u>Other Modifications on Detailed Implementation Plan</u>

-N.A.

4. Preparation of Gove. of the DRC Toward after Completion of the Project

-N.A.

II. Project Monitoring Sheet I & II

See attached.

Project Monitoring Sheet I （Revision of Project Design Matrix）

version 5

Dated: 5 June, 2018

Project Title: The Project for Capacity Development of Road Maintenance Management

Inputs	Plan/Actual	Remarks	Monitoring: Issue	Monitoring: Solution
Expert				
Leader / Road Maintenance Plan 1 (Mr. Shimizu) 9.60	Plan	Some assignments (1.66 MM) of Coordinator has been shared to Ms.Saito. Below shows her schedule on site; 1)10 Feb.- 6 Mar. 2018, 2)16 Jul.- 9 Aug., 2018	Prevention of delay of respective activities is very much crucial, in particular, database development and OJT on construction supervision as key activities.	Adding an Expert (Ms. Saito), who has experiences on assisting counterparts under the similar circumstances, would help smooth implementation of the said activities. At the same time, coordination work should be handled in harmonized manner by both Experts.
	Actual			
Sub-Leader/ Road Maintenance Plan 2 (Mr. Saito) 10.50	Plan			
	Actual			
Road Inspection (Mr.Takahashi) 9.90	Plan			
	Actual			
Pavement Repair (Mr. Shishido) 12.00	Plan			
	Actual			
Road Inspection (Database) (Mr. Sakai) 10.07	Plan			
	Actual			
Road Inspection (Database 2) (Mr. Maeda) 0.73	Plan			
	Actual			
Pavement Repair (Construction Supervision) (Mr. Mukai) 5.80	Plan			
	Actual			
Coordinator (Mr. Yamagishi / Ms. Saito : Coordinator/Road Maintenance Plan Assistant 2) 10.43	Plan			
	Actual			
Monitoring and Evaluation (Ms.Taguchi) 3.10	Plan			
	Actual			
Training Plan 0.60	Plan			
	Actual			
Equipment				
Equipment for database system	Plan	Upon obtaining the procured vehicle, equipment installation/ equipment (in-vehicle camera) manual development were instructed by Database 2 Expert.		
	Actual			
Training in Japan				
Training for Counterpart Personnel	Plan	2nd training in Japan was held during 13- 26 May 2018 (including traveling time and weekends).	Feedback (including action plan) from the participants will be presented at the 5th JCC.	
	Actual			

Activities / Sub-Activities	Plan/Actual	Responsible Organization: Japan	Responsible Organization: GoDRC	Achievements	Issue & Countermeasures
Output 1: Asphalt paved (AP) road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites.					
1.1 Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites	Plan	JICA	OR/OVD	***Completed**: it had taken a bit more time than expected due to the preparation.*	*No major issues.*
	Actual				
1.2 Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites	Plan	JICA	OR/OVD	*Identification stage has been **completed.** Currently, it is in an application stage.*	
	Actual				
1.3 Define the road network to be covered by the project	Plan	JICA	OR/OVD	*In collaboration with Master Plan Project, it has been **completed.***	
	Actual				
1.4 Conduct traffic volume survey on some sections of the defined road network	Plan	JICA	OR/OVD	***Completed.** Joint traffic volume surveys were conducted in collaboration with Master Plan Project.*	
	Actual				
1.5 Develop an AP road maintenance plan FY2018 of OR and OVD in the project sites	Plan	JICA	OR/OVD	Not achieved.	Project aims to utilize database when developing maintenance plan. However, database development has been delayed, and currently it is expected to finish it in July 2018. AP road maintenance planning can be commenced by using the said data in Aug. 2018, which makes it for FY2019 instead of FY2018.
	Modification				
	Actual				
1.6 Elaborate budget FY2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request	Plan	JICA	OR/OVD	Not achieved; Due to the situation described above 1.5 (issue).	Project is aiming to submit a budget request document FY 2019 for AP road maintenance instead of FY2018.
	Modification				
	Actual				
Output 2: Technical guidelines on AP road maintenance are developed.					
2.1 Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites	Plan	JICA	OR/OVD	***Completed.***	
	Actual				
2.2 Collect and review the existing AP road maintenance manuals and technical guidelines	Plan	JICA	OR/OVD	***Completed.***	
	Actual				
2.3 Establish the Joint Working Group for developing technical guidelines on AP road maintenance	Plan	JICA	OR/OVD	***Completed.***	From Dec.2017-May 2018, 21 meetings have been held.
	Actual				
2.4 Develop and draft technical guidelines on AP road maintenance	Plan	JICA	OR/OVD	***Completed.***	Updates of the Guidelines has been continued through WG1/TAG activities.
	Modification				
	Actual				

Project Title: The Project for Capacity Development of Road Maintenance Management

														Monitoring	
2.5 Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group (TAG) meetings etc. and revise the drafted technical guidelines	●	●	○	○	○			○			Plan / Modification / Actual	JICA	OR/OVD	In progress. This activity has been implemented mainly at the TAG meetings. Last TAG meeting was held in Jan. 2018.	TAG members consist of University/institute professors, and they tend to less prioritize Project related work. Sensitization and raising their motivation are necessary to maintain timely work.
2.6 Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection	○	○	●		○						Plan / Modification / Actual	JICA	OR/OVD	Previous inspections were conducted in Dec. 2017/Jan.2018.	Some of the inspection data came out inaccurate. PC skill itself requires improvements. Re-training on calibration, data processing, interpretation of road surface condition, etc. will be conducted in June 2018.
2.7 Develop a database for accumulating the AP road inspection results	○	○	○		●						Plan / Modification / Actual	JICA	OR/OVD	In progress.	Certain constraints (physical/technical/ security) prevented from implementing this activity as planned. On the other hand, accuracy on data input/analysis should be enhanced.
2.8 Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works	○	○	○	●	○		●				Plan / Modification / Actual	JICA	OR/OVD	In progress.	Similar situation as 2.7. Upon completion of planned activity on the above 2.6/2.7, result of interpretation will be explained at the WG1.
2.9 Finalize the technical guidelines	●	○	●	●	○		○	○			Plan / Actual	JICA	OR/OVD		Current target is to implement this activity in July 2018.
2.10 Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations	●	●	○	○	○		○				Plan / Actual	JICA	OR/OVD		Current target is to implement this activity in September 2018.
2.11 Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPW	●	○						○			Plan / Actual	JICA	OR/OVD		Current target is to implement this activity in October 2018.
Output 3: AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites.															
3-1.Training plan for AP road inspection and APm repair works															
3.1.1 Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works	○	○	●	●	○	○	○	○			Plan / Actual	JICA	OR/OVD	***Completed:***	From Dec.2017-May 2018, 57 meetings/related activities have been implemented.
3.1.2 Plan the trainings on AP road inspection and APm repair works	○	○	●	●	○	○	○	○			Plan / Modification / Actual	JICA	OR/OVD	***Completed.***	
3.1.3 Select candidate sites for the trainings on AP road inspection and APm repair works	○	●	●	●	○	○	○				Plan / Modification / Actual	JICA	OR/OVD	Candidate sites for OJT in 2018 have been selected.	Discussion with the counterparts on the candidate sites has been on going.
3-2. Trainings on AP road inspection															
3.2.1 Conduct baseline survey on the training participants' skills and knowledge of AP road inspection	○	○	●	○	●	○	○		○	○	Plan / Modification / Actual	JICA	OR/OVD	In progress. Previous baseline survey was conducted in Feb. 2018 followed by May 2018.	Remaining sessions will be organized in June 2018.
3.2.2 Conduct lectures on AP road inspection	○	○	●	○	●	●				○	Plan / Modification / Actual	JICA	OR/OVD	In progress. Last session of lectures was held in Feb. 2018.	Remaining sessions will be organized in June 2018.
3.2.3 Conduct OJTs on AP road inspection at the selected sites in the project sites	○	○	●	○	●	○				○	Plan / Modification / Actual	JICA	OR/OVD	In progress. Last OJT was organized in Feb. 2018.	Following OJT will be arranged in June 2018.
3.2.4 Conduct endline survey on the training participants' skills and knowledge of AP road inspection	○	○	●	○	●	○			○	○	Plan / Modification / Actual	JICA	OR/OVD	In progress. Previous endline survey was done in Feb. 2018.	Experts tried to organize initial endline survey as scheduled however, it was not possible due to time constraint. Thus 2nd baseline survey is considered as initial endline survey. Final endline survey will be implemented in June 2018.

Project Title: The Project for Capacity Development of Road Maintenance Management

Activities												Responsible (Japan)	Responsible (Nepal)	Monitoring: Issue	Monitoring: Solution
3.2.5 Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines	●	○	●	○	●	○	○	○		○	Plan / Modifi-cation / Actual	JICA	OR/OVD	In progress. Latest action on this activity was taken in Feb. 2018.	It resumed in May 2018. Discrepancy between guidelines & actual situation (if any) needs to be pointed out for improvements.
3.3 Training on APm Repair Works															
3.3.1 Conduct baseline survey on the training participants' skills and knowledge of APm repair works	○	○	○	●	○	○	●		○	○	Plan / Modifi-cation / Actual	JICA	OR/OVD	In progress. 2nd baseline survey was conducted in Feb/Mar. 2018.	Currently, final baseline survey will be conducted in July to Sep. 018.
3.3.2 Conduct lectures on APm repair works	○	○	○	●	○	○	●			○	Plan / Modifi-cation / Actual	JICA	OR/OVD	Last lectures were conducted in Feb./Mar. 2018.	Final lectures will be arranged in July/Aug. 2018.
3.3.3 Conduct OJTs on APm repair works at the selected sites in the project sites	○	○	○	●	○	○	●			○	Plan / Modifi-cation / Actual	JICA	OR/OVD	Last OJTs were conducted in Feb./Mar. 2018.	Final OJT will be conducted in between July to Sep. 2018.
3.3.4 Conduct endline survey on the training participants' skills and knowledge of APm repair works	○	○	○	●	○	○	●		○	○	Plan / Modifi-cation / Actual	JICA	OR/OVD	Initial endline survey was conducted in December 2017.	Due to material constraint, some of the 2nd OJT contents was not covered as planned. Remaining contents of the 2nd +3rd OJTs & final endline surveys are to be implemented in Sep. 2018.
3.3.5 Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines	●	●	●	○	○	○	○	○		○	Plan / Modifi-cation / Actual	JICA	OR/OVD	The latest implementation of this activity was done in Feb. 2018.	Final session will be in July 2018. Discrepancy between guidelines & actual situation (if any) needs to be pointed out for improvements.
Duration / Phasing											Plan / Actual				

Schedule columns: 2016 (II: 5, 6; III: 7, 8, 9; IV: 10, 11, 12), 2017 (I: 1, 2, 3; II: 4, 5, 6; III: 7, 8, 9; IV: 10, 11, 12), 2018 (I: 1, 2, 3; II: 4, 5, 6; III: 7, 8, 9; IV: 10, 11, 12), 2019 (I: 1, 2, 3)

Monitoring Plan	Plan / Actual	Remarks	Issue	Solution
Monitoring				
Joint Coordination Committee	Plan / Actual	5th JCC was held on 5 June 2018.		
Set-up the Detailed Plan of Operation	Plan / Actual	*Completed*		
Baseline Survey for Target Figures	Plan / Actual	*Completed.*		
Set-up the Target Figures within 6 months after the commencement of the project	Plan / Actual	*Completed.*		
Submission of Monitoring Sheet	Plan / Actual	Version 5 was submitted to the 5th JCC.		
Reports/Documents				
Inception Report (Work Plan)	Plan / Actual	*Submitted to the 1st JCC*		
Draft Project Completion Report	Plan / Actual	In accordance with the below situation, most like to be shifted to Feb. 2018.		
Project Completion Report	Plan / Actual	Due to the discussion with JICA, due date for the said report most like to be shifted to Mar. 2018.		
Public Relations				
Establishment and Operation of web Site, and other relevant PR activities	Plan / Actual	Project News of JICA HP has been updated for 12 times so far, and new article was submitted to JICA early May 2018. 4th version of News letter (in French) was also submitted in mid Mar. 2018. The Project News letters have been linked to the website of Infrastructure Unit since May 2017.	Next Project News of JICA HP is going to be updated around mid-June 2018. Contents will be "Training in Japan" and "the 5th JCC".	Further PR activities will be implemented having different approaches. Eg., media, website, provision of newsletter,etc.

■ Activities with fixed period
□ Activities to be continuously conducted, or with tentative schedule

06 Monitoring Sheet - Version 6

TO CR of JICA D. R. Congo Office

PROJECT MONITORING SHEET

Project Title:

The Project for Capacity Development of Road Maintenance Management

Version of the Sheet: Ver. 6 （Term: June 2018 –November 2018）

Name: Mr. Nobuharu SHIMIZU

Title: Leader/Road Maintenance Plan

Prepared on 15th November 2018, Submission Date: 18th December 2018

The contents of the below are based on the planned activities during the target period of this particular monitoring (ref. to the Monitoring Sheet II for the timeframe of the respective activities).

0. General Information

0-1. Implementation Agency

Office des Routes (OR) and Office des Voiries et Drainage (OVD)

0-2. Target Group

Technical staffs of headquarters and Kinshasa provincial offices of OR and OVD

03. Project Period

June 2016 – January 2019

0-4. Project Site

Kinshasa city and the surrounding area

0-5. Overall Goal

Maintenance condition of the asphalt-paved (AP) roads is improved in the capital city, Kinshasa, and it's suburb

0-6. Project Purpose

AP road maintenance capacity of OR and OVD in the project sites is developed

0-7. Reporting

The following documents/reports will be developed under the Project.

	Report	Status	Notes
1	Monitoring Sheet Ver.1	Submitted on 13July 2016	1st JCC: 6 Jul. 2016
2	Monitoring Sheet Ver.2	Submitted on 19 December 2016	2nd JCC: 8 Nov.2016
3	Monitoring Sheet Ver. 3	Submitted on 26 June 2017	3rd JCC: 25 May 2017
4	Monitoring Sheet Ver. 4	Submitted on 15 December 2017	4th JCC: 15 Nov. 2017
5	Monitoring Sheet Ver. 5	Submitted on 18 July 2018	5th JCC: 5 June 2018
6	Monitoring Sheet Ver. 6	Submitted on 20 December 2018	6th JCC: 8 Nov. 2018
7	Project Completion Report	*To be submitted*	By April 2019 *(Draft Completion Report: by March 2019)*

I. Summary

1. Progress

1-1 Progress of Inputs

(1) JICA Experts

The Japanese Side 1) A total of 9 JICA experts have been (will be→remaining assignments in Japan) assigned for a sum of 69.23 Man/Month (M/M) out of 69.60 M/M by the end of November 2018, which will be the same as the Project total assignment in the DRC.

Ver. 5)

The Expert in charge of "Road Inspection (Database 2)", conducted a field monitoring and training for the equipment after arrival of the purchased vehicle.

Some assignments (1.66 MM) of Coordinator has been shared to Ms. Saito.

Below shows her schedule on site;)10 Feb.- 6 Mar. 2018, 2)16 Jul.- 9 Aug., 2018

Prevention of delay of respective activities is very much crucial, in particular, database development and OJT on construction supervision as key activities.

Adding an Expert (Ms. Saito), who has experiences on assisting counterparts under the similar circumstances, would help smooth implementation of the said activities. At the same time, coordination work should be handled in harmonized manner by both Experts.

Ver. 6)

With relevant adjustments by the respective Experts, the total assignment duration of all the Experts has reached the target.

(2) Congolese Side

Ver. 1)

1) Counter personnel were identified. The Chairperson from the Ministry of Infrastructures, Public Works and Reconstruction (MIPWR), the Coordination Secretary from the Cellule Infrastructures, MIPWR, and the Vice Chairperson from Fonds National d'Entretien Rouiter (FONER) were officially positioned. Also the Project Managers and the Deputy Project Managers as well as the administrative personnel of both sides are in position. Moreover, an official who is in charge of monitoring and evaluation for Cellule Infrastructures was assigned to oversee monitoring and evaluation for the Project, and will work with the JICA expert.
2) Furnished office space was provided with necessary utilities.
3) Administrative and operational costs were shouldered as required, specifically during the initial stage.

Ver. 2)

Members of two (2) Working Groups (WG, 1: Development of technical guidelines on AP road maintenance, WG 2: Conducting training on AP road inspection and APm repair works) have been identified and commenced respective activities as explained in "1-2 Progress of Activities (2) 2-3 and (3) 3-1-1."

Ver. 3)

1) Members of WG 1/WG 2 have been contributing to carry out the respective activities. WG 1 had 31 meetings in total while the WG 2 had a kick off meeting in early November 2016 followed by 6 other meetings (as of 25 May 2017. Refer to "1-2 Progress of Activities (2) 2-4 and (3)").
2) Training for the counterparts (C/Ps) was held in Japan from 4 May 2017 till 22 May 2017

(including traveling time and weekends). 8 personnel were dispatched to Japan to participate in the training program as shown below;

① Participants:

	Name	Title	Organization
1	Mr. Pierre WANET MUTUMOSI	Head of Brigade 901 (Kinshasa)	OR
2	Mr. Jean Paul MAVUNGU SOKANA	Database Expert	OR/Headquarters
3	Mr. Timothee SUMAHILI	Technical Director, Kinshasa Province	OVD
4	Mr. Leon MUTOMBO	Head of Evaluation	OVD
5	Mr. Pascal BULONGO	Provincial Director	FONER (Fonds National d'Entretine Routier)
6	Mr. Willy MONDA TONA	Head of Division	BTC (Bureau des traveaux et construction)
7	Mr. Fils ZENGA MBALA	Head of Service	BTC
8	Mr. Chocquet N'DOBE di SOKI	Coordinator	PRCMR (Projet de renforcement de capacités sur la maintenance de routes)

② Training Program:

May	a.m.	p.m.	Remarks
8 (Mon.)	Briefing	Orientation, Visit to ISEC office	-
9 (Tue.)	Road maintenance method	Safety management measures	Lecture
10 (Wed.)	*Move to Osaka*	Outline of Hanshin Expressway	Lecture
11 (Thur.)	General road maintenance	Maintenance information management	Lecture
12 (Fri.)	Akashi Kaikyo Bridge, Akashi Kaikyo Bridge Exhibition Center, Maiko Marine Promenade	*Return to Tokyo*	Site visit
13 (Sat.)	*Preparation on the training report*		-
14 (Sun.)	*Off*		-
15 (Mon.)	Pavement restoration work, Kayama District, Saitama		Lecture, site visit
16 (Tue.)	Road inspection method	Demonstration on the road inspection	Lecture, site visit
17 (Wed.)	Construction machine factory	Construction machinery	Site visit, lecture
18 (Thur.)	JICA technical cooperation projects	Preparation on the training report	Lecture
19 (Fri.)	Presentation on the training report	Training evaluation	-

③ Some feedback from the participants:

- In general, the training program was well received by the participants. Particularly, majority of the participants considered the lecture on the "safety management measures" was the most useful subject amongst others followed by the "database" (lecture on the "road inspection method"). At the same time, the participants have become fully aware of the importance of the safety for the workers at the construction site to conduct road maintenance properly.
- On the other hand, considering the actual situation back home, the participants commented the following subjects to be included in order to make the training more appropriate and meaningful;
  - Monitoring on the road projects
  - Quality control, etc.
- The participants have committed action to be taken as follows;
  - Report to the senior managements what they have learned and experienced through the training so as to strengthen the partnership with JICA, and improve the situation of the DRC
  - Implement AP road maintenance by utilizing the technical guidelines which have drafted by the Project
  - Share what they have learned with the other engineers, and train them
  - Organize workshops/seminars
  - Comply with the methods, etc.

3) The budget for the traffic volume survey was finally approved by the Congolese side however, budget execution has been taking rather too long and timing of it is very much uncertain, which may affect the activity of the Project. In view of smooth implementation of the project, the Project has proposed collaboration with “Project for Urban Transport Master Plan in Kinshasa City (Master Plan Project)” under JICA, which has a plan to conduct traffic volume survey for about 40 sections (Refer to “1-2 Progress of Activities (1) 1-4”).

Ver. 4)

1) Several activities of the WG 1 and WG 2 have been carried out by each WG members. The WG 1 had meetings to discuss countermeasures for the comments on the draft technical guidelines (21, 28 July 2017). While the WG 2 members received trainings as well as OJT on AP road inspection and APm repair works (Refer to “(2) 2-4 and (3) “, “1-2 Progress of Activities”).

2) In view of efficient implementation, the Project has proposed collaboration with “Project for Urban Transport Master Plan in Kinshasa City (Master Plan Project)” under JICA, which has been conducting the traffic volume survey for about 40 sections (Refer to “(1) 1-4”, “1-2 Progress of Activities”).

3) Newspaper article (Le Pontentiel) on the road maintenance was published on 3 August 2017. The article says “Supervised by the “Office des Voiries et Drainage (OVD)”, the rehabilitation work was carried out for three days, from 24 to 26 July 2017.” This rehabilitation work was well received by the public and the article continues to mention the followings; “We are pleased after the rehabilitation of this section, and thank the authorities".

4) In order to enhance smooth operation and management of the Project, the Project monitoring in charge, officials of the Congolese side and the Experts concerned gather to discuss the progress and the issues of the Project. The main representatives of the Congolese side are from Infrastructure Unit (Gestionnaire de Projet Transports, on behalf of Charge de Suivi-Evaluation), OR (Coordinator) and OVD (Logistic Director). With regard to the Project Design Matrix (PDM), several achievements (refer to the “1-2 Progress of Activities”), including the set timeframe, were reported while the rest of the indicators were reminded in order to fulfill those in a timely and proper manner.

Ver. 5)

1) WGs:

From December 2017 till May 2018, 21 WG 1 meetings were held. The below shows the number of participants for the respective meetings;

ST NO.	DATE	WG1	PARTICIPANTS
1	2017/12/1		6
2	2017/12/8		6
3	2017/12/14		9
4	2017/12/15		3
5	2017/12/18		3
6	2017/12/20		4
7	2017/12/21		4
8	2017/12/29		5
9	2018/1/22	Revision of manual in	3
10	2018/1/23	relation to the TAG	3
11	2018/1/24	comments	3
12	2018/1/25		3
13	2018/1/26		3
14	2018/1/29		3
15	2018/2/1		3
16	2018/2/6		3
17	2018/2/9		4
18	2018/2/21		3
19	2018/2/22		4
20	2018/4/26	Clarification and some	10
21	2018/5/3	observations on	8

Likewise, WG 2 organized meetings and implemented their activities as shown below;

ST NO.	DATE	WG2	PARTICIPANTS
1	2017/12/27	Inspection and database development	11
2	2018/12/28		8
3	2018/1/25		6
4	2018/1/26		7
5	2018/2/14	Inspection	17
6	2015/2/15	Inspection and datase development	23
7	2018/2/16	Inspection	22
8	2018/2/19	Inspection and datase development	8
9	2018/2/20		7
10	2018/2/21		10
11	2018/2/27		4
14	2018/3/5		7
15	2018/3/6		7
17	2018/3/8		8
18	2018/3/13		12
19	2018/3/14		14
20	2018/3/15		15
21	2018/3/16		10
22	2018/3/19		10
23	2018/3/20		8
24	2018/3/21		14
25	2018/3/22		13
26	2018/3/23		7
27	2018/3/26		5
28	2018/3/27		6
29	2018/3/28		10
30	2018/3/29		11
31	2018/3/30		15
32	2018/4/3	Inspection vehicle setting	14
33	2018/4/4		15
34	2018/4/5	Inspection vehicle setting and inspection	15
35	2018/4/6		14
36	2018/4/10	Inspection and database development	9
37	2018/4/11		10
38	2018/4/12	Palse line, destance calibration, inspection mannual development and data processing mannual development	14
39	2018/4/13		11
40	2018/4/14		11
41	2018/4/28	Inspection and database development	5
42	2018/4/29		5
43	2018/4/30		5
44	2018/5/3	Data processing	3
45	2018/5/4		4
46	2018/5/5		6
47	2018/5/6		3
48	2018/5/7	Inspection and database development	6
49	2018/5/8		6
50	2018/5/9		7
51	2018/5/11	Data processing	3
52	2018/5/14		4
53	2018/5/15		4
54	2018/5/16		3
55	2018/5/18		3
56	2018/5/19		3
57	2018/5/21	Inspection and database development	3

2) The second round of the training in Japan was held from 14 May 2018 till 25 May 2018. The participants of the said training were shown below;

① Participants:

	Name	Title	Organization
1	Mr. Jonathan MAYAMBA UMBI	Operation Manager	OR/DG
2	Mr. Albert MUINDILE MUTSHIPAYI	Site Supervisor	OR/DPK
3	Mr. Rudy ALONDA KYATANGALWA	Research Engineer	OR/LNTP
4	Mr. Guylain LUZOLO TUKITALO	Operation Manager	OVD/DPK
5	Mr. Victor KALONDA Ka KALONDA	Brigade Chief	OVD/DPK
6	Mr. Dominique NZUZI MASSAMBA	Head of Research and Expertise Department	BTC
7	Mr. Joseph MASISA	Monitoring, Works and Equipment Chief	FONER

	Name	Title	Organization
8	Mr. Mao NTUMBA MULUME	Chief of Service	ACGT

It was very much meaningful to have the participants from several other concerned organizations apart from OR/OVD. For instance, with regard to the AP road maintenance plan, budget issue is crucial. Since the official from FONER has also participated in the training in Japan, information on the budget flow was shared with the Project smoothly. As such, communication amongst the concerned parties has been strengthened.

② Training Program:

May	a.m.	p.m.	Remarks
14 (Mon.)	Briefing	Orientation, Visit to ISEC office	-
15 (Tue.)	Road maintenance method	Safety management measures	Lecture
16 (Wed.)	Road administration	Road maintenance cycle	Lecture
17 (Thur.)	Pavement technology which contributes to environmental improvement	Road inspection method	Lecture
18 (Fri.)	System introduction	Demonstration on road inspection	Lecture, demonstration
19 (Sat.)	Off		-
20(Sun.)	Off		-
21 (Mon.)	Furukawa maintenance work	Site visits in Tokyo	Site visit
22 (Tue.)	Facility observation at Public Works Research Institute	Road conservation	Observation, lecture
23 (Wed.)	Factory/material observation	Construction machinery	Site visit, lecture
24 (Thur.)	Technical cooperation projects, Civil engineering session Q & A	Preparation on the training report	Lecture
25 (Fri.)	Presentation on the training report	Training evaluation	-

③ Some feedback from the participants:

- The training program was well received by the most of the participants. They consider the following subjects as very much useful amongst others; “Safety management measures”, “Road maintenance method”, “Road administration”, “Pavement technology which contributes to environmental improvement” and “Road inspection”.
  Some of the reasons behind of the above views were; 1) It can be directly applied back home; 2) It will be one of the main recommendations to the organization that the participants belong to; and 3) It can be a significant source to develop mid and long term maintenance/repair plans, and so forth.
- The participants commented the following subjects should have been included in the program; 1) Asphalt road pavement repair work (site inspection); 2) Quality management; and 3) Bridge maintenance and repair works, etc.
- The participants have committed action to be taken as follows;
  - Sensitization and awareness raising on road maintenance
  - Development and execution of maintenance plan
  - Establishment of monitoring system on road maintenance
  - Securing system that allows local governments’ direct intervention on road maintenance, as well as to encourage private sector participation
  - Recommendation on safety management training and work style reform

3) As it has been done so, prior to the JCC, meetings with the C/Ps on the monitoring related issue were organized. Participants from the Congolese side were regular faces; a person in charge of

monitoring (Infrastructure Unit), and representatives from OR (Coordinator) /OVD (Logistic Director). Discussion on the progress (achievements) made so far, challenges and issues as well as un-achieved activities, etc. were held. At the same time, the Project Design Metrix (PDM) was reviewed and reminded the remaining indicators which needs to be fulfilled. The details are explained in below “Progress of Activities”.

Ver. 6)

1) WGs:

After the 5th JCC, which was held on the 5th June 2018, till late October 2018, 29 WG 1 meetings/related activities were organized. The below shows the number of participants for the respective meetings;

SL No.	DATE	WG1	No of PARTICI-PANTS
1	2018/7/26	Presentation of the manual draft as amended by small number of WG members	4
2	2018/8/15	Manual	1
3	2018/8/28	Manual	2
4	2018/8/30	Manual	2
5	2018/8/31	Manual	2
6	2018/9/3	Manual	2
7	2018/9/4	Manual	2
8	2018/9/7	Manual	3
9	2018/9/11	Manual	2
10	2018/9/20	Manual	3
11	2018/9/21	Manual	2
12	2018/9/24	Manual	3
13	2018/9/25	Manual	2
14	2018/9/26	Manual	2
15	2018/10/3	Manual	2
16	2018/10/4	Manual	1
17	2018/10/8	Manual	2
18	2018/10/9	Manual	2
19	2018/10/10	Manual	3
20	2018/10/11	Manual	2
21	2018/10/12	Manual	2
22	2018/10/15	Manual	3
23	2018/10/16	Internal meeting on the presentation of the final version of manual (with Focal Points)	7
24	2018/10/17	Preparation of the manual presentation workshop	4
25	2018/10/18	Manual presentation workshop	41
26	2018/10/22	Manual	1
27	2018/10/23	Manual	1
28	2018/10/24	Manual	3
29	2018/10/25	Manual	2

Similarly, WG2 has organized 97 meetings/related activities as described below.

SL No	DATE	WG2	PARTICIPANTS	Focal point	
1	2018/6/7	Data processing	3		
2	2018/6/8	Inspection and database lecture, baseline	21		
3	2018/6/11	Data processing	5		
4	2018/6/12	OJT , data processing OR/OVD	20		
5	2018/6/13	OJT , data processing OR/OVD	19		
6	2018/6/14	OJT, data processing OR/OVD	18		
7	2018/6/15	Endline test, data processing	30		
8	2018/6/18	Data processing	6		
9	2018/6/19			Lecture and continuation of training	13
10	2018/6/20	Inspection (OVD)	3		
11	2018/6/21	Data processing (OR)	10		
12	2018/6/22	Data processing	8		
13	2018/6/25	Data processing	7		
14	2018/6/26	Inspection OR team/data processing OVD team	5		
15	2018/6/27	Inspection OVD/data processing OR team	N.A.		
16	2018/6/28	Inspection and database OVD/Data processing OR	8		
17	2018/7/1	Inspection and database OR	3		
18	2018/7/2	Data processing	7		
19	2018/7/3	Inspection OVD and data processing OR/observation, budget calculation, plan for the works	7		
20	2018/7/4	Observation, budget calculation, plan	9		
21	2018/7/5	Data processing /observation, budget calculation	1		
22	2018/7/6	Data processing	4		
23	2018/7/9	Data processing	7		
24	2018/7/10	Data processing	7		
25	2018/7/11	Inspection and data base	7		
26	2018/7/12	Inspection and data base	6		
27	2018/7/13	Data processing	5		
28	2018/7/16	Data processing	2	Meeting on OJT	9
29	2018/7/17	Data processing	6		
30	2018/7/18	Data processing/ inspection and data base OVD	7		
31	2018/7/19	Visiting of Chinese company) + data processing	17		
32	2018/7/20	Inspection and data base, data processing	N.A.	Meeting on the 3rd OJT	5
33	2018/7/24	Meeting and Data processing	6		
34	2018/7/25	Data processing, inspection	6		
35	2018/7/26	Wrap-up meeting, baseline, data processing	24		
36	2018/7/27	Investigation on Lumumba Avenue with OVD, data processing	7		
37	2018/7/30	Data processing	2		
38	2018/7/31	Data processing	N.A.	Meeting on OJT	6
39	2018/8/2	Data processing	4		
40	2018/8/3	lecture, Endline, inspection, data processing	18		
41	2018/8/6	OJT : crack sealing on 30 June Blvd., data processing, inspection	(29+5)34		
42	2018/8/7	OJT : crack sealing on Lumumba Blvd., data processing	(29+5)34		
43	2018/8/8		5		
44	2018/8/9	OJT : crack sealing on Congo-Japan Blvd, inspection, data	(28+5)33		
45	2018/8/10	base	35		
46	2018/8/13	Visiting RN43	31		
47	2018/8/14	Data processing	4		
48	2018/8/15	Data processing	5		
49	2018/8/16	Data processing	4		
50	2018/8/18	Inspection and database	2		
51	2018/8/19	Inspection and database	5		
52	2018/8/21	Data processing	4		
53	2018/8/22	Data processing	3		
54	2018/8/23	Data processing	3		
55	2018/8/24	Data processing	5		
56	2018/8/25	Inspection and database	4		
57	2018/8/26	Inspection and database	4		
58	2018/8/27	Data processing	5		
59	2018/8/28	Data processing	5		
60	2018/8/29	Data processing	4		
61	2018/8/30	Data processing	3		
62	2018/8/31	Data processing	3		
63	2018/9/1	Inspection and database	4		
64	2018/9/2	Inspection and database	4		
65	2018/9/3	Data processing	5		
66	2018/9/4	Data processing	4		
67	2018/9/5	Data processing	4		
68	2018/9/6	Data processing	4		
69	2018/9/7	Data processing	4		
70	2018/9/9	Inspection and database	2		
71	2018/9/10	Inspection and database	6		
72	2018/9/11	Data processing	4		
73	2018/9/12	Data processing	3		
74	2018/9/13	Data processing	5		
75	2018/9/14	Data processing	4		
76	2018/9/15	Data processing	1		
77	2018/9/17	data processing	6		
78	2018/9/18	Data processing & lecture of OR on the inspection road and database	4		
79	2018/9/19	Data processing	5		
80	2018/9/20	Data processing	3		
81	2018/9/21	Data processing	4		
82	2018/9/24	Data processing	4		
83	2018/9/25	Data processing	4		
84	2018/9/26	Data processing	3		
85	2018/9/27	Data processing	4		
86	2018/9/28	Data processing			
87	2018/10/1	Data processing	6		
88	2018/10/2	Lecture : presentation of inspection and database results by OR	50		
89	2018/10/3	Lecture : presentation of inspection and database results by OVD	43		
90	2018/10/4	data processing	1		
91	2018/10/5	Lecture : presentation of inspection and database results by OR; data processing	29		
92	2018/10/8	Elaboration of report on road inspection and data processing	1		
93	2018/10/9	Elaboration of report on road inspection and data processing	1		
94	2018/10/10	Elaboration of report on road inspection and data processing	4		
95	2018/10/11	Elaboration of report on road inspection and data processing	2		
96	2018/10/12	Elaboration of report on road inspection and data processing	1		
97	2018/10/22	Elaboration of report on road inspection and data processing	1		

2) Prior to the final JCC, regular pre-meeting was arranged amongst concerned parties of the Congolese and JICA Experts' sides. In particular, considering the final stage of this particular Project, the said meeting had in-depth discussions on the achievements, issues, and actions required for the way forward.


Discussion with the C/Ps on the monitoring results

3) Concerning the Project office working environment, in fact, from almost the beginning of the Project, the condition of the washroom has been an issue; no running water (flushing/washing hands, etc.), technically no separation of main door for male/female, only one person can use at one time, etc (shared not only amongst Project related members but other officials/staff of OR). This should have been looked into more carefully by the Congolese side to secure proper hygiene and working environment with certain comfortableness. However, it was also understood that the condition of the Congolese side did not permit to accommodate such demand due to insufficient financial resources, which is another concern.

1-2 Progress of Activities

(0) Activities for the General Issues:

Ver. 1)

1) A Kick-off meeting was held on the 8th June 2016 in order to obtain more understandings of JICA project and to comprehend function of the concerned parties of the DRC side.
   - A preparatory meeting for the 1st Joint Coordination Committee (JCC) and several other follow up meetings were held starting from 29th June 2016 till right before the 1st JCC.
2) Current situation has been carefully observed so as to identify the contents of the baseline survey to fix the Performance Indicators, which remain unset in the Project Design Matrix (PDM). Once the contents were determined, the baseline survey will be conducted and the survey results will be analyzed accordingly.
3) The counterparts (C/Ps) and the JICA experts conducted several site visits, for instance, RN 1, RN 4) and RP 118 which are under the supervision of OR. Likewise, Av.Victoire, Av. Cambela, Bld. Sedwe, Av.Poids Lourds, and etc. were visited by the JICA exerts guided by the OVD C/Ps. These exercises led the JICA experts to understand the actual situation on the ground.

Ver. 2)

1) Over all progress of the project activity is more or less as planned.
2) 2nd JCC was organized on 8 November 2016 having the Working Group members, and total number of the participants for the 2nd JCC was 47. The Congolese side took initiative to lead the meeting and discussions went on. However, there may be some room for improvement in terms of time management.
3) A series of meetings in line with each activity had been organized for outputs 1, 2 and 3 during this target period of the monitoring.
4) Establishment and operation of the web site are in progress. Project site of JICA HP and Infrastructure Unit HP have been updated from time to time. Project Newsletter recorded 2nd edition so far. On the other hand, the Project has issued a request letter to OR in Aug. 2016 to include the Project information on their website. However, so far no response has been made by the OR. The Project will follow it up with this matter and try to materialize it in near future.

Ver. 3)

1) A key activity, which is to develop a draft version of technical guidelines, has been marked approximately 6 months delay. Series of activities had planned in accordance with the said guidelines which had affected the progress of the other related activities. The Project had reviewed the planned schedule and proposed modification of the concerned activity plans. The proposal was approved by the 3rd JCC meeting. Currently, the Project has clear picture of the progress management and activity implementation.
2) 3rd JCC meeting was organized on 25 May 2017. Totally, 44 participants attended this meeting, having African Development Bank, and Transporters Association, etc.
3) A series of meetings in line with the respective activity of the outputs 1, 2 and 3 had been organized for this target period of the monitoring lead by the WGs.
4) Activities of the public relations (PR) have been on going. 2 radio stations came to report on the 3rd JCC. The 3rd edition of the Project Newsletter is under preparation while JICA project site (website) of this Project has been updated on a regular basis. The 6th edition of the Project News of the JICA website was uploaded in April 2017.
5) The Project has secured a link to the website of Infrastructure Unit of Ministry of Infrastructures,

Public Works and Reconstruction (former Ministry of Infrastructures and Public Works). The Project Newsletters of 1st and 2nd edition are going to be uploaded shortly.

Ver.4)

1) In line with the revised schedule (initial schedule was revised at the time of the 3rd Monitoring) for developing draft technical guidelines (prime activity of the Project), the Project activities have been marking a certain progress.
2) The 4th JCC meeting was held on 15 November 2017. 40 participants attended this meeting in total. Those participants are including the Advisor to the MoIPWR, Director General of FONER, Chief Resident Representative of JICA, Professors of Institut National du Bâtiment et des Travaux Publics, officials from Bureau d'études d'aménagement et d'urbanisme, Infrastructure Unit of MoIPWR, OR/OVD and others
3) A series of meetings for the respective activities of the outputs 1, 2 and 3 had been arranged for this target period of the monitoring lead by each WG.
4) Activities on PR have been continued. In line with this, RTNC (Radio-Television Nationale Congolaise), TELE 7 and ACP (Agence Congolaise de Presse) came to the 4th JCC and reported this event.
5) The 3rd edition of the Project Newsletter has been uploaded on the JICA homepage (French version: https://www.jica.go.jp/project/drc/004/newsletter/index.html) while JICA project site (website) of this Project has been updated on a regular basis. The 10th edition of the Project News of the JICA website was uploaded (https://www.jica.go.jp/project/drc/004/news/index.html). The next update of the Project News is scheduled to be done in mid-November 2017.
6) The Project has secured a link to the website of Infrastructure Unit since May 2017. The Project Newsletters of up to the 3rd edition have been uploaded to this particular site. (http://www.celluleinfra.org/index.php/publications/lettre-mensuelle-d-information-du-projet-pro-routes).

Ver. 5)

1) With regard to the 4th JCC, newspaper article was uploaded on the website as below;

   https://www.digitalcongo.net/article/5a0d9838f84d560004a0cb4f
   The headline states "Government is satisfied with JICA's support for the elaboration of the manual of the road maintenance", and the article also covered overall project outlines including main concerned parties.
2) The 5th JCC, which dated 5 June 2018, had 55 participants in total.

   Apart from the main organizations concerned, such as OR, OVD, MIPWR, FONER, etc., representatives from Delegation of the European Union (DUE), Office of Development Studies and Urban Planning (BEAU), Department of Road and Bridge (DEP), Public Works Infrastructure (TPI) and National Corporation of Building and Public Works Engineers (CNirs BTP) were joined.

   Main agenda of the JCC were 1) Progress of Road Inspection (current situation of database development included); 2) Training in Japan (Action Plan, etc.); and 3) Towards the final stage of the Project.

3) Project News of JICA HP has been uploaded for 12 times so far, and new article was submitted to the JICA Headquarters early May 2018. The 4th edition of News Letter (in French) was also submitted to JICA HQs in mid-March 2018. The next update of the Project News is going to

be around mid-June 2018. The expected contents will be “Training in Japan” and “the 5th JCC”.

Ver. 6)

1) The article of the last (5th) JCC was publicized on the following JICA website (dated 20 June, 2018);
https://www.jica.go.jp/project/drc/004/news/20180620.html

2) Likewise, the article of the 3rd site inspection was uploaded (dated 5 July, 2018) as the 16th edition as shown below;
https://www.jica.go.jp/project/drc/004/news/20180705.html

3) The Project News Letters have been linked to the website of Infrastructure Unit since May 2017 and some updates have been made;
http://www.celluleinfra.org/index.php/publications/lettre-mensuelle-d-information
In the above site, “Lettre d’information N°01 du 18 Juillet 2016”, “Lettre d’information N°02 du 1er novembre 2016”, “Lettre d’information N°03 du 07 juillet 2017’ and “Lettre d’information N°04 du 22 février 2018” are the ones from the Project.

4) The 6th (final) JCC was organized on the 8th November 2018, having 61 participants in total.

   Apart from the main organizations concerned, such as OR, OVD, MIPWR, FONER, BTC, etc., representatives from Delegation of the European Union (DUE), Belgian Development Agency (CTB), Congolese Agency of Great Works (ACGT), Congolese Environment Agency (ACE), Congolese Association of Civil Engineering (ACTC), Department of Road and Bridge (DEP) were joined.

   Main agenda: 1) Overall Project achievements; 2) Way forward; and 3) Discussions

5) During the course of the said JCC, comments and questions were raised in terms of training, quality control in road maintenance, area to cover (Kinshasa only or expanding to the provinces), establishment of common/harmonized database within the MIPWR and so forth.

Presentation from the Project

Discussion during the 6th JCC

Progress of the planned activities *is described as follows.*

(1) Activities for OP1: Asphalt paved (AP) Road Maintenance Cycle is Established in OR and OVD with Clearly Defined Roles And Responsibilities in the Project Sites

1.1 Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites: **Completed** in July 2016.

Ver. 1)

This Activity has been jointly done by the C/Ps and the JICA experts having series of discussions and site visits. The major findings are as follows; 1.Majority of the staff who are involved in the AP road maintenance work have not enough working experiences and knowledge, 2. The existing inspection system for the road damage has room for improvement, 3.Similarly the inspection reporting format has room for improvement.

1-2 Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites: **Completed** in November 2018.

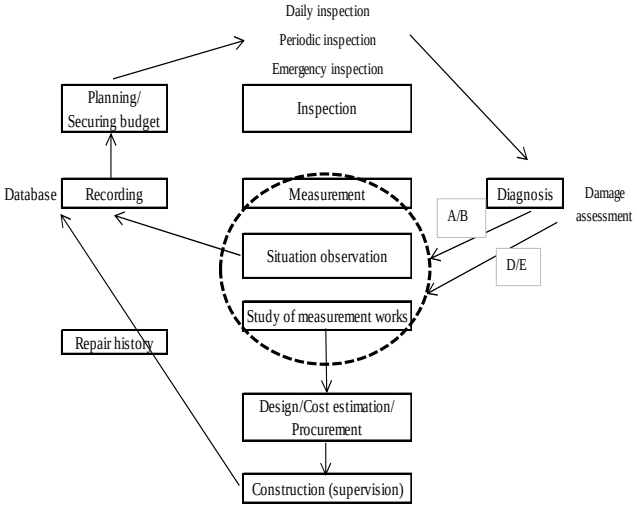
Ver. 1)

The above has been gradually identified based on the analysis of the above findings (problems), and those will be applied throughout the project period.

Ver. 2)

These activities have been **identified** and those will be continuously applied throughout the Project period. Needless to say, OR and OVD are the main actors for this particular Project while Infrastructure Unit oversees the overall implementation, and FONER is a road maintenance budget authority. All concerned parties play respective roles in line with the AP road maintenance cycle.

Assessment	Condition of damage
A	Fine condition (no damage)
B	Minor damage but no problem for smooth traffic
C	Minor damage but no hindrance to the traffic (repair works required within 5 years)
D	Large-scale damage but no hindrance to the traffic (repair works required within 1 year)
E	Large-scale damage to hinder the traffic (emergency restoration required)



Ver. 3)-5)

This activity has been in an application stage. The identified roles, responsibilities and work procedures for AP road maintenance of OR and OVD will be continuously applied throughout the Project period.

Ver. 6)

The application stage of this activity has come to an end under the Project in November 2018. However, the said application with necessary review and revision should be handled by the Congolese side in a continuous manner even after the completion of the Project.

1-3 Define the road network to be covered by the project: **Completed** in August 2017.

Ver. 1)

Will be defined" by the end of September 2016.

Ver. 2)

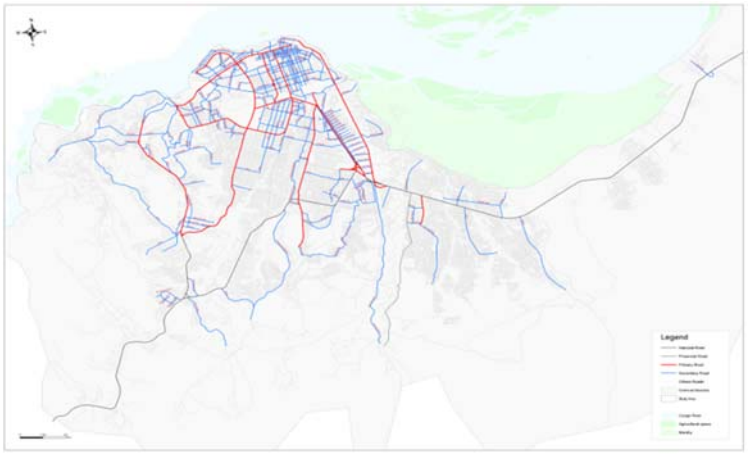
The C/Ps have conducted site observation at the OR roads and OVD roads respectively. This task is aimed to be completed sometime in between January to March 2017.

Ver. 3)

It has been defined having lists of the respective target areas from OR and OVD. It was initially planned to complete it by the end of September 2016. In an actual situation, it had prolonged till May 2017. Involving 2 different organization (OR and OVD) takes much more time than expected. And coordination between them is also a demanding issue. This is one of the "lessons learned", and the Project has taken notes on this matter.

Ver.4)

The road network to be covered by the Project" has been defined (**completed**) as shown below.



1-4 Conduct traffic volume survey on some sections of the defined road network: **Completed** in August 2017.

Ver. 1)

-

Ver. 2)

This activity is currently suspended. The C/Ps are facing difficulty to deal with such activity because of the budget constraint. The Project has inquired this issue to the Infrastructure Unit seeking for support to materialize the survey. Currently, the Infrastructure Unit is considering sending a request letter to Agence Congolais des Grands Travaux (ACGT) to secure some funds. However, in order to do so, determination of target area for the survey is required.

Ver. 3)

1) This activity is expected to be conducted by the end of July 2017, having collaboration with the "the Master Plan Project". The Project C/Ps from OR and OVD together with the Japanese Experts will be joining the Master Plan workshop on induction of the traffic volume survey followed by the actual survey on the ground. Accordingly, collected data from the survey will be analyzed. OR and OVD C/Ps will take parts in the whole set of traffic volume survey, and the C/Ps are expected to acquire knowledge and skills on this. Out of total target sections of the said survey under the Master Plan Project, at least 2 sections (one for OR and the other for OVD) for the Project related sites will be covered.
2) Upon completion of the draft guidelines, "1-5: An AP road maintenance plan FY 2018 of OR and OVD in the project sites" has started to be developed. Initial plan was to begin this activity from November 2016. Therefore, the Project proposed modification of the activity schedule.

Ver.4)

1) This activity was conducted on the 20th June 2017 to start with, having collaboration with the "the Master Plan Project". Prior to that, preparatory workshop (how to conduct the aforementioned survey) was organized on the 7th June 2017. Thereafter, some more traffic volume surveys with the Master Plan Project were implemented. To be specific, twice (3 sections) in July and 6 times in August 2017. In July, traffic volume at Boulevard (Bd.) 30 juin, Bd. Congo-Japon and Bd.Matadi sections were surveyed. In total, 9 sections were covered. For each traffic volume survey, 5 officials concerned of the Project were participated.
2) One of the "Objectively Verifiable Indicators" of Monitoring Sheet I has been set as follows; "1-1. Traffic volume survey is conducted on 2 sections by July 2017 for one time throughout the project period." And this has been achieved (**completed**) as described above.

1-5 Develop an AP road maintenance plan FY 2018 of OR and OVD in the project sites: **Completed** in September 2018 in accordance with the modified target as to develop an AP road maintenance plan FY 2019 AP of OR/PVD instead of FY 2018.

Ver.1) ～Ver.3)

-

Ver. 4)

OR and OVD have been preparing the respective FY 2018 plans however, those plans were not under the Project which have no base on the implementation/evaluation of the Project. For this, the priority should be given to them to acquire skills on how to obtain the data as well as to utilize it. Once the data is well utilized, economical operation of the road maintenance can be materialized, at the same time, the mid-term plan can be developed by predicting the road condition in near future.

Ver. 5)

Not completed as planned.

1) The Project aims to utilize the database when developing maintenance plan. However, database development has been delayed, and currently it is expected to finish it in July 2018. Accordingly, AP road maintenance planning can be processed by using the said data in August 2018. That makes the plan for FY 2019 instead of FY 2018.

   Due to the delay of the budget allocation by FONER, development of the existing road maintenance plan of both OR and OVD has been also delayed.

2) In line with the above, one of the "Objectively Verifiable Indicators" of Monitoring Sheet I has been set as follows; "1-2. AP road maintenance plan FY 2018 is developed by OR and OVD". This has not been achieved as described above.

   Currently, the Project is trying to complete this activity by developing the AP road maintenance plan FY 2019 of OR and OVD in the project sites.

Ver. 6)

1) Based on the database, AP road maintenance plans FY2019 of OR and OVD have been developed.
2) The said plans for both OR and OVD have been submitted to Infrastructure Unit on the 28th September 2018 respectively.
3) In accordance with the modified target, this activity has been **completed** in September 2018.
4) "Objectively Verifiable Indicators" of Monitoring Sheet I; "1-2. AP road maintenance plan FY 2019 (modified from FY 2018) is developed by OR/OVD" has been achieved.

1-6 Elaborate budget FY 2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request: **Completed** in October 2018 in accordance with the modified target as to elaborate budget FY 2019 instead of FY 2018 (to submit the said request to Infrastructure Unit).

Ver.1) ～Ver.3)

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Ver.4)

The Project proposed modification of the plan to commence the activity in June 2018. And this proposal was accepted by the 4th JCC. Several delays such as developing database, which should be utilize for budget planning, etc. need to be overcome before this activity to be handled.

Ver.5)

Not completed as planned.

1) Elaboration of budget FY 2018 as well as budget request were not materialized due to the same reason described above 1-5.
2) An "Objectively Verifiable Indicator" of Monitoring Sheet I, which is in accordance with the above issue, is described as follows; "1-3. Budget request document FY 2018 for AP road maintenance is submitted by OR and OVD".

   This has also not been achieved as described above.

   In general, the budget request for the following FY is to be submitted to FONER in between March and April if a notification letter has been sent by FONER prior to that. However, at this stage it has not been done so yet. According to FONER, the budget request should be submitted

by September this year for the next year, and they will be issuing the notification letter to OR/OVD in due course. Thus currently, the Project targets to complete this activity by elaborating budget FY 2019, and proceeding a request for the said budget by September 2018.

Ver. 6)

1) FY 2019 budget requests have been submitted to Infrastructure Unit by both OR and OVD on the 1st October 2018.
2) In accordance with the modified target, this activity has been **completed** in October 2018.
3) "Objectively Verifiable Indicators" of Monitoring Sheet I; "1-3. Budget request document FY 2019 (instead of FY 2018) for AP road maintenance is submitted by OR and OVD" has been achieved.
4) On the other hand, actual submission of OR/OVD road maintenance budget requests, which are rather additional, to FONER is pending. It will be done so by February 2019, which is still acceptable to FONER (as for the overall OR/OVD budget requests have been already submitted to FONER).
5) The Project has recommended establishing the "Committee for Road Maintenance Monitoring" as to facilitate necessary action, including the budget related matters, to be taken after the Project completion

(2) Activities for OP2: Technical Guidelines on AP Road Maintenance are Developed

2-1: Review the current AP road maintenance works of OR and OVD and analyze their problems in the Project sites: **Completed** in June 2016.

Ver. 1)

1) This activity has been carried out partially by interviewing the concerned officials, and the actual observation on the ground will be done by mid- August. The progress of this activity is slightly delayed due to the delay of the DRC side response for the questionnaires. The answers for the questionnaires will be submitted to JICA expert team shortly.
2) The major findings at this stage are as follows; 1. Most of the officials explained that lack of budget is a critical obstacle to prevent them from doing their maintenance work properly and regularly. 2.The inspection is carried out visually, 3. Data base has not been updated, and so forth.

		Findings
Budget	Road Inspection	-Young officials have insufficient knowledge on the road inspection
		-Detailed assessment of the road damage is insufficient
		-Daily and periodic inspections have not been conducted
		-Evaluation criteria is based on the subjective data
		-Inspection has been conducted only the area that the damage is severe. Minor damage (cracks, etc.) is not recorded (Repar works are done only when the roads get bad)
	Maintenance Plan	-Database has not been updated
	Budget Allocation	-Insufficient budget
Budget Execution	Budget Execution	-Allocated badget amount is significantly reduced from the requested amount and thus maintenance works have been relatively limited
		-Budget allocation takes time and damage gets worse. Consequently, it makes the situation worse
	Work/Construction Preparation	-Insufficient construction management technology
	Repair works	-Lessons for the pavement repair works have not been organized but the offcials learn at the OJT. However, OJT is not conducted in a regular basis

Ver. 2)

This activity has been carried out (**completed**) based on the result of the interview, site observation and observation of the road maintenance as well as road repair sites.

2-2 Collect and review the existing AP road maintenance manuals and technical guidelines: **Completed** in July 2016.

Ver. 1)

These activities have been conducted partially, and these will be continued till the end of July 2016.

Ver. 2)

These activities have been **completed**. The Project team has collected and reviewed the existing manual.

2-3 Establish the Joint WG for developing technical guidelines on AP road maintenance (WG 1): **Completed** in August 2016.

Ver. 1)

The WG will be established around mid-July 2016. Currently it is in a process of identifying the appropriate members for the WG.

Ver. 2)

The WG (WG 1) has been established. The members consist of the following officials;

	Name	Position	Institute
1	M. Jean-Pierre MUTAMBA NENE	Chief of Road Section	Infrastructure Unit
2	M. Balayi KADIMA	Coordinator	OR
3	M. Sangana MALONDA	Director of Training	OR
4	M. Joshua MUTIA	Head of Research Dept. / Laboratory	OR
5	M. Pierre WANET MUTUMOSI	Chief of Brigade 901 / Kinshasa	OR
6	M. Richard MATANDA MWAMB	Logistic Director	OVD
7	M. Leon MUTOMBO	Chief of Section of Monitoring and Evaluation	OVD
8	M. Timothée SUMAHILI	Technical Director / Provincial Direction of Kinshasa (PDK)	OVD
9	M. Pela WASAMA C.	Studies & Analysis	OVD
10	M. Jimmy NKULA	Studies & Analysis	OVD
11	M. Zico NSIALA MPUNGI	Studies & Analysis	OVD
12	M. Pascal BULONGO	Provincial Director	FONER
13	M. Patou MWA ILUNGA	Chief of Division	BTC
14	M. Willy MONDA TONA	Chief of Division	BTC
15	M. Fils ZENGA MBALA	Chief of Service	BTC
16	M. Michel DINGANGA	Chief of Road Section	ACGT

*BTC=Bureau des traveaux et construction

2-4 Develop and draft technical guidelines on AP road maintenance: **Completed** in April 2017.

Ver. 1)

At this stage, series of observation and information gathering have been taken place in order to start drafting the guidelines, and the guideline contents have been gradually set.

Ver. 2)

Starting from late August 2016, the WAG 1 members gather regularly (every Thursday) in order to handle these activities.

Ver. 3)

1) As reported in the 3rd Monitoring Summary, the WG1 members did final review of the draft technical guidelines, and the technical inputs by the Japanese Experts have been incorporated into the guidelines by the end of April 2017 (**completed**).
2) The WG 1 members reported the progress, and the draft guidelines were distributed in the 3rd JCC.
3) The completion timeframe of this particular activity is described in the "Objectively Verifiable Indicators" of Monitoring Sheet I; "2-1 Technical guidelines on AP road maintenance are drafted by April 2017". Thus this has been achieved within the given timeframe.

2-5 Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group (TAG) meetings etc. and revise the drafted technical guidelines: **Completed** in October 2018.

Ver. 1)

-

Ver. 2)

1) Kick off meeting was held on 24 August 2016. The draft version of the technical guidelines has been distributed during the course of the said meeting. The table of contents is shown below;

Chapter 1: Overview
Chapter 2: Work implementation structure
Chapter 3: Work planning and implementation
Chapter 4: Schedule of work implementation and road safety measures
Chapter 5: Diurnal and nocturnal visual patrol
Chapter 6: Maintenance and reparation plan
Chapter 7: Maintenance method
Chapter 8: Reconditioning method
Chapter 9: Quality control
Chapter 10: Database

2) So far, the WG meetings have been held seven times having proactive participation from majority of the members, and continue working on the draft technical guidelines. Specifically, the members have been sharing respective working experiences as well as views on the road maintenance to contribute to the discussions. Currently the draft technical guidelines are half a way. Expected timeframe for the completion of draft version will be January to February 2016;

Ver. 3)

This activity was once commenced in November 2016, however, the Project recognized the necessity to organize TAG meetings for several times, and proposed modification of the plan of this activity (Refer to the Monitoring Sheet II). The draft version of the said guidelines will be reviewed and revised based on the shared views and technical inputs by the TAG, as well as the results of the trial application on the ground to observe whether the guidelines are suitable and practical in the actual situation. The re-planned process is shown below;

Step 1: Development of the draft technical guidelines
↓
Step 2: Discussion with the TAG

↓

Step 3: Revision of the draft technical guidelines based on the given technical inputs

↓

Step 4: Trial application on site

↓

Step 5: Necessary revision based on the situation on the ground

↓

Repeat Step 2 – Step 5

The below list indicates the members of the TAG;

Title	Organization
Professors (2 people)	Polytechnic Faculty, University of Kinshasa
Head of Operation	Polytechnic Faculty, University of Kinshasa
Professors (2 people)	National Institute of Building and Public Works
Assistant	National Institute of Building and Public Works

Ver. 4)

1) Comments on "the contents of the draft technical guidelines" were collected starting from June 2017 and continued till July 2017 with English translation. Accordingly the countermeasures have been discussed among the WG1 members. Then discussion with the Technical Advisory Group (TAG) was organized on 22 September 2017 followed by 19 October 2017 and 3 November 2017. This exercise will be continued for a couple of times thereafter. The TAG members are listed below;

Title	Organization
Professors (2 people)	Polytechnic Faculty, University of Kinshasa
Head of Operation	Polytechnic Faculty, University of Kinshasa
Professors (2 people)	National Institute of Building and Public Works
Assistant	National Institute of Building and Public Works

2) The 1st TAG meeting: the countermeasures (revision) for the comments from the TAG and the other concerned parties (The 3rd JCC invitees) on the 1st - 5th Chapters of the technical guidelines were presented by the WG1 members. The TAG and the WG1 members had detailed discussions in order to revise the draft technical guidelines.

3) The 2nd TAG meeting: In view of the 1st TAG meeting discussion, draft version of the 1st, 2nd, 3rd, 4th and 5th Chapters of the technical guidelines has been finalized. The rest of the draft Chapters (6th – 11th) has been distributed to the TAG members.

4) The 3rd TAG meeting: Prior to the 3rd meeting, the comments from the TAG members on the rest of the Chapters of the technical guidelines were shared with the WG1. During the course of the 3rd meeting, the countermeasures (revision) have been taken and they had further discussion on those. Accordingly, the draft technical guidelines from the 6th till 11th Chapters have been completed.

Ver.5)

This activity has been implemented mainly at the TAG meetings.

The member of the TAG has been slightly changed. To be specific, one of the professors of UK has

been withdrawn while another assistant of NIBPW has been added as shown below;

Name	Title	Organization
M. Paul TSHIULA	Professor	Polytechnic Faculty, University of Kinshasa (UK)
M. Patrick NDOLO	Head of Operation	
M. Evariste PHANZU	Professor	Polytechnic Faculty, National Institute of Building and Public Works (NIBPW)
M. Pierre MUZYUMBA	Professor	
M. Michel MISEKA	Assistant	
M. Papy KABADI	Assistant	

The last TAG meeting was held in January 2018, which should have been in March 2018. The TAG comments on the draft technical guidelines were not submitted to the WG 1 early enough, which prevented the WG 1 to discuss and revise the guidelines as planned.

Since the above mentioned professors have their own business at the respective university/institute, the Project related work tends to be pended. Sensitization and raising their motivation are necessary to maintain timely work.

Ver. 6)

1) Technical Guidelines (TGs) presentation and discussions were held several times at the WG 1 prior to finalization.
2) Considering the aforementioned discussion points, the workshop was organized on the 18th October 2018, which has led the said activity **complete**.

2-6 Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection: **Completed** in November 2018.

Ver. 1) ～Ver. 2)

-

Ver. 3)

This activity was initially planned to commence in December 2016. However, given the progress of the draft technical guidelines, also the delay of the procurement procedure, the Project proposed modification of the activity schedule.

Ver. 4)

This activity is underway. Evaluation of the procedure as well as outcomes of AP road inspection will be implemented sometime in February or March 2018.

Ver. 5)

1) AP road inspection using the inspection vehicle was arranged in December 2017 and January 2018.
2) Prior to the commencement of the inspection, “Order de mission” is required for smooth operation of the activity. However, the issuance of it was delayed. For this, the Project was only able to conduct the inspection for a few days.
3) The data obtained through the inspection using the vehicle was not appropriate on the ground of the followings:

- When operating the measurement equipment, there is no consistency between the position of the photos and the distance: and
- During the inspection, test mode was used for obtaining the data instead of measurement mode.

4) Vehicle for the inspection has been finally delivered in April 2018. It was handed over to Infrastructure Unit on the 10th April 2018.

5) The recent inspections were conducted in December 2017 and January 2018. However, some of the inspection data came out inaccurate. One of the reasons behind of this should be low level of PC skill, which requires some improvements.

6) Re-training on the calibration, data processing, interpretation of road surface condition, etc., will be conducted in June 2018.

Ver. 6)

1) Through this activity, AP road maintenance plan, budget plan, as well as finalization of TGs have been realized.

2) This is a continuous exercise which should be initiated by the Congolese side even after the Project completion.

2-7 Develop a database for accumulating the AP road inspection results: **Completed** in September 2018.

Ver. 1)

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Ver. 2)

1) This activity has been gradually taken up. It has started from interviewing with OR regarding their database which is under way. And also OVD has been interviewed. Recommended equipment for inspection/database was introduced and demonstration was organized during the WG meeting. Once those are approved by the 2nd JCC, the equipment will be purchased sometime in 2017 (expecting to be by April 2017).

Ver. 3)

1) In order to “develop a database for accumulating the AP road inspection results”, the equipment (a camera to measure the road surface) was purchased and shipped to the DRC. A vehicle, which will be granted by JICA, to carry the said equipment is still under tax exemption procedure. Meanwhile, the existing vehicle has been temporary used to conduct trainings as well as inspection. The granted vehicle is expected to be in use around mid-July 2017. The fuel will be covered by the Congolese side, and the maintenance will be handled by the same.

2) The Project proposed the modification of the activity plan due to the fact that the arrival of the equipment and the progress of the draft technical guidelines had been delayed

Ver. 4)

1) As to conduct the trainings and inspection, the Project faced challenges with unavailability of the temporary vehicle. Moreover, due to the security reason, it is required to be escorted by the police when conducting inspection, the arrangements with the police is another concern, which is not always easy.

2) Database entry training has been provided, yet the data to process is lacking. Inspection and interpretation of data need to be improved. Currently the Expert is developing data input/analysis application of excel macro to follow up with these issues.

Ver.5)

1) The Project received inspection equipment on the 23rd April, 2017.
2) Physical/technical constraints as well as security situation prevented it from implementing this activity as planned. For instance,①when the Project was borrowing a vehicle from Infrastructure, the procedure took much time, ②for the last one year, it was required to have a police officer on board for the inspection, it again took some time to arrange, specifically due to the cost involvement, ③data obtained from the inspection was found inaccurate.
3) It is pointed out that at least accuracy on data input/interpretation need to be enhanced for better implementation of the project.

Ver. 6)

1) OR took a lead to complete the database development which was done by July 2018.
2) OVD required more time than OR due to insufficient attendance for the required work. Yet they have also completed this exercise at later stage. Some of the reasons behind of the delay were explained as follows; time constraints (while OVD has more to cover within Kinshasa, given time was the same for both OR and OVD), availability of the inspection vehicle, prohibition of weekend work (during less traffic congestion period), weather condition, etc.
3) "Objectively Verifiable Indicators" of Monitoring Sheet I; "2-2. Database of AP road inspection is developed by July 2018" has not been achieved with 2 months delay.
4) Development of database for accumulating the AP road inspection results was finally completed on the 29th September 2018.
5) The above database was presented at the workshops (WG2 meetings) organized on the 2nd, 3rd and the 5th October 2018, and discussion on this particular outcomes was done.

Database Development by C/Ps

2-8 Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works: **Completed** in September 2018.

Ver. 1) ～Ver. 2)

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Ver. 3)

1) Concerning the said activity, the WG 2 is planning to discuss this matter in line with the training

starting from late May 2017. “The evaluation” of the procedure and outcomes of these works will be followed in due course.

2) The Project proposed modification of the activity schedule considering the progress of the draft technical guidelines.

Ver. 4)

1) With regard to the AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines”, those works have been undertaken through OJT referring to the said guidelines. The training/OJT participants were listed below.

Participants List for Training on AP Road Inspection

#	Name	Institution
1	Christ NSIMBULU MASAMBA	OVD
2	Pierre WANET MUTUMOSI	OR
3	Jonathan MAYAMBA	OR
4	Albert MUINDILE MUTSHIPAYI	OR
5	Guylain LUZOLO TUKITALO	OVD
6	Victor KALONDA KAKALONDA	OVD
7	Chiristophe TSHIDIBI TSIMBOMBO	LABO
8	Eric DIOMBA PAMBU	LABO
9	Michel DINGANGA	ACGT
10	Pascal BULONGO PYANA	FONER
11	Dominique NZUZI MASSAMBA	BTC
12	Timothe SUMALI	OVD
13	FIMPADIO MAMPUYA	OVD
14	AGIGBA ZONO	OVD
15	EWMBE NANDO	OVD
16	IMBOTO MABILA	OVD
17	MVUEZOLO TOLOMBA	OVD
18	MUKUDI KAZADI	OR
19	MURHULA GWA KASHEMWA	OR
20	MAKANDA TRIKASE	OR
21	BUKASA MUKENDI	OR
22	MOIKA NGBOLIKO	OR
23	NKENDA MATONDO	OR
24	Patrick MBILA ESONG	BTC
25	Corneille MADIMBA MADIMBA	BTC
26	ESRHER MATUTALA	LABO

Participants List for Training on APm Repair Works

#	Name	Institution
1	Rose BUKAWU KALUBI (Female)	OVD
2	Hélène SEKO MFUNDU (F)	OR
3	Déogratias NTAMBI KALULO	OR
4	Kady OLEKONYA KADIMA	OR
5	BWABWA MUKENDI	OR
6	LOMBOMBE NSUNDJU (F)	OR
7	Zacharie LANDAMO MADIATA	OR
8	Olivier MITSHABU KADIMA	OVD
9	Jean-Jacques KAWE LUMUMBA	OVD
10	NKUNGA MANSIANTIMA	OVD

#	Name	Institution
11	Didier FATAKI KASONGO	LABO
12	DAKWA BEMBA	OR
13	Géorges MAKANDA TRIKASE	OR
14	Kevin BABAKA LELO	ACGT
15	Andy MPUTU ISSANZA	OR
16	Olga BANZA NGOIE (F)	OR
17	Eddy BONGONGO SOZANE	OVD
18	KYUNGU NTAMBI	OR
19	Jean BAWILI KAZINGUVU	OR
20	LOSHA KAZADI	OVD
21	MBOMA MAKASI	BTC
22	Jorluquin SANGI NKANZA	OVD
23	KHONDE MAKAYA	OVD
24	Narra KIMVULA MUDIMUNANGA	OVD

Ver.5)

1) Upon completion of the planned activity on the above 2.6 and 2.7, the result of the implementation will be explained at the WG 1.

Ver. 6)

1) After completion of the above 2.6 and 2.7, evaluation results were explained at the WG 2 meetings (workshops) on the 2nd October 2018 for OR followed by the 3rd October 2018 for OVD.
2) The said workshops covered the following items in line with the technical guidelines; ①Road inspection, ②Database, and ③Procedure of the budget request.

2-9 Finalize the technical guidelines: **Completed** in September 2018.

Ver1) – Ver.4)

-

Ver. 5)

1) Current this activity is to be implemented in July 2018.

Ver. 6)

1) After series of WG 1 discussions, to be specific, as explained in the above Ver. 6), (2) Congolese side, I-I Progress of Inputs, after the 5th JCC, 29 meetings were held (as of 25 Oct. 2018) in order to finalize the technical guidelines. In fact, it was continued once the 1st edition of the technical guidelines was submitted to Infrastructure Unit on the 28th September 2018 for further improvements.
2) Then, at the 6th JCC held on the 8th November 2018, the 1st edition of the technical guidelines was approved by the MIPWR Minister.
3) "Objectively Verifiable Indicators" of Monitoring Sheet I; "2-3. Technical guidelines on AP road maintenance are finalized by October 2018", has been achieved.

2-10 Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations: **Completed** in October 2018.

Ver.1) – Ver.4)

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Ver.5)

Currently, this activity is to be implemented in September 2018.

Ver. 6)

1) Once finalized and submitted to Infrastructure Unit (as mentioned above 2-9, on the 28th Sep., 2018), technical guidelines were presented at the workshop on the 18th October 2018.
2) Prior to that, the said guidelines, including the inspection results, were explained to OVD on the 2nd October 2018, while the same were done so to OR on the 3rd October 2018.

2-11 Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPWR: **Completed** in November 2018.

Ver1) – Ver.4)

-

Ver.5)

Currently, this activity is to be implemented in October 2018.

Ver.6)

1) Through the final JCC, technical guidelines were officially approved by the MIPWR.
2) The said activity is described in the "Objectively Verifiable Indicators" of Monitoring Sheet I; "2-4. Formalities for official approval of the finalized technical guidelines on AP road maintenance are submitted" have been achieved.

(3) Activities for OP3: AP Road Maintenance Skills and Knowledge of OR's and OVD's Technical Staffs are Improved in the Project Sites

3-1: Training Plan for AP Road Inspection and APm Repair Works

3-1-1 Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works: **Completed** in October 2016.

Ver. 1)

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Ver. 2)

1) The members of the said WG (WG 2) have been selected, and the kick off meeting was organized 9 November 2016 (completed). The WG 2 was joined by the Chief of Road Section of Infrastructure Unit and Logistic Director of OVD.

   The below list shows the selected members of the WG 2;

	Name	Position	Institute
1	M. Jean-Pierre MUTAMBA NENE	Chief of Road Section	Infrastructure Unit
2	M. Balayi KADIMA	Coordinator	OR
3	M. Sangana MALONDA	Director of Training	OR
4	M. Jean Paul MAVUNGU SOKANA	Database Chief	OR / HQ
5	M. Pierre WANET MUTUMOSI	Chief of Brigade 901 / Kinshasa	OR
6	M. Jonathan MAYAMBA UMBI	Site Chief	DPK Brigade
7	M. Albert MUINDILE MUTSHIPAYI	Site Chief	DPK Brigade
8	M. Guylain LUZOLO TUKITALO	Site Chief	DPK Brigade
9	M. Victor KALONDA Ka KALONDA	Site Chief	DPK Brigade
10	M. Richard MATANDA MWAMB	Logistic Director	OVD
11	M. Leon MUTOMBO	Evaluation Chief of Service	OVD
12	M. Lobo LOBO MPUMFA	Study and Project Section	OVD / HQ
13	M. Christ NSIMBULU MASAMBA	Road Section	OVD / HQ
14	M. Timothée SUMAHILI	Technical Director / DPK	OVD
15	M. Dominique NZUZI MASSAMBA	Chief of Service	BTC
16	M. Willy MONDA TONA	Chief of Division	BTC
17	M. Pascal BULONGO	Provincial Director	FONER
18	M. Joseph MASISA	Chief of Monitoring, Works, and Equipment Section	FONER
19	M. Mao NTUMBA MULUME	Chief of Service	ACGT
20	M. Michel DINGANGA	Chief of Road Section	ACGT

2) The members will be meeting once a week, every Wednesday. During the course of the next WG 2 meeting, some of the representatives from WG 1 will be performing TOT to share their knowledge and understandings of the concept of maintenance, etc. to the WG 1 members. Then, the following week, baseline survey will be conducted.

3-1-2 Plan the trainings on AP road inspection and APm repair works: **Completed** in April 2017.

Ver. 1)

-

Ver. 2)

1) This activity is under preparation. It will be completed in January 2017. Trainings on the road inspection and repair works are scheduled to be organized three times respectively.

   The below shows the sample training programs;

Sample Training Program for the AP Road Inspection

Day	Type of training	am (10:00-12:00)	pm (14:00-16:00)	Venue
1	Lecture	Introduction (baseline survey included)	Group discussion on the condition of the road maintenance, issues, etc.)	Training room at OR laboratory
2		Overview of the road maintenance		
3		Road inspection method		
4		Recording and evaluation of the road inspection results		
5		Summary of lecture		
6	Hands-on training at the site	Implementation of general visual inspection	Recording and evaluation of the road inspection results	Training target road (site) / Training room at OR laboratory
7		Implementation of visual inspection by the forward image acquisition		
8		Implementation of the detailed visual inspection (cracks, quantity measurement of the ruts, etc.)		
9		Implementation of the detailed inspection (quantity measurement of the deflection, etc.)		
10		End line survey / Development of the action plan	Presentation of the action plan / Assessment	Training room at OR laboratory

Sample Training Program for the APm repair works

Day	Type of training	am (10:00-12:00)	pm (14:00-16:00)	Venue
1	Lecture	Introduction (baseline survey included)	Group discussion on the condition of the road maintenance, repair method, issues, etc.)	Training room at OR laboratory
2		Overview of the road maintenance		
3		AP road damage and cause, maintenance, repair method		
4		Quality management, safety management measures, construction record		
5		Summary of lecture, group discussion		
6	Hands-on training at the site	Safety management measures		Training target road (site) / Training room at OR laboratory
7		APm material	Quality management	
8		APm repair works	Quality management	
9		APm repair works	Construction record	
10		End line survey / Development of the action plan	Presentation of the action plan / Assessment	Training room at OR laboratory

2) The WG will determine the actual contents of the training programs and other necessary issues having in-depth dialogues as they organize the weekly meetings.

Ver. 3)

1) The plan of the trainings on AP road inspection and APm repair works" had been **completed** by the end of April 2017, which was the revised target time frame (as reported in the 3rd Monitoring Summary).

2) The completion timeframe of this activity is described in the "Objectively Verifiable Indicators" of Monitoring Sheet I; "3-1: Training Plan is developed by April 2017". Thus this activity has been completed within a given timeframe.

3) After the 2nd JCC, the Project reviewed it in a view of required time for induction to the WG members, etc. In between the 2nd and the 3rd JCC, the Project considered modification of the target timeframe as follows; "Training plan is developed by April 2017".

The developed plan is shown below;

Training Plan for AP Road Maintenance

N°	Trainer (Japanese Expert)	Subject of the Practical Training	Training Content (module)
			Training on Inspection
1	Mr. Sakai	Inspection	**1) Purpose and role of surface inspection**
			2) Types of surface inspection
			3) Inspection Equipement (OJT)
			Training on Database
2	Mr. Sakai	Database	**1) Purpose of creating Database**
			2) Shewhart Cycle (PDCA)
			3) Inspection Equipement : OJT(analyse)
			4) Operating Database (Road Maintenance Plan)
			Training on Evaluation (classification and Damage Causes)
3	Mr. Takahashi	Training on Evaluation (Classification and Damage Causes)	**1) Structure and Function of Asphalt Surrface**
			2) Purpose of Surface Evaluation
			3) Overview of Surface Damage and its Causes
			§ Types Surfaace Damage
			§ Surface Degradation and Deterioration Mechanism
			4) Analysis for Deterioration Causes (non-destructive Analysis, Open Excavation Analysis)
			Training on Repair (Method of Work, Quality Control)
4	Mr. Shishido	Repair (Method of Work, Quality Control)	**1) Purpose of the Pavement Repair**
			§ Potholes
			§ Cracks
			§ Treatment of Surface
			§ Partial Reconstruction
			Overlay (after cutting)
			2) Purpose of Quality Control
			§ Test required for the specified mixture formula
			§ Tests required until delivery of hydrocarbon asphalt mix
			§ Daily tests of the asphalt mixing plant
			§ Tests required at the construction site
			Training on Quality Control (Works Plan, Safety Measures)
5	Mr. Mukai	Quality Control (Works Plan, Safety Measures)	**1) Work Plan**
			§ Method of Repair Works
			Patching, crack sealing, surface treatment, partial reconstruction, overlay (after cutting)
			2) Safety Measure
			§ Safety Measures Principles
			§ Shewhart Cycle (PDCA) Safety
			§ Prevention of dangers
			§ Traffic Control

4) Target officials for this particular training are almost confirmed. Considering the time that the Japanese Experts are absent, Congolese trainers need to be trained. This training of trainers (ToT) is aiming to be introduced. The training has been gradually commenced since March 2017. Feasibility to conduct ToT will be observed while conducting training. Once the Project confirms the feasibility, the trainers are to be selected from the WG 2 members and/or from the trainees.

Ver.4)

3) The Project considered introducing ToT. The trainers of Congolese side have been nominated by the C/Ps. However, the results of the baseline survey were moreover similar scores for both the trainers and the trainees, even at some points, the scores of the trainees were higher than those of the trainers. Given the fact that the Congolese expected trainers' huge challenges, the Project has re-considered the ToT scheme to be suspended, at least for the time being.

3-1-3 Select candidate sites for the trainings on AP road inspection and APm repair works: **Completed** in June 2018.

Ver. 1)

-

Ver. 2)

1) As shown below, the OJT candidate site on the OVD road (red-marked part) has been confirmed while that of OR road (green-marked part) has been slightly pending due to the BTC maintenance budget related matter. Once the WG activity has been commenced, this issue will be solved in due course.

Ver. 3)

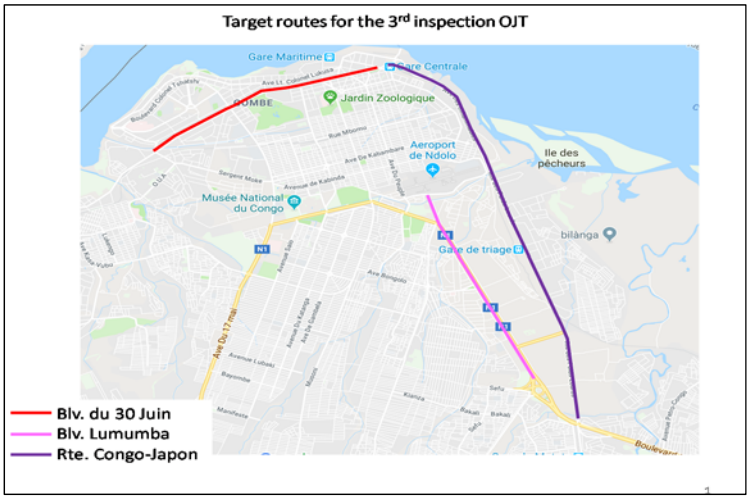
1) National Route (NR) 1 has been identified as a training site for OR.

Ver. 4)

1) Different candidate sites for the remaining trainings may be identified so as to make the trainings more meaningful.

Ver.5)

1) Candidate sites for the OJT in 2018 have been selected after discussing with the C/Ps as follows; ①Blv.du 30 juin, ②Blv.Lumumba and ③Rte.Congo-Japon.



Ver. 6)

1) The selected sites for the OJT were explained to OR/OVD/FONER on the 6th June 2018, which was right after the 5th JCC. However, on the 26th July 2018, re-selection was done due to the budget constraint of the Congolese side, with that, this activity has been **completed**.

2) The reason behind of selecting the above OJT sites was the degree of damage (more severe than the other sites), which was found through the road inspection database.

3) Since the selected OJT sites have high traffic volume, it required special attention to the safety as well as to conduct OJT in an efficient manner to avoid worsening the traffic congestion, the number of the trainees was limited to 7 participants per day as maximum.

3-2: Trainings on AP Road Inspection:

3-2-1 Conduct baseline survey on the training participants' skills and knowledge of AP road inspection: **Completed** in June 2018.

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) The baseline survey for the main C/Ps was organized in December 2016. Out of 37 questions, only 2 questions marked 100% as correct answers. The average rate of correct answer was 49.8%, and the worst rate was 0% followed by 6 %. The most difficult question was the following; "How many percent is the crack rate? (1 mesh =0.5 m x 0.5 m, target range of the survey: 5m x 3m)"

2) The Project proposed modification of the second and the third round of the baseline surveys in accordance with the progress of the other related activities, specifically development of the draft technical guidelines. The second round of the said survey is planning to be organized February 2018.

Ver. 4)

1) The initial baseline survey on the training participants' skills and knowledge of AP road inspection was conducted on the 14 June 2017. The said survey will be arranged 2 more times.

2) Out of 30 questions, only 2 questions were marked 100% as correct answers for the initial baseline survey. The average rate of correct answers was 45.9%, and the worst rate was 8% followed by 13 %.

Ver. 5)

1) Recently, the baseline surveys were conducted in February and May 2018 (Ref. to 3.2.4).
2) The final baseline survey will be done in June 2018.

Ver. 6)

1) The final baseline survey was conducted on the 8th June 2018.

2) 19 officials (OR:8, OVD:6, FONER:2, BTC:3,) took the baseline survey, and the correct answer marked 65% in average. (ref. to 3.2.4).

3-2-2 Conduct lectures on AP road inspection: **Completed** in June 2018.

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) This activity is to be implemented in between April and June 2017 for the initial stage based on the modified schedule. The first lecture has been conducted since mid-April 2017.

Ver. 4)

1) Lectures on AP road inspection" have been organized 3 times so far focusing on the inspection by using the equipment as explained below:

   ① The equipment was first used for the Project: May 2017

   ② Confirmation of the actual situation on the ground followed by the brush up training: August 2017

   ④ The 2nd round of brush up training: October 2017

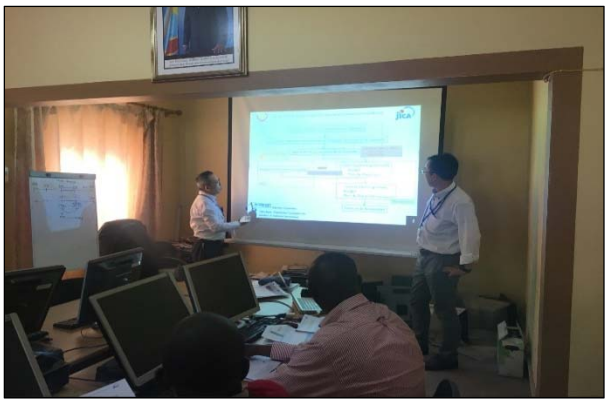
   The above ③was conducted due to the fact that the trainings on how to use the equipment and crack interpretation have not been well acquired by the majority of the trainees.

Ver. 5)

1) The last session of the lectures was held in February 2018.
2) Remaining lectures will be organized in June 2018.

Ver. 6)

1) The final lectures on AP road inspection were conducted from 12th June 2018 for 3 days, and in accordance with those lectures, OJTs have been arranged.
2) The said activity is described in the "Objectively Verifiable Indicators" of Monitoring Sheet I; "3-2. 3 times of lectures on AP road inspection are conducted", and this has been achieved.



Lecture by JICA Expert

3-2-3 Conduct OJTs on AP road inspection at the selected sites in the project sites: **Completed** in June 2016.

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) This activity will be conducted from June to July 2017.

Ver. 4)

1) Initial OJTs on AP road inspection at the selected sites in the project sites" have been conducted on NR 1/NR 43 for OR and Poids-Lourds/30 Juin for OVD. However, given the situation addressed above 3-2-2, it requires inspection and crack interpretation trainings to be redone. The 2nd and the 3rd OJTs will be organized sometime during the 1st and the 2nd Quarters of 2018.
2) The training received participants not only from the WG 2 members but others from OR, OVD, BTC, LABO, ACGT and FONER, which make up to 73 participants.

Ver. 5)

1) Recent OJT was conducted in February 2018.
2) Following OJT is going to be arranged in June 2018.

Ver. 6)

1) The final OJTs were implemented from the 12th to the 14th June 2018.
2) The details of the OJTs are explained below;

Date	OJT site	Contents	No. of Participants				
			OR	OVD	FONER	BTC	Total
12June	Rte.Congo - Japon	Visual survey on the pavement condition (damage caused by the pothole/roadbed)	4	3	1	1	9
13 June	Blv.du 30 juin	Visual survey on the pavement condition (mainly contraction crack) and flatness measurements	3	2	1	1	7
14 June	Blv.Lumumba	Visual survey on the pavement condition (mainly pothole/hexagonal pattern crack) and flatness measurements	4	2	1	2	9

3) The said activity is described in the "Objectively Verifiable Indicators" of Monitoring Sheet I; "3-3. 3 times of OJTs on AP road inspection are conduced" has been achieved.

OJT at Rte. Congo - Japon

OJT at Blv. Lumumba

3-2-4 Conduct endline survey on the training participants' skills and knowledge of AP road inspection: **Completed** in June 2018.

Ver. 1) ~ Ver. 2)

-

Ver. 3)

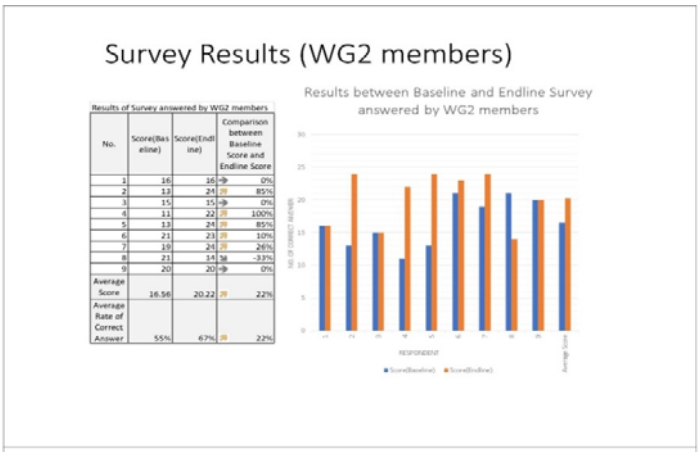
1) This activity will be organized in early August 2017.

Ver. 4)

1) The initial endline survey on the training participants' skills and knowledge of AP road inspection" will be organized in between January and February 2018. The 2nd and the 3rd end line surveys will be implemented as scheduled (March 2018 and June 2018 respectively).

Ver. 5)

1) The recent endline survey was organized in February 2018 as the initial one.
2) The Expert tried to organize the initial endline survey as planned. However, the Project faced a challenge due to the time constraint. Thus the 2nd baseline survey is considered as the initial endline survey as well.
3) The comparison of the results of the baseline and endline surveys is shown below;



- Among 9 surveyees of the WG 2 members, more than a half showed improvement and the remarkable score increase was 100% (1 person) followed by 85% (2 persons). On the other hand, 2 of them had exactly the same score while one marked less score. The average rate of correct answer was 22 %.
- Likewise, as for 24 trainees, more than a half obtained higher scores than the baseline survey. The highest increase recorded as 183 % followed by 117%. However, the average rate of correct answer was 27 %.
- One of the reasons of the survey results, which were found relatively differ from one parson to another, was due to the different organizations that the surveyees belong to, which means they have different expertise area and background; OR, OVD, BTC, FONER, Laboratory, and ACGT.

4) It is indicated that "3-4. A percentage of correct answers of the endline survey on AP road inspection is increased by 60.0 % compared to that of the baseline survey" in "Objectively Verifiable Indicators" of Monitoring Sheet I.

   It might be possible for some of the surveyees to mark the increase as above (60% increase) for the final endline survey, however, considering the past experiences as described above 3), surveyees as a whole to mark as such could be challenging.

   Nonetheless, the important aspect is to lead them better understandings on the contents of the lectures/OJTs, and enhance their capacity to apply those at their respective work places continuously.

1) The final endline survey is going to be implemented in June 2018.

Ver. 6)

1) The final endline survey was conducted on the 15th June 2018, which marked this activity **completed**.

2) The below shows respective (3 times) results (correct answers and increase) of the baseline and endline surveys.

	Baseline Survey (%)	Endline Survey (%)	Increase (%)
1	48	61	27.1
2	55	61	10.2
3	65	76	16.9
Average	56	66	17.9

3) In case of the final surveys, there were 2 participants whose score decreased while 1 participant's result marked more than 70% increase (from 53 to 89).

4) Likewise, amongst 19 questions in total, 15 questions marked score up, and out of those, the scores of 6 questions increased more than 60%.

5) However, "Objectively Verifiable Indicators" of Monitoring Sheet I; "3-4. A percentage of correct answer of the endline survey on AP road inspection is increased by 60.0% compared to that of the baseline survey" has not been achieved.

6) It might have been the case that the baseline survey results came out much better than initially expected. Thus from there, it was rather challenging to mark more than 60% increase on the correct answer. The JICA Experts confirmed that the C/Ps have relevant basic knowledge, which the results of the baseline survey show.

7) Questions regarding the design and database found low score. Concerning the former, once the road maintenance management system is in place, knowledge on the design should be enhanced. As for the latter, which is closely related to the road maintenance plan, it should be aimed that

the AP road maintenance plan development as well as preparation of budget request to be implemented in a systematic manner.

3-2-5 Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines: **Completed** in July 2018.

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) The said activity will be initially conducted from late July 2017 for 3.5 months.

Ver. 4)

1) AP road inspection through trial implementation of the drafted technical guidelines by the training participants" has been pending since the inspection data is lacking (Refer to 2-7, (2), 1-2 Progress of Activities).

Ver.5)

1) The latest action on this activity was taken in February 2018, and it resumed in May 2018.
2) If there is any discrepancy between the draft technical guidelines and the actual situation on the ground, it should be pointed out and reflected in the guidelines for the improvement.

Ver.6)

1) Discussion on the technical guidelines was made on the 26th July 2018 as the last of this activity.
2) "Objectively Verifiable Indicators" of Monitoring Sheet I; "3-5. 3 times of trial AP road inspection are conducted" has been achieved.
3) To be specific, in February, May and July 2018 were the time when this particular activity was implemented, and after the discussion, revision was made to improve the technical guidelines.

3-3: Training on APm Repair Works

3-3-1 Conduct baseline survey on the training participants' skills and knowledge of APm repair works: **Completed** in July 2018.

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) This activity was organized in November 2016 to start with. The next one will be held in February 2018.

Ver. 4)

1) The baseline survey on the training participants' skills and knowledge of APm repair works" was organized on the 11 September 2017 for the second time after the initial ones taken on the 17th/29th August 2017.

Ver.5)

1) The 2nd baseline survey was implemented in March 2018.
The below table shows the percentage of the correct answer from the 2nd baseline survey (segregated by the main subjects)

(%)

	Construction Supervision	Safety Management	Overall
OVD	30.36	24.29	26.98
OR	25.00	28.33	26.85
LABO	54.17	33.33	42.59
FONER	37.50	40.00	38.89
BTC	12.50	20.00	16.67

Ver. 6)

1) The final baseline survey was conducted on the 26th July2018.
2) Out of 54 who were nominated by the C/Ps, 20 (OR: 9, OVD: 8, FONER: 2, BTC: 1) actual attendees took the baseline survey.
3) The average percentage of the correct answer marked 38.3 (repair works related questions: 39.5, construction supervision related: 37.0, ref. to 3.3.4)

Baseline Survey

3-3-2 Conduct lectures on APm repair works: **Completed** in August 2018.

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) The lecture on APm repair works of the 1st session was conducted in May 2017.

Ver. 4)

1) Lectures on APm repair works" of the second session were organized from August 2017 till September 2017.

Ver.5)

1) The recent lectures were conducted in February/March 2018.
   One of the sessions was highlighted the following aspect; Important point of vehicle inspection, and covered “role of operator, “role of driver”, “operation at starting/ending point”, “test mode”, “check the route” and “communication”.
2) The final session will be arranged in July/August 2018.

Ver. 6)

1) The final lectures on the repair works and construction supervision were conducted in between July to August 2018.
2) 4 kinds of maintenance methods (crack-sealing, partial reconstruction of pavement, sealing, and overlay) were explained during the course of the said lectures.
3) The said activity is described in the “Objectively Verifiable Indicators” of Monitoring Sheet I; “3-6. 3 times of lectures on APm repair works are conducted” has been achieved.

Lecture by JICA Expert

3-3-3 Conduct OJTs on APm repair works at the selected sites in the project sites: **Completed** in August 2018.

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) The said activity is scheduled to be implemented from August 2017.

Ver. 4)

1) The OJTs on APm repair works at the selected sites in the project sites” were implemented in August, September and November 2017 for the initial stage. After 3-day OJTs held on 8-10 November, the review meeting was set on 14 November 2017.
2) During the course of the OJTs, some LABO works were arranged. For instance, experiments on the relation between the density/temperature of the asphalt were implemented on 10 November 2017 for the purpose of the asphalt temperature control.

Ver.5)

1) The 2nd OJT was conducted in between February to March 2018.
   One of the main themes of the said OJT was “crack sealing”.
2) The final OJT will be organized in between July to September 2018.

Ver. 6)

1) The final OJTs were organized in between 7th to 10th August 2018.
2) In accordance with the contents of the lectures described above 3-3-2, OJTs were arranged and implemented as follows;

Date	OJT site	Target Maintenance Method
7 August	Blv.du 30 juin	Crack-sealing
8-9 August	Blv.Lumumba	Partial reconstruction of pavement
10 August	Rte.Congo - Japon	Sealing

3) The said activity is described in the “Objectively Verifiable Indicators” of Monitoring Sheet I; “3-7. 3 times of OJTs on APm repair works are conducted” has been achieved.

Crack-sealing method

Partial reconstruction of pavement method

Sealing method

3-3-4 Conduct endline survey on the training participants' skills and knowledge of APm repair works: **Completed** in August 2018.

Ver. 1) ~ Ver. 2)

-

Ver. 3)

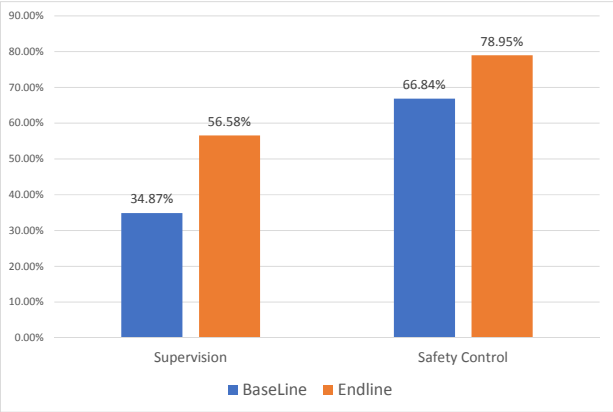
1) The initial end line survey on the training participants’ skills and knowledge of APm repair works” will be implemented in November 2017.

Ver. 4)

1) This activity will be implemented in mid-November 2017.

Ver.5)

1) The initial endline survey was conducted in December 2017.



Result Comparison between Baseline/Endline Surveys

Comparison of the results between the baseline survey and endline one, both supervision and safety control parts show improvements as indicated in the above graph.

As show below table, in case of the endline survey result, while respective organizations as well as the overall marked a certain increase of the points obtained from the baseline survey, the said increase was under 60.0%, which the "Objectively Verifiable Indicator" targets.

(%)

	Baseline Overall	Endline Overall	B/E increase
OVD	55.1	71.8	30.3
OR	51.5	76.2	47.9
LABO	49.3	77.0	56.1
FONER	77.0	91.0	18.1
BTC	63.0	74.5	18.2
Overall	59.1	78.1	32.1

Moreover, as often the case, the surveys tend to be differ from the baseline and endline surveys, it is, in fact, rather difficult to compare the results.

The Project targeted such increase to start with, in an actual situation, materialization of it was rather challenging.

However, considering the unfamiliarity of taking examinations (surveys) on the newly introduced issues, most of them marked increase, that should be recognized and evaluated.

1) Due to the material constraint (crack sealing material) during the course of OJT, the 2nd round of endline survey has been pending. It will be organized at the time of the 3rd endline survey in August 2018.

Ver. 6)

1) The final endline survey was conducted on the 3rd August 2018.
2) To be specific, it was the 3rd round for the Repair works team while the 2nd round one for the repair works as explained above Ver. 5).
3) The comparison of the percentage of the correct answers between the baseline survey and the endline survey is shown below.

		Baseline survey (%)	Endline survey (%)	Increase (%)
1	Construction Supervision	53	66	24.5
2	Repair works	41	62	51.2

		Baseline survey (%)	Endline survey (%)	Increase (%)
	Construction supervision	73	86	17.8
	Average	57	74	29.8
3	Repair works	40	69	**72.5**
	Construction supervision	37	67	**81.1**
	Average	39	68	**74.4**
Average	Total Average	50	69	38.0

4) Regarding the "Objectively Verifiable Indicators" of Monitoring Sheet I; "3-8. A percentage of correct answers of the endline survey on Apm repair works is increased by 60.0 % compared to that of the baseline survey", was achieved finally.
5) Similar to the above 3-2-4, main reason for not achieving the indicator at the 1st and 2nd time of the surveys was that the result of the baseline survey came out better than expected while the endline survey result remained slightly lower than expected. Yet in general, the endline survey results were not bad, either.
6) Technically, the target was not all the time fulfilled. In fact, the comparison of the percentage of the correct answer between the final baseline survey/endline survey marked 74.4 % increase in average, which was much higher than 60.0%. At the same time, a certain improvement was observed throughout the project period.
7) In particular, the C/Ps have the basic knowledge on the required subjects, the Project focuses on the fundamental aspect of the fact (improvement), and strengthen the C/Ps' capacity, at least, to assist maintaining their knowledge gained through the Project.

3-3-5 Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines: **Completed** in July 2018.

Ver. 1) ~ Ver. 2)

-

Ver. 3)

1) This activity is scheduled to be handled from late August till whole November 2017 for the first round of this activity. The evaluation of the procedure and outcomes for revising the guidelines will be done accordingly.

Ver. 4)

1) In line with the APm repair works through trial implementation of the drafted technical guidelines by the training participants", general review on the initial stage of the OJTs was done in September 2017. In view of the raised issues at the general review, the OJTs will be continued for the betterment of the current situation of the concerned officials.

Ver.5)

1) The last action of this activity was taken in February 2018.
2) The final stage of this activity will be in between July to September 2018. Similar case as above 3-2-5, if there is any discrepancy between the draft technical guidelines and the actual situation on the ground, it should be pointed out and reflected in the guidelines for the improvement.

Ver. 6)

1) The final action for this particular activity was taken in September 2018.
2) Obtained knowledge through the OJTs was incorporated into the technical guidelines.
3) OJTs, as practical work, enhanced the C/Ps' learning process in an effective manner.
4) The said activity is described in the "Objectively Verifiable Indicators" of Monitoring Sheet I; "3-9. 3 times of trial APm repair works are conducted" has been achieved.

1-3 Achievement of the Project Purpose and Outputs

1) Apart from the aforementioned narrative explanation on the "Progress of Activities", achievements are shown in the achievement columns of the Monitoring Sheet I and Monitoring Sheet II.
2) Despite having rather negative results of the endline surveys, in general, the participants of the lectures and OJTs are proactive to raise questions and comments. It was not always the same during the initial stage. This kind of behavioral change is, indeed, a significant sign of improvements, and it should be strengthened.
3) After introducing the assessment rank of the damage condition, importance of the preventative measures has been gradually understood, and slowly those have been put into a practice.
4) Under the Project, upon completion of the trainings, review and evaluation meetings have been organized since the year 2017. The main C/Ps and the other trainees are the ones to gather and discuss any of the findings and views at the said meetings.

Ver. 6)

5) While some remained un-achieved, majority of the Project targets including several modified ones have been fulfilled.
6) The Project has introduced some new approaches in order for the Congolese side to improve their AP road maintenance management. And it has brought transition to the Congolese side. During this transition stage, it requires more efforts for the Congolese side to build sound basis to put those into practice.
7) Joint efforts made by the Congolese side and JICA Experts, under the given circumstances (restrictions due to the security reason for JICA Experts, financial constraints as well as challenges to acquire/absorb new knowledge/skills for Congolese side), brought certain changes described above.
8) JICA Experts have tried to manage and implement the Project by being flexible, realistic and also by having prompt decision to modify the schedule/how to deal with the respective activities whenever necessary.
9) "Objectively Verifiable Indicators" of Project Purpose of Monitoring Sheet I; "1. More than 29.0% of the AP roads are inspected based on the AP road maintenance plan FY2018", has been achieved in accordance with the existing OR/OVD AP road maintenance plans. The target indicated in the said plans was 271.67 km. Joint efforts made by both OR/OVD, their inspection covered for 551.34 km.
10) "Objectively Verifiable Indicators" of Project Purpose of Monitoring Sheet I; "2. More than 60.0% of the people concerned consider the condition of AP road maintenance of OR and OVD has improved compared to that of before the commencement of the project", has been achieved having 61 % of the people concerned responded positively. For instance, acquired knowledge on assessment of AP road condition, acquired skills after introduction of the inspection equipment, etc. are the questions raised.
11) "Objectively Verifiable Indicators" of Project Purpose of Monitoring Sheet I; "3. More than 70.0% of the APm repair works plan is implemented based on the AP road maintenance plan

FY2018" has not been achieved as a whole.
OR: Approximately 21 % has been implemented against their plan. To be specific, out of the planned budget USD 3,299,905.96, USD 688,742 was executed for this particular purpose.
In general, allocated budget for road maintenance is relatively limited, the MIPWR's priority has been given to the roads within the city, which OVD is in charge.
OVD: Out of planned budget as USD 5,732,921.31, USD 5,439,851.65 was executed, which makes it 95 % of actual implementation. Thus as for OVD, the target was achieved.
Considering the average of OR and OVD, it remained 58 %, and turned out to be 12 % less than the target.
Financial constraint and the Ministry's priority are those that OR would not be able to control. Under such circumstances, respective road maintenance priority setting has been agreed upon (OR: 4 sections, OVD: 7 sections).

12) "Objectively Verifiable Indicators" of Project Purpose of Monitoring Sheet I; "4. More than 60.0% of the people concerned consider the condition of APm repair works of OR and OVD has improved compared to that of before the commencement of the project" has not been achieved. The result came out as 57 %, which slightly less than the target. Some of the questions raised are, environmental precautions at the construction site, ride comfortableness on AP road, and etc. The result is not too critical yet it should be well taken notes by the concerned parties for their work to be done in a better way.

1-4 Changes of Risks and Actions for Mitigation

1) After the 2nd monitoring, the similar concern remains on the Presidential election related matter. Depending on the situation in the country, specifically in Kinshasa, the Experts' assignments may be affected as previously experienced.

2) At the same time, rather minor yet disturbing movements have been frequently happening in Kinshasa. In fact, on the day that the 4th JCC was held, political demonstration was announced and it was assumed that organizing the 4th JCC might not be feasible. Fortunately, the said demonstration related matter did not affect the JCC; however, this kind of incidents may occur any time in this country. The Project needs to keep abreast of those issues.

3) In spite of some delays and modification of the plans including the issues in line with the aforementioned situation, the Project as a whole has been putting efforts to complete the entire planned activities. At this stage, the Project expects to accomplish all those, but if the security situation worsens in coming months, there may be necessity to amend respective Experts' assignments, and also to reschedule the timing of organizing the remaining JCCs.

Ver. 6)

4) Security issue remained a concern throughout the Project period. Political, security and financial unitability had imposed the Project challenges to implement the planned activities. However, the Project had tried to manage those and has completed the on-site assignments by mid-November 2018.

1-5 Progress of Actions undertaken by JICA

1) Necessary support and suggestions to the Project have been continuously provided.

Ver.6)

2) Even though the C/Ps gained skills, knowledge as well as confidence through the Project, the Congolese side condition is rather unstable. Under such circumstances, it would have been (be) better if the Phase 2 of the Project be considered, without any time lag, in order to secure

significant sustainability. Yet it is not the case for this Project, thus it would be very much appreciated if JICA DRC Office could follow up with the C/Ps from time to time, and provide them relevant opportunities to sustain their capacity in AP road maintenance.

1-6 Progress of Actions undertaken by the Gov. of the DRC

Even with a certain delay with consecutive reminder by the Project, the Gov. of the DRC side's responsive roles, including budget allocation, have been played gradually. The Project has been observing some improvements of the Congolese side actions.

Ver.5) and Ver. 6)

With the aforementioned achievements, the Project has been observing certain progress made by the Congolese side, however, the following actions are required by them in order to promote further progress;

1) It is expected that the Congolese side to secure budget for the fuels in order to conduct inspections by using the procured vehicle under the Project (shared between OR/OVD).
2) It is indispensable for the C/Ps to enhance capacity on PC skills and improve data accuracy for inspection. In this regard, continuous efforts should be put by the Congolese side on a daily basis.
3) As the Project targets both OR and OVD as one to achieve mutual goals, it is also expected for both parties to take advantage of respective strengths (e.g. while OR has rich experiences on the road maintenance, OVD is a younger organization and has more flexibility to absorb new issues, etc.) and complement each other on their weakness to overcome challenges having joint efforts.
4) The Project has established a sound platform to gather different organizations, seniors and juniors, males and females, and etc., concerning the AP road maintenance, it is again expected that the recommended "Road Maintenance Monitoring Committee" to be regularly as well as continuously organized to discuss issues, share challenges and consider measures to be taken, and improve the situation on the ground.
5) All those above issues are to be taken into consideration and put into practice so that PDCA cycle can be smoothly implemented.
6) In line with the above 4), the said Committee, is under preparation with C/Ps' initiative. The Minister of MIPWR is expected to be a Chair while Infrastructure Unit is to lead actual operation of the Committee. It is also expected to be realized soonest possible timing and play a proactive role to facilitate road maintenance exercise in a smooth manner. As such, key persons of the respective organizations (OR, OVD, FONER and BTC who attend major Project related meetings, etc.) should play a leading role.

1-7 Progress of Environmental and Social Considerations (if applicable)

Ver. 6)

1) These issues are not directly applicable to the Project. However, the contents of the technical guidelines include environmental issues, for instance, consideration of the roadside environment, specifically noise and vibration matters. It is expected that the Congolese side will respect such and put those into practice.
2) At the same time, the road maintenance itself is a significant source of environmental protection. The Project had supported such initiative of the Congolese side throughout the Project.

1-8 Progress of Considerations on Gender/Peace Building/Poverty Reduction (if applicable)

Ver. 6)

1) These issues are also not directly applicable to the Project, yet the roads are for the entire citizens, which certainly include men and women, children, economically vulnerable people and so on.

2) On the other hand, the Project had secured female participation as trainees. Their capacity should have been enhanced through the trainings/OJTs under the Project.

1-9 Other Remarkable/considerable Issues Related/affect to the Project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs, etc.)

1) The Project has met with the Organization for Equipment of Banana-Kinshasa (OEBK), which is responsible for Matadi Bridge in terms of maintenance. The Project has been utilizing the shared experiences of OEBK as a reference for its implementation.

2) As stated in "(3), 1-1 Progress Inputs, I Summary" and "(1-4), (1), Progress of Activities", collaboration between 2 JICA projects, namely Master Plan Project and this Project, have been strengthened, and such holistic approach is expected to contribute to the improvement of the Road Transport Sector of DRC as a whole.

2. Delay of Work Schedule and/or Problems (if any)

1) As explained in "1-4" above, there are some foreseeable risks due to the security reason. If the security situation worsens, the OJTs and the other activities on sites may be suspended, which would affect the progress of the Project.

Ver.5)

1) As explained above, while some marks a certain progress as well as completion, remaining ones have not been achieved as initially targeted or it can be foreseen rather negative results (un-achievement).

   In addition to the aforementioned matter, "Objectively Verifiable Indicators" of Project Purpose stipulated in the Monitoring Sheet I, the following indicators are to be checked in line with the existing AP road maintenance plan FY2018;

   1. More than 29.0 % of the AP roads are inspected based on the AP road maintenance plan FY2018
   3. More than 70.0 % of the APm repair works plan is implemented based on the AP road maintenance plan FY2018

   Given the Congolese C/Ps'culture, background and other aspects, progress can be relatively slow and take much time. In this regard, within the given timeframe of the Project duration, there may not be feasible to lead all concerned parties to a certain level in a same manner. However, steadiness should be respected, and step by step approach should be taken.

Ver. 6)

2) Financial constraints often become a challenge for the C/Ps, in particular, in this country. Even the C/Ps who are willing to take parts on the project activities could not participate in several activities due to lack of internal financial support (e.g. transportation allowance, etc.). Delay of salary payment might have been added to their burden with decreasing their motivation. This is not directly related to the Project implementation however, it is a critical point, which should be addressed, proper solution to be considered and taken by the Congolese side.

3) Congolese side has tendency to depend on the Project, including the financial issue yet in a real

situation, this kind of matter cannot be neglected. Under the specific circumstances, as the other donors have been doing, some degree of financial support could have been considered and provided by the Japanese side to enhance efficiency as a driving source for the time being.

3. Modification of the Project Implementation Plan

3-1 PDM and PO

As explained above "1-6 (1)", "1-2 Progress Activities", the Project proposed modification of the implementation schedule of the following activity (Refer to the Monitoring Sheet II);

Output 1: 1-6 "Elaborate budget FY 2018 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request"

Initially it was planned to commence from October 2017 till mid-May 2018, and modified to do so from June till October 2018. And the said modification was approved by the 4th JCC.

3-2 Other Modifications on Detailed Implementation Plan

-N.A.

4. Preparation of Gove. of the DRC Toward after Completion of the Project

Ver. 6)

1) As indicated in the above 1-6, establishment of the Road Maintenance Monitoring Committee requires sound preparation. At the same time, actual operation is, indeed, requires commitments and efforts. As the discussion with the C/Ps on this matter has been taken, the Congolese side initiative needs to be continuously secured and put into practice.
2) JICA Experts presented some recommendations to the C/Ps (OR:2, OVD:2, FONER:1, BTC:1) on the continuation of the AP road maintenance including aforementioned committee to be created, road inspection related, repair works/construction supervision related matters.
3) Those recommendations were agreed and accepted by the C/Ps. Concerning the Road Maintenance Monitoring Committee, comments were raised on the necessity to have policy level involvement, such as the Minister of MIPWR, FONER as well as Ministry of Finance, in order to secure relevant budget to mobilize it. For this, FONER suggested that to start with, Infrastructure Unit, OR and OVD to include such budget into their road maintenance budget plans. This recommendation should be materialized.


Discussion with the C/Ps on the Recommendation

Project Monitoring Sheet I (Revision of Project Design Matrix)

version 6

Dated: 9 Nov. 2018

Project Title: The Project for Capacity Development of Road Maintenance Management

Inputs		Plan/Actual	2016			2017				2018				2019	Remarks	Monitoring: Issue	Monitoring: Solution
			II	III	IV	I	II	III	IV	I	II	III	IV	I			
Expert																	
Leader / Road Maintenance Plan 1 (Mr. Shimizu)	9.60	Plan													All the scheduled on-site assignments for the respective Experts have been accomplished. Some remaining assignments for the domestic ones for 4 Experts (Leader, Sub-Leader, Road Inspection and Pavement Repair) will be handled in Japan in late November 2018 onwards. On the other hand, Project Completion Report submission to the Congolese side will be done some time in March 2019, which is apart from the current given assignment.		
		Actual															
Sub-Leader/ Road Maintenance Plan 2 (Mr. Saito)	10.50	Plan															
		Actual															
Road Inspection (Mr.Takahashi)	9.90	Plan															
		Actual															
Pavement Repair (Mr. Shishido)	12.00	Plan															
		Actual															
Road Inspection (Database) (Mr. Sakai)	10.07	Plan															
		Actual															
Road Inspection (Database 2) (Mr. Maeda)	0.73	Plan															
		Actual															
Pavement Repair (Construction Supervision) (Mr. Mukai)	5.80	Plan															
		Actual															
Coordinator (Mr. Yamagishi / Ms. Saito : Coordinator/Road Maintenance Plan Assistant 2)	10.43	Plan															
		Actual															
Monitoring and Evaluation (Ms.Taguchi)	3.10	Plan															
		Actual															
Training Plan	0.60	Plan															
		Actual															
Equipment																	
Equipment for database system		Plan													Upon obtaining the procured vehicle, equipment installation/ equipment (in-vehicle camera) manual development were instructed by Database 2 Expert.		
		Actual															
Training in Japan																	
Training for Counterpart Personnel		Plan													2nd training in Japan was held during 13- 26 May 2018 (including traveling time and weekends).	Feedback (including action plan) from the participants will be presented at the 5th JCC.	
		Actual															

Activities / Sub-Activities										Plan/Actual	2017				2018				2019	Responsible Organization		Achievements	Issue & Countermeasures/ Remarks
											I	II	III	IV	I	II	III	IV	I	Japan	GoDRC		
Output 1: Asphalt paved (AP) road maintenance cycle is established in OR and OVD with clearly defined roles and responsibilities in the project sites.																							
1.1 Review the current roles, responsibilities and work procedures for AP road maintenance of OR and OVD and analyze their problems in the project sites	●	●	●	●	●		○			Plan										JICA	OR/OVD	***Completed**: it had taken a bit more time than expected due to the preparation.*	*No major issues.*
										Actual													
1.2 Identify the most appropriate roles, responsibilities and work procedures for AP road maintenance of OR and OVD in the project sites	●	●	○	○	○		○			Plan										JICA	OR/OVD	*Identification stage has been* ***completed.***	Identified roles, responsibilities and work procedures for AP road maintenance of OR/OVD will be continuously applied.
										Actual													
1.3 Define the road network to be covered by the project	●	●	●	○	○					Plan										JICA	OR/OVD	*In collaboration with Master Plan Project, it has been* ***completed.***	
										Actual													
1.4 Conduct traffic volume survey on some sections of the defined road network	●	●	●	○						Plan										JICA	OR/OVD	***Completed.*** *Joint traffic volume surveys were conducted in collaboration with Master Plan Project.*	
										Actual													
1.5 Develop an AP road maintenance plan FY2018→FY 2019 of OR and OVD in the project sites	●	●	○	○	○		○			Plan										JICA	OR/OVD	Not achieved. **Completed.** AP road maintenance plan FY2019 of OR/OVD has been respectively submitted to Infrastructure Unit on 28 Sep.2018.	*Project aims to utilize database when developing maintenance plan. However, database development has been delayed, and currently it is expected to finish it in July 2018. AP road maintenance planning can be commenced by using the said data in Aug. 2018, which makes it for FY2019 instead of FY2018.*
										Modifi-cation													
										Actual													
1.6 Elaborate budget FY2018→FY 2019 necessary for AP road maintenance of OR and OVD in the project sites and proceed budget request	●	●	○	○				○		Plan										JICA	OR/OVD	Not achieved; Due to the situation described above 1.5 (issue). **In progress.** Budget requests have been submitted by OR/OVD to Infrastructure Unit on 1 Oct. 2018.	*Project is aiming to submit a budget request document FY 2019 for AP road maintenance instead of FY2018.* Accordingly, road maintenance budget requests will be submitted to FONER by Feb.2019.
										Modifi-cation													
										Actual													
Output 2: Technical guidelines on AP road maintenance are developed.																							
2.1 Review the current AP road maintenance works of OR and OVD and analyze their problems in the project sites	●	●	●	●	●		○	○		Plan										JICA	OR/OVD	***Completed.***	
										Actual													
2.2 Collect and review the existing AP road maintenance manuals and technical guidelines	●	●	●	●	●		○	○		Plan										JICA	OR/OVD	***Completed.***	
										Actual													
2.3 Establish the Joint Working Group for developing technical guidelines on AP road maintenance	●	●	○	○	○		○	○		Plan										JICA	OR/OVD	***Completed.***	From July 2018 to Oct. 2018, 29 (as of 25 Oct) meetings/related activities have been held for guidelines related activities.
										Actual													

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Project Title: The Project for Capacity Development of Road Maintenance Management

																Monitoring	
2.4 Develop and draft technical guidelines on AP road maintenance	●	●	●	●	○						Plan / Modification / Actual	JICA	OR/OVD	***Completed.***	
2.5 Explain and discuss the contents of the drafted technical guidelines at several meetings such as Technical Advisory Group (TAG) meetings etc. and revise the drafted technical guidelines	●	●	○	○	○			○			Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Technical Guidelines (TGs) presentation/ discussion were done several times followed by the final workshop held on 18 Oct. 2018.	
2.6 Conduct AP road inspection in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of AP road inspection	○	○	●		○						Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Through this activity, AP road maintenance plan, budget plan, and finalization of TGs have been realized.	This is a continuous exercise, which should be initiated by the Congolese side.
2.7 Develop a database for accumulating the AP road inspection results	○	○	○		●						Plan / Modification / Actual	JICA	OR/OVD	**Completed.** It was completed on 29 Sep. 2018, and presented at the workshops held on 2, 3 and 5th Oct. 2018.	*Certain constraints (physical/technical/ security) prevented from implementing this activity as planned. On the other hand, accuracy on data input/analysis should be enhanced.*
2.8 Conduct AP road maintenance and APm repair works in accordance with the drafted and revised technical guidelines and evaluate the procedure and outcomes of these works	○	○	○	●	○		●				Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Upon completion of above 2.6/2.7, evaluation results were explained at WG 2 meeting on 2/3 Oct. 2018.	
2.9 Finalize the technical guidelines	●	○	●	●	○		○	○			Plan / Actual	JICA	OR/OVD	**Completed.** MIPWR has officially approved TGs at the final JCC.	1st edition of TGs have been submitted to Infrastructure Unit as 1st edition of TGs on 28 Sep. 2018. However, as comments raised, these will be reflected.
2.10 Organize seminars and workshops for explaining and distributing the finalized technical guidelines to relevant organizations	●	●	○	○	○		○				Plan / Actual	JICA	OR/OVD	**Completed.** TGs presentation workshop was held on 18 Oct, 2018.	OVD: TGs including AP road inspection results have been explained on 2 Oct., 2018. OR: Same as above on 3 Oct., 2018.
2.11 Make an arrangement of the formalities for official approval of the finalized technical guidelines as national regulations of MIPWR	●	○						○			Plan / Actual	JICA	OR/OVD	**In progress.** Through the final JCC, TGs are to be officially approved by the MIPWR.	Afterwards, MIPWR Decree is expected to be issued.
Output 3: AP road maintenance skills and knowledge of OR's and OVD's technical staffs are improved in the project sites.															
3-1.Training plan for AP road inspection and APm repair works															
3.1.1 Establish the Joint Working Group for conducting trainings on AP road inspection and APm repair works	○	○	●	●	○	○	○	○			Plan / Actual	JICA	OR/OVD	***Completed:***	After 5th JCC till late Oct. 2018, 97 meetings/related activities have been implemented.
3.1.2 Plan the trainings on AP road inspection and APm repair works	○	○	●	●	○	○	○	○			Plan / Modification / Actual	JICA	OR/OVD	***Completed.***	
3.1.3 Select candidate sites for the trainings on AP road inspection and APm repair works	○	●	●	●	○	○	○				Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Candidate sites for OJT in 2018 have been re-selected in July 2018.	Candidate sites have been selected in June 2018. However, due to budget constraint, minor change was required afterwards.
3-2. Trainings on AP road inspection															
3.2.1 Conduct baseline survey on the training participants' skills and knowledge of AP road inspection	○	○	●	○	●	○	○		○	○	Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Final baseline survey was implemented on 8 June 2018.	19 officials took final baseline survey while 21 underwent final endline survey.
3.2.2 Conduct lectures on AP road inspection	○	○	●	○	●	●				○	Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Final lectures in line with the OJT were conducted from 12-14 June 2018.	
3.2.3 Conduct OJTs on AP road inspection at the selected sites in the project sites	○	○	●	○	●	○				○	Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Final OJTs were implemented from 12-14 June 2018.	

Project Title: The Project for Capacity Development of Road Maintenance Management

Activity														Monitoring: Issue	Monitoring: Solution
3.2.4 Conduct endline survey on the training participants' skills and knowledge of AP road inspection	○	○	●	○	●	○			○	○	Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Final endline survey was conducted on 15 June 2018.	Final endline survey result was increased by 17%. In average (1st/2nd/3rd), the same marked about 18 %. Thus it did not reach to the target (60% imcrease). However, given the fact that baseline survey results came out better than expected, it should be considered that the Project has secured a certain improvement.
3.2.5 Conduct AP road inspection through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines	●	○	●	○	●	○	○	○		○	Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Last action related to this activity was taken in July 2018.	In line with this activity, discussion on the TGs was organized on 26 July 2018.
3.3 Training on APm Repair Works															
3.3.1 Conduct baseline survey on the training participants' skills and knowledge of APm repair works	○	○	○	●	○	○	●		○	○	Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Final baseline survey was implemented on 26 July 2018.	Out of nominated 54 trainees, 20 of them took the baseline survey.
3.3.2 Conduct lectures on APm repair works	○	○	○	●	○	○	●			○	Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Final lectures were conducted in July/Aug.2018.	4 kinds of maintenance methods were explained.
3.3.3 Conduct OJTs on APm repair works at the selected sites in the project sites	○	○	○	●	○	○	●			○	Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Final OJTs were held in between 7 to 10 Aug. 2018.	
3.3.4 Conduct endline survey on the training participants' skills and knowledge of APm repair works	○	○	○	●	○	○	●		○	○	Plan / Modification / Actual	JICA	OR/OVD	**Completed.** Final endline survey was conducted on 3 Aug. 2018	While result comparison of baseline/endline surveys came out 38 % increas in average, final one marked 74.4 % increase, which shows achievement of the tagrget (60% increase).
3.3.5 Conduct APm repair works through trial implementation of the drafted technical guidelines by the training participants and evaluate the procedure and outcomes for revising the guidelines	●	●	●	○	○	○	○	○		○	Plan / Modification / Actual	JICA	OR/OVD	**Completed.** The latest implementation of this activity was taken in Sep. 2018.	Obtained knowledge through OJTs was incorporated into the TGs.
Duration / Phasing											Plan / Actual				

Monitoring Plan	Plan / Actual	Remarks	Issue	Solution
Monitoring				
Joint Coordination Committee	Plan / Actual	6th (final) JCCis was held on 8 Nov. 2018.		
Set-up the Detailed Plan of Operation	Plan / Actual	*Completed*		
Baseline Survey for Target Figures	Plan / Actual	*Completed.*		
Set-up the Target Figures within 6 months after the commencement of the project	Plan / Actual	*Completed.*		
Submission of Monitoring Sheet	Plan / Actual	Version 6 was submitted to the last JCC.		
Reports/Documents				
Inception Report (Work Plan)	Plan / Actual	*Submitted to the 1st JCC*		
Draft Project Completion Report	Plan / Actual	Draft project completion report will be submitted to Congolese side in March 2019.		
Project Completion Report	Plan / Actual	Project completion report is going to be submitted in April 2019.		
Public Relations				
Establishment and Operation of web Site, and other relevant PR activities	Plan / Actual	Project News of JICA HP has been updated for 16 times. Project News letters have been linked to the website of Infrastructure Unit since May 2017. The said site of the Project info. will be updated on TGs & final JCC.	Next Project News of JICA HP is going to be updated around late Nov. 2018. Contents will be "Finalized TGs/Final JCC".	Further PR activities will be implemented having different approaches. Eg., media, website, provision of newsletter,etc.

Schedule columns: 2016 (II, III, IV; months 5–12), 2017 (I–IV; months 1–12), 2018 (I–IV; months 1–12), 2019 (I; months 1–3).

■ Activities with fixed period
□ Activities to be continuously conducted, or with tentative schedule

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ANNEX 6: Copy of Products Produced by the Project

01 Technical Guidelines on Asphalt paved Maintenance

DEMOCRATIC REPUBLIC OF CONGO
MINISTRY OF INFRASTRUCTURE, PUBLIC WORKS AND RECONSTRUCTION

JICA

MANUAL FOR MAINTENANCE AND REPAIR OF ASPHALT PAVED ROADS

1st Edition

Kinshasa, November 2018

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PREAMBLE

This Manual for maintenance and repair of asphalt paved roads was prepared at the initiative of His Excellency the Minister of Infrastructures, Public Works and Reconstruction.

It was developed by a working group composed of representatives of the Roads Office (OR), the Office of Roadways and Drainage (OVD), the Technical Control Authority (BTC), the Congolese Agency of Great Works (ACGT), the Infrastructures unit (CI), and the National Road Maintenance Fund (FONER), with joint financing from JICA and FONER.

Its validation was ensured by a technical group composed of scientific professsionals (professors from the Polytechnic Faculty of the University of Kinshasa and the National Institute of Buildings and Publics Works), representatives of certain technical and financial partners, the Town Hall of Kinshasa, public enterprises, and socio-professional organizations concerned.

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- Michel KAYEMBE (Deputy Secretary General of the Congolese Association of Civil Engineers (ACIC)).

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LIST OF ACRONYMS AND ABBREVIATIONS

AASHO	:	The American Association of State Highway Officials
ACIC	:	Association Congolaise des Ingénieurs Civils
ACGT	:	Agence Congolaise des Grands Travaux
BEAU	:	Bureau d'Etudes d'Aménagement et d'Urbanisme
BTC	:	Bureau Technique de Contrôle
CBR	:	California Bearing Ratio
CI	:	Cellule Infrastructures
CNIrs BTP	:	Corporation Nationale des Ingénieurs en Bâtiment et Travaux Publics
DPC	:	Direction des Ponts et Chaussées
DRC	:	The Democratic Republic of the Congo
EU	:	European Union
FONER	:	Fonds National d'Entretien Routier
FWD	:	Falling Weight Deflectometer (Déflectomètre à masse tombante)
JICA	:	Japanese International Cooperation Agency
LNTP	:	Laboratoire National des Travaux Publics
OR	:	Office des Routes
OVD	:	Office des Voiries et Drainage
PDCA	:	Plan – Do – Check – Act
PRCMR	:	Projet pour le Renforcement de Capacités en Maintenance des Routes
PTF	:	Partenaires Techniques et Financiers
RAKIN	:	Régie d'Assainissement de Kinshasa

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MANUAL FOR MAINTENANCE AND REPAIR OF ASPHALT PAVED ROADS

0. FOREWORD

0.1 Context

The Democratic Republic of the Congo (DRC) resolutely launched a vast and ambitious program for rehabilitation, reconstruction and modernization of its infrastructures a few years ago in view of the crucial role that roads play in the nation's development.

However, the success of that program does not depend solely on mobilization of the necessary financial, means to make it possible to start big road works, but also on realizing effective structures for management and sustainability of such basic infrastructures.

At the present time, Roads in the DRC are not well maintained whether old or newly built. In most cases the repair work comes too late, which prevents it from being cost efficient because of the substantial damage that has to be dealt with.

Moreover, whether built well or not, a road always ends up deteriorated. To make sure that it lasts, maintenance work on it is necessary over its entire life to guarantee the considerable investment needed for that in spite of the very limited means that the country has available[1].

To date, the Government of the DRC, like other countries in Africa, has set up the National Road Maintenance Fund "FONER" to financially support its road maintenance policy. recently rehabilitated or rebuilt with the support of technical and financial partners (PTF) or on own funds. Unfortunately, the funds mobilized by FONER each year remain insufficient to cover all the maintenance needs of the country's roads.

This situation of insufficient financial means makes it difficult to fully support an annual road maintenance program ao that only emergency maintenance is often implemented while pending a possible rehabilitation of the network.

It is therefore necessary to establish a dynamic and effective policy for road maintenance and repairs that is based on a national reference document common and binding on all the state structures involved in and organizations responsible for such an important task are in particular the Roads Office (OR) and the Office of Roadways and Drainage (OVD).

That's the reason for this manual, which is the result of a series of meetings of the working groups of the Japanese experts of the Japanese International Cooperation Agency (JICA) and the Congolese experts of the Infrastructures unit (CI), the National Road Maintenance Fund (FONER), the Technical Control Authority (BTC), l'Agence Congolaise des Grands Travaux (ACGT), the Roads Office (OR) and the Office of Roadways and Drainage (OVD), organized within the framework of the Project for Reinforcement of Road Maintenance Capacity (PRCMR), directed by CI with financing by JICA and FONER regarding the contribution of the Government of the DRC.

[1] PHANZU E, 2012, Cours de routes, INBTP, inédit, Kinshasa.

0.2 Scope of Application of the Manual

This manual specifically covers maintenance and repair of asphalted roads and does not apply to rehabilitation work on the entire structure of roads.

For that reason this document is meant only for work relating to the asphalt surface course. In other words, it applies to newly built roads for which an effective maintenance policy has been described and to those the state of which is determined by ultrasonic inspection to require work affecting only the asphalt surface course.

Anyway, the interest given in this work to surface deterioration is due to the fact that it has been determined that surface deterioration constitutes, in most cases, one of the earliest and most sensitive indicators of change in the structural and surface characteristics of roads[2].

Readers who want to undertake repair work partly or totally affecting the structure of a road are asked to refer to other specific documents. Also not concerned by the present manual are maintenance and repair work on engineering works, on wastewater facilities connected with roads and on road equipment.

However, in view of the extent of the deep degradation of the road in the city of Kinshasa and its surroundings as well as the dysfunction of the road sanitation system, a description of the partial or total repair work on the roadway and some essential notions relating to the maintenance of the road sanitation system are briefly mentioned in this manual.

0.3 Brief Historical Overview of Roads in the Democratic Republic of Congo

To give a better idea of the evolution of roads in the DRC and their condition and importance to the country's development, we will summarize the history of Congolese roads from colonial times to the present day in the following lines.

The explorer Henry Morton Stanley said "Without railroads, the Congo is not worth a penny". We can say for the needs of interior development, "Without roads, the DRC cannot develop". In fact, with a surface area of 2,345,410 km^2, the Democratic Republic of the Congo is second among African nations only to Algeria in terms of the extent of its territory. Situated in the heart of the African continent, it has nine thousand kilometers of borders with nine countries: Congo Brazzaville, the Central African Republic, South Sudan, Uganda, Rwanda, Burundi, Tanzania, Zambia and Angola. It is true that this immense country is almost entirely an enclave. All it has in the way of coastlines is forty kilometers on the Atlantic Ocean[3].

Thus, in the colonial period between 1920 and 1959, the country saw spectacular road construction. Indeed, in the course of those 39 years, about 145,000 km of roads were built, for an average of 3,718 km a year. Furthermore, it should be noted that the road network was kept in good condition whatever the season with upkeep by regularly paid road menders

[2] Laboratoire Central des Ponts et Chaussées, 1998, Catalogue des dégradations de surface des chaussées, Paris.
[3] Magazine spécial de l'Office des Routes, 1999, Projet d'aménagement du réseau routier en RDC, Kinshasa

stationed on well-defined itineraries. Regulations regarding limitation of axle loads and rain barriers were strictly applied[4].

In the post-colonial period from 1960 to 1970 sociopolitical instability brought deterioration of roads as a result of poor management of manual road upkeep. Under the terms of Ordinance-Law No. 71-023 of 26 March 1971, the former Directorate of Roads and Bridges gave birth to the Road Office (OR) with missions to study, build, develop and to modernize the roads of the network in the general interest as well as the structures and the bins therein and to manage the National Laboratory of Public Works (LNTP).

Formerly, Public Company created by Ordinance n ° 87-331 of September 16 1987, the Office of Roads and Drainage (OVD) has been transformed into a public institution with technical nature and legal personality possesing the autonomy of administrative and financial management, by the effect of the law n ° 08/007 of July 07 2008 laying down general provisions relating to the transformation of the Public Enterprises. Since then, it is governed by the law n ° 08/09 of July 07 2008 laying down general provisions applicable to the Public Establishments and by the Decree n ° 09/48 of December 03 2009 fixing its statutes.

The OVD has as its object the construction, the maintenance, the modernization and the development of the urban roads of the DRC. To date, the urban roads of the DRC total a linear of 8,213.31 km including 1,841,32 km paved and 6,371.99 km dirt road[5].

Under Ordinance No. 78-335 of August 30, 1978 amending Ordinance No. 71-78 of March 26, 1971 on the classification of the road network, the DRC had 145 000 km of roads and 7 400 km of urban roads. These linear are divided as follows:

- 18,500 km of unpaved national highways (RN)
- 2,500 km of paved national highways (RR)
- 20,000 km of priority regional/provincial roads (RRP/RPP)
- 17,000 km of secondary regional/provincial roads (RRS/RPS)
- 87,000 km of agricultural service roads (RDA)
- 7,400 km of urban roadways (VUR)

The network of urban roadways is in a very pronounced state of deterioration because most of the existing structures date from the colonial period. The age of the network, lack of maintenance have resulted in severe deterioration of many roads to the point that they have become impassible today.

All of the roads, or almost all, have undergone stopgap work on many occasions, and such work has shown how limited it is in terms of effectiveness[6].

Tables 0.1 and 0.2 below show the evolution of the state of networks in charge of the OR and the OVD from 2010 to 2016.

[4] Office des routes, 2016, Département de recherche, Kinshasa.
[5] OVD, Etat généraux
[6] TSHIULA P, Op.cit.

0.4 Acknowledgements

Finally, we cannot close this foreword without expressing our appreciation to those who have made it possible to draw up this manual. We think first of all of the Ministry of Infrastructures, Public Works and Reconstruction for its active involvement in the success of the work that has led to this work. The effective contributions of its departments (CI, FONER, ACGT, BTC, OR and OVD) have made it possible to complete this important reference work.

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We are grateful to the JV of consultants: INGEROSEC CORPORATION - EIGHT JAPAN ENGINEERING CONSULTANTS - KATAHIRA for their technical support for Congolese experts.

We are grateful to all the technical and financial partners, to the other State structures of the DRC and to all the professional organizations for their contribution to the enrichment of the contents of this manual. We are thinking in particular of the European Union (EU), the Belgian Technical Cooperation, the Provincial Ministry in charge of Infrastructures, the Kinshasa Sanitation Authority (RAKIN), the Urban Development Research Office (BEAU), the Directorate of Roads and Bridges (DPC), the Congolese Association of Civil Engineers of Congo (ACIC) and the National Corporation of Construction Engineers BTP (CNIrs BTP).

Working Group

Table 0.1 : Evolution of main indicators of activities from 2010 to 2016 compared to RING national[7].

No.	Désignation	2010	2011	2012	2013	2014	2015	2016	2017
1	**Total road network (km)**	58 129	58 129	58 129	58 129	58 129	58 129	58 129	58 129
2	**Ring national (km)**	30 788	30 788	30 788	30 788	30 788	30 788	30 788	30 788
3	**State of Ring national (km)**								
	Good	8 621	10 758	9 667	10 784	13 245	13 612	11 089	10 785
	Average	6 773	6 160	6 465	6 163	5 651	5 772	6 303	7 863
	Poor	15 394	13 870	14 655	13 841	11 892	11 404	13 396	12 140

The general assessment of the state of the DRC's network of urban roads can be summarized in Table 0.2 below.:

Table 0.2 : State of the DRC's network of urban roads in Kinshasa[8]

			2010		2011		2012		2013		2014		2015		2016		2017	
No.	**Type of road**	**State**	**%**	**km**	**%**	**km**	**%**	**km**	**%**	**km**	**%**	**km**	**%**	**km**	**%**	**km**	**%**	**km**
1	**paved road**	**Good**	8	125,69	8	125,69	8	125,69	35	533,36	35	533,36	35	533,36	35	641,36	54,25	1 066,41
		Average	17	267,10	17	267,10	17	267,10	22	333,9	22	333,9	22	333,9	24	441,77	19,29	379,19
		Poor	75	1178,38	75	1178,38	75	1178,38	43	652,62	43	650,45	43	650,45	41	760,49	26,44	519,74
2	**dirt road**	**Good**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13,71	1 351,49
		Average	10	591,55	10	591,55	10	591,55	10	591,55	10	591,55	10	591,55	13	819,81	29,71	2 928,72
		Poor	-	-	-	-	-	-	-	-	-	-	-	-	87	5 552,18	56,57	5 576,50

[7] Rapport annuel OR, exercice 2017

[8] Rapport annuel OVD, exercice 2017

CHAPTER 1
OVERVIEW OF MAINTENANCE AND REPAIR OF ASPHALTED ROADS

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1.1 Importance of and Need for Road Maintenance and Repair

Roads constitute one of the main factors of the socioeconomic development of a country. They are a part of social capital at the most basic level in the sense that they serve as links between centers of production and consumption in the case of most economic sectors on the one hand, and on the other, make it possible for all sectors of society to have their jobs, to social services and to education.

The road network of the DRC covers a total of 152,400 km[9] of roads: 86,871 km of local-use or agricultural service roads, for which the DVDA is responsible, 7,400 km of urban roadways under the OVD and 58,129 km of general-use roads under the OR, of which 3,000 km are paved[10].

The paved roads, which the present manual concerns, generally have a subbase, a base course and a surfacing course, which tires come into contact with. The role of the surface course to ensure the safety, quality and comfort of vehicle movement while at the same time taking the road environment into account.

Over the years and as a result of passage of vehicles, precipitation, ultraviolet rays, deformation and cracks appear on the road covering, a direct consequence of which is progressive lowering of the performances that the road had when its construction was completed. Since the state of the road surface impacts the structural life of the road and the safety and comfort of road users and people living along the road, it is obviously necessary to have management activities for effective restoration of the road's performances on time and by proper methods.

The target values that have been established for such management are indicated in Figure 1 below.

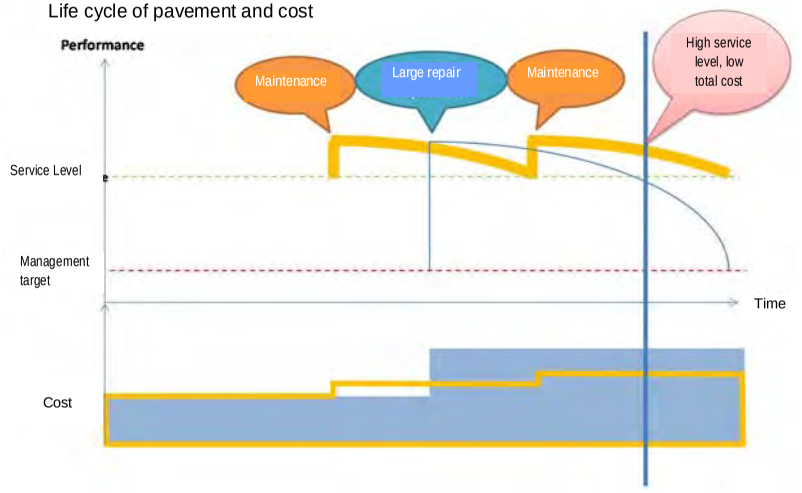

Figure1.1 The Target Values Set for Management

[9] Ordonnance n° 78-335 du 30 août 1978 modifiant l'Ordonnance n° 71-78 du 26 mars 1971 portant classification du réseau routier

[10] Ordonnance n° 71-078 du 26 mars 1971 portant classification du réseau routier.

In road management, a distinction must be made between two concepts considered to be the most important for such matters: 'maintenance' and 'repair of the surfacing'. In this manual, those two concepts are defined as follows:

i) Maintenance
Maintenance means planned, repeated repairs or minor repairs undertaken urgently or all of the work done for the sake of restoring the performances of the road surface. The main maintenance work consists in filling potholes and cracks and treating the surface.

ii) Repairs
This is work done for the purpose of restoring the performances that the road had at completion of construction, when maintenance no longer makes it possible to accomplish such restoration adequately and economically. The main methods of repair work are methods of replacement/reconstruction of the road surface and the methods of resurfacing.

1.2 Development of a Road Use and Road Maintenance Cycle

For an asphalted road, a PDCA cycle (Deming wheel) is indispensable in order to:
i) ensure its strength,
ii) accomplish its maintenance in a regular and effective manner,
iii) improve technical competences and know-how concerning its maintenance.

Management of the surfacing corresponds to the PDCA cycle as per the sequence illustrated in Figure 2. The overall schematic process is as follows: (1) setting the management objectives, (2) analysis of the condition of the surfacing, (3) evaluation/forecasting of sturdiness, (4) collection and updating of data, (5) drawing up of the maintenance and repair / management objective correction plan, (6) implementing the maintenance and repair work and (7) feedback of the information concerning evaluation and the results after the work.

Note:
The Deming wheel is an illustration of the PDCA (Plan-Do-Check-Act) which defines the maintenance management of a road in four (4) steps, namely: Plan - realize - check - improve. His name comes from the statistician William Edwards Deming. It is therefore a *cycle* that is represented by a wheel.

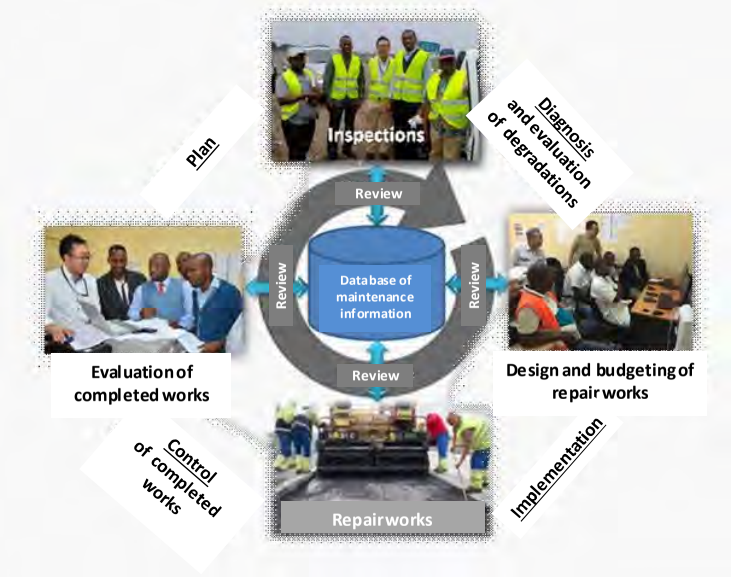

Figure 1.2 Road Maintenance Management System

The PDCA cycle makes it possible to :
- validate the choice of method for the work by analysis of the cumulative data concerning service after implementation of maintenance and repair work ;
- determine the causes of rapid deterioration of the roads ;
- judge in particular implementation of the measures for improvement.

1.3 Implementation Procedure

1.3.1 Setting of Management Objectives

The management objectives put emphasis on the functions of the road suface, and the level to be reached is expressed by a numerical value. Two (2) types of target indicators are defined:

1.3.1.1 Service index

That is an indicator that illustrates the condition of the road surface in a simple manner (level of satisfaction, level of reliability, comfort, etc.).

In the Democratic Republic of the Congo, the quality index of paved roads is defined so as to assess their condition on the basis of whether or not cracks and/or deformations are to be seen on their surface and according to deflection results obtained in technical inspection of the road.

1) Quantification according to deterioration[11]

For a class of traffic, varying between 1,000 and 3,000 vehicles/day and a reference 7 m x 100 m road surface, and for the road structures defined in Tables 1.1 and 1.2 below:

Table 1.1 Assumptions Concerning the Structure of a Flexible Road Pavement to be Taken into Account

Surface course with bituminous layers	:	Thickness: 5 cm
Base course with 0/31.5 crushed stone	:	Thickness: 20 cm
Subbase course consisting of choice soil, CBR ≥ 30%	:	Thickness: 20 cm
Platform soil, CBR ≥ 5%	:	Thickness: 30 cm compacted to 90% OPM

Table 1.2 Assumptions Concerning the Structure of a Semi-rigid Road Pavement with a Base Course Stabilized with Cement (5%)

Surface course with bituminous layers	:	Thickness: 4 cm
Base course consisting of stabilized soil	:	Thickness: 15 cm
Subbase course consisting of choice soil, CBR ≥ 30%	:	Thickness: 20 cm
Platform soil, CBR ≥ 5%	:	Thickness: 30 cm compacted to 90% OPM

The conditions and ratings are defined as follows:

- *Cracks and deformations*

Table 1.3 Condition of the Road Based on Deterioration

Condition of the road	Characteristic of the road
Good	Few or no cracks
Fair	Cracks but no deformations (ruts, subsidence, depressions)
Poor	Cracks and deformations
Very bad	Too many cracks and too many deformations

- *Rating*

  On the basis of the above-mentioned reference surface, three (3) ratings (numerical values) are assigned to the condition of the road:

Table 1.4 Cracks/Deformations Grid

Deformations \ Cracks	1	2	3
1	1	2	3
2	2	4	6
3	3	6	9

In the Table 1.4 above, the ratings are defined as follows:

Rating 1: less than 10% deterioration;
Rating 2: 10-50% deterioration;
Rating 3: more than 50% deterioration.

For each case the condition of the road is defined by numerical values from 1 to 9 as follows:

1 = Good, i.e. few or no cracks on the road;
2-3 = Fair, i.e. cracks but no deformations on the road;
4-6 = Poor, i.e. presence of cracks and deformations on the road;
6-9 = Very bad, i.e. very cracked and deformed road.

[11] Methodology of technical inspection of flexible asphalt pavements, "Manual for Reinforcement of Flexible Asphalt Pavement in Tropical Countries", LCPC, May 1985.

2) Quantification According to Critical Deflections D90 and Traffic (axles equivalent to 13 T)

Table 1.5 Condition of the Road on the Basis of Deterioration

Trafic	Deflection (1/100 mm)	
	Flexible road pavement	Stabilized road
10^3	150	130
10^4	135	115
10^5	120	100
10^6	105	85

The permissible values of deflections are as follows:

- *For a road in elastic phase*

Flexible road pavement	:	40-50 / 100 mm	excellent performance
Stabilized road	:	20-30 / 100 mm	excellent performance

- *For a road in elasto-plastic phase*

Flexible road pavement	:	60-100 / 100 mm	very good performance
Stabilized road	:	40-80 / 100 mm	very good performance

- *For a road in plastic phase*

Flexible road pavement	:	> 100 / 100 mm	acceptable performance
Stabilized road	:	> 80 / 100 mm	acceptable performance

3) Schematic results, deflection, bearing capacity and quality of the structures

Deflection	elastic	elasto-plastic	plastic
Bearing capacity	high	acceptable	low
Quality of structures	good	acceptable	bad

4) Decision and work-to-be-done grid

Apparent condition / rating \ Deflection	**low**	**medium**	**high**
Good : 1	*Q1*	*Q2*	*Q3*
Cracks without deformation : 2-3	*Q2*	*Q3*	*Q4*
Cracks with deformation : 4-7	*Q3*	*Q4*	*Q5*

Where:
Q1 and Q2: good condition
Q3: maintenance at points in time
Q4 and Q5: reinforcement

Remark :

The values given in the tables above do not concern the present Project although they are based on the results of concrete research. They have been mentioned only for the purpose of reference.

The actual threshold values, that will make it possible to decide the type of work to be done in the PRCMR Project, will be determined following ultrasonic campaigns carried out for that purpose on target roads of the Project.

1.3.1.2 Indicators that make it possible for road administrators to analyze and evaluate the condition of the surfacing from a technical viewpoint

Here it is a matter, for example, of analyzing and/or evaluating the sturdiness of the surfacing, the degree of deflection of the road surfaces (using a falling weight deflectometer (FWD)), the degree of cracking, rutting, etc.

For estimation of the degree of cracking, reference is made to the degree of deterioration that can be seen on the surface of the road.

Table 1.6 Degree of Cracking according the Level of Deterioration

Degree of deterioration	**Low (rate of cracking of about 0-20%)**
Overview	- No crack detected : 0 % - A continuous longitudinal crack: approx. 10% - A continuous longitudinal crack where the left and right wheels pass: approx. 20% - On certain road sections corresponding to evaluation units several cracks or alligator cracking are produced on one side of the road surface where vehicle wheels pass: approx. 20%
Photo images	 
Degree of deterioration	**Medium (rate of cracking of about 20-40%)**
Overview	- Several cracks, particularly where the left and right wheels pass, as well as multiple longitudinal and transverse cracks on one side of the road surface where vehicle wheels pass: approx. 30% - Cracks where left and right wheels pass as well as cracks turning into alligator cracks on one side of the road surface where vehicle wheels pass: approx. 30%
Photo images	 

Degree of deterioration	**Considerable (rate of cracking of about 40% or more)**
Overview	- Cracks where left and right wheels pass and turning into alligator cracks: approx. 50-60% - Cracks covering the whole tread width and turning into alligator cracks: approx. 80-100%
Photo images	 

In order to estimate the degree of rutting, reference is made to the degree of deterioration visible in depth on a plane perpendicular to the road surface.

Table 1.7 Level of Deterioration according to Degree of Rutting

Degree of deterioration	**Low (ruts of about 0-20 mm)**
Overview	Note: The measurement of rutting corresponds approximately to the difference between the highest point and the lowest point on a cross section perpendicular to the road surface (without taking camber into account). However, in the case of an asphalt surfacing, an initial rut of about 5 mm is produced immediately after the road is put into service.
Photo images	 
Degree of deterioration	**Medium (ruts of about 20-40 mm)**
Overview	
Photo images	 

Degree of deterioration	Considerable (ruts of more than about 40 mm)
Overview	
Photo images	 

1.3.2 Parameters concerning surface characteristics of a road with a bituminous surfacing[12]

There are three parameters to be noted that are connected with the surface qualities of a road: overall irregularity, roughness and impermeability.

1) The notion 'overall irregularity'

Overall irregularity is the set of vertical elevation differences of a road.
In the sense of the term that concerns roads, overall irregularity means all of the surface irregularities or defects that a vehicle encounters on a road when it travels on it. Such defects are usually located within a range of lengths from 50 cm to 50 m.

That parameter indicates the quality of road surfaces and corresponds to comfort in that the lengthwise and crosswise profiles differ very little from the theoretical profiles. That is to say that when one compares the red (theoretical) line of the project with that of the profile actually implemented in the field, not very much in the way of differences is observed from the point of view of change in level and presence of undulation. The difference is ± 3 mm for roads with bituminous surfacing.

For the driver overall irregularity is felt in terms of comfort in driving. He must not feel any excessive vibrations or strong jolts. In a vehicle, comfort is conditioned by the vehicle's suspension and the overall irregularity of the road surface. When the latter is pronounced, that results in loss of adhesion.

Measurement of Overall Irregularity
Overall irregularity is measured either longitudinally (longitudinal overall irregularity) or transversely (transverse overall irregularity) using a wide range of measurement instruments.

- For longitudinal overall irregularity: measurements are made using:
  - An ultrasonic apparatus: it determines the geometric pattern.
  - A shock integrator: it measures dynamic flatness. It is a device towed by a laboratory vehicle in which recorders are installed. It is equipped with vertical movement sensors.
  - A 'viagraph': That is an apparatus that measures the change in level of the longitudinal profile going at a speed of 4-5 km/h.

[12] E. PHANZU, Cours d'Entretien des Routes, INBTP, Kinshasa, 2015, inédit.

  - A 'profilograph': (AASHO test) That is a device developed in the US that makes it possible to measure the slope of the longitudinal profile.
  - A 3m 'rolling rule': It is equipped with a sensor at the middle. It makes it possible to check overall irregularity, especially when the road is under construction, when deflections of around 3 mm in longitudinal profile and 10 mm in transverse profile are tolerated in the case of the cement concrete and 5 mm in longitudinal profile and 10 mm in transverse profile in the case of the surfacing.
  - A longitudinal profile analyzer (A.P.L.): it is a device which assesses overall irregularity very satisfactorily in the longitudinal profile.
  - A comfort indicator: It records shocks by producing impulses, which makes it possible to obtain the results rapidly and directly.

- For transverse overall irregularity:
  - A gyroscope: That is a device with which it is possible to reveal certain localized defects such as depressions.
  - A transverse 'profilograph'.

2) The notion 'roughness'

Roughness is a characteristic of the surface state of solid material. It is the anti slip property of a road.

In road technology, ensuring safety is the most important role assigned to the surface course, the second most important being comfort. In order to make it possible for vehicles in motion to brake conveniently under conditions of transverse stability, it is recommended that a surface course have sufficient roughness.

Measurement of Roughness
In roughness or adhesion, a distinction is made between two qualities that a road might present:

Micro roughness
It is associated with the surface texture of road surfacing. Adhesion between the tires and the surface depends on the following factors:
- the kind of tires
- the kind of surfacing and/or
- the speed of the vehicle

Micro roughness has to do with the petrographic nature of the granulate rock, which makes it possible to consider the Los Angeles test regarding hardness, 'accelerated polishing'.

The different instruments used to measure roughness are:
- The 'sand deepener'
- The 'drainometer'
- The Leroux instrument
- The LPC light trailer (in France)
- The scrim
- The road drain

3) Impermeability

This characteristic is of particular interest to the road engineer, because the surface course is subject first of all to the aggressiveness caused by traffic and the climate, but it must play its third role as well, that of being an obstacle to penetration of water into the base.

That is a protective role that makes the surface course ensure impermeability to rainwater of an aggressive nature and runoff water. It is therefore recommended that the binder film used in the surface course should be sufficiently cohesive in order not to crack under the action of repeated loads and the climate, because aging of the binder results in cracks, into which water penetrates, which in turn produces alligator cracking.

Permeability is a sign of wear, thus of aging. It is measured *in situ* using an instrument called a 'permeameter', which consists of a tube to be strongly applied to the surface of the road after having cemented it at its lower part, the speed of flow then being measured.

1.3.3 Analysis of the Condition of the Surfacing

It is necessary to analyze the state of the surfacing on all axes, in order to obtain the information concerning the indicators of the management objectives, set in the purpose of an objective evaluation of condition of the managed roads.

1.3.4 Evaluating/forecasting the Sturdiness of the Road

Evaluation of the sturdiness of the surfacing is quantitative or qualitative evaluation of the state of the surfacing, after comparing the condition of the road on each section with the management objectives. Sturdiness, once evaluated, gives basic data that makes it possible for road administrators to adequately calculate the timing and the budget that need to be assigned to maintenance and repair of the surfacing.
In forecasting sturdiness, it is therefore necessary to take deterioration of the surfacing into consideration.

1.3.5 Database / Upgrading of the Data

The database is a fundamental stage in implementation of management of surfacing. It should contain, not only data indicating the condition of the surfacing such as the properties of the road surface, but also basic data such as the type of road, the superstructure, the materials used and the record of maintenance and repair work as a database on the surfacing. Such data constitutes valuable information used for management of daily maintenance and evaluation of the practical methods of maintenance and repair. A centralized database should be created to avoid having the data only at different places.

Moreover, in order for it to be possible for the database at the operational level to be used effectively for road management, it will be necessary, after creation of the database, to continue to collect information such as maintenance and repair records. It will also be important to work out a management system that can make it possible for road administrators to find the necessary information, correct it, update it and accumulate the data thus collected.

1.3.6 Drawing Up of a Plan for Maintenance and Repair and Correction of the Management Objectives

For all of the roads being managed, a maintenance plan that is as effective as possible must be drawn up on the basis of the analyses of the condition of the surfacing and the results of the forecasts for all of the roads of the road network. That plan must take into consideration the cost of the life cycle by identifying the roads and road sections for which the management objectives that are set in accordance with the properties of each road from the point of view of the performances of the surfacing and the level of service have not been met.

For calculation of the life cycle cost, different maintenance and repair models (replacement/reconstruction of the surfacing, resurfacing using a milling machine, treatment of the surface) should be established. The maintenance and repair model to be identified in order to met the management objectives that have been set is the one with the lowest life cycle cost.

In concrete terms, the performances of the surfacing are subject to forecasting, and the road sections on which the management objectives that have been set cannot be met are examined, in order to determine the timing, manner and volume of the maintenance and repair work. From that is obtained a cost evaluation of the work on the different road sections that is to be implemented on the basis of planning involving identification and establishment of a maintenance and repair model with the lowest life cycle cost. Such is the plan for maintenance and repair of the surfacing for good management thereof.

1.3.7 *Implementation of Maintenance and Repair Work*

Concerning the potential places marked for maintenance and repair work, mentioned in 1.3.5 above, a technical estimate regarding selection of the road sections for implementation of the work, evaluation of the existing surfacing and the design and work methods to be applied is necessary for implementation of the maintenance and repair work in the field at the project level. A maintenance and repair work implementation plan must also be drawn up.

Those steps are further detailed in Chapter X of the present manual. They require, for example, evaluation of whether the state of deterioration of the road sections in question is average or of a local nature as well as the extent of implementation of maintenance and repair work taking into consideration the degree of deterioration of the surfacing of neighboring road sections, the record of maintenance and repair work, the situation regarding utilization of the roadsides and the impacts of regulation of the work on traffic movement. It will also be necessary to adequately choose the maintenance and repair methods to be used according to the structure of the surfacing, the causes of the deterioration and the past record of maintenance and repair work.

Particular attention should also be given to the maintenance and repair of sanitation facilities for which an appropriate method is to be adopted depending on the nature and importance.

1.3.8 Updating of the Database on Evaluation After the Work and the Results

After implementation of the maintenance and repair work the work data will be added to the database. Moreover, it will be necessary to carry out a post-maintenance evaluation and updating of the database on the basis of the maintenance and repair plan in the surfacing management system.

1.4 Moral and Psychological Preparation of the Persons Involved in Maintenance and Repair of Roads

For the success of road maintenance, the officials who are charged with the task of road maintenance and repair must be made aware of the importance thereof so that they can have good control of the work by getting the workers to be fully conscious of need to do it the best they can.
Psychological preparation of such officials before and during the work will therefore be indispensable for that purpose. Such a feeling of belonging and responsibility that is to be developed among the workers will in the long run make the product of their work a part of the

workers themselves. That concept is applied much more in Japan through Kaizen system which help sensitize the working personnel.

This system shall sensitize all the working personnel who shall be assigned to the road maintenance for a better future in order to correct the past mistakes caused by the lack of consciousness.

MANUAL FOR MAINTENANCE AND REPAIR OF ASPHALT PAVED ROADS

CHAPTER 2
WORK IMPLEMENTATION STRUCTURE

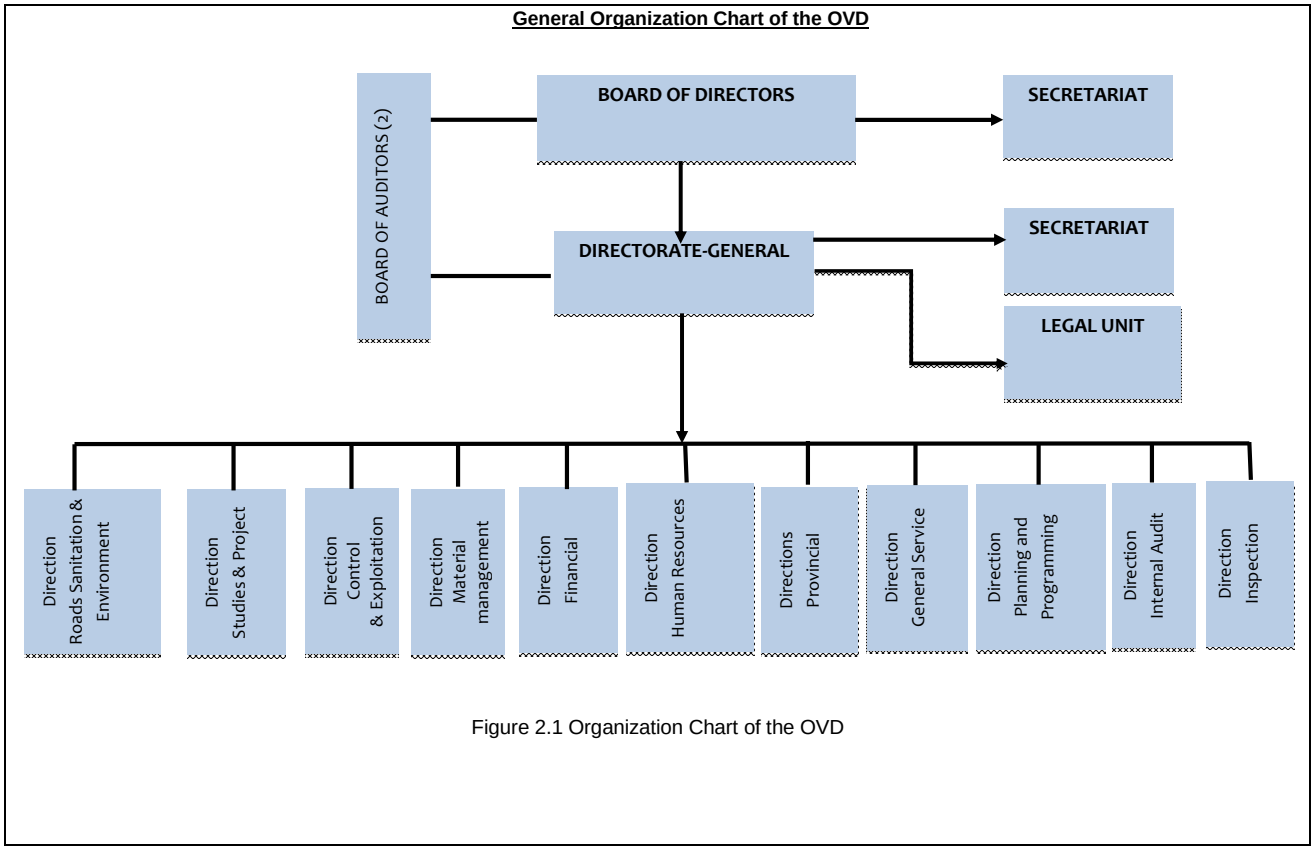

Figure 2.1 Organization Chart of the OVD

2.1 Overwiew

Organization of the human and material resources as well as supply of the materials for implementation of the work must be accomplished in a rational manner. The criteria for choosing between direct operation and subcontracting must also be clearly defined.

2.2 Recommendation on Work Implementation Model

In view of the high rate of personnel who have retired or are on the way to retirement as well as the remarkable increase in the volume of maintenance work, it is absolutely necessary to promote subcontracting. However, in all cases the OR and/or the OVD always retain the responsibilities of road maintenance management. It would therefore be wise in case of subcontracting to clearly define the tasks that the subcontractor takes upon itself.

The types of contracts must be in agreement with the laws and legal provisions in force of the DRC governing public contracts.

2.3 Organizational Entities

The main organizational entities that the present project concerns are the Roads Office (OR) and the Office of Roadways and Drainage (OVD), both permanent structures of the Ministry of Infrastructures and Public Works.

Below are given the organizational charts of the OVD and the OR.

2.4 System for Sharing of Information on Road

The situation regarding road traffic must be analyzed and shared with road users. Messages making them aware of the situation must be broadcasted on radio or television. For better reaching the public audience targeted for that, the following various means of communication have to be used, such as navigation devices, billboards, road signs, etc.
The frequency and period of transmission of information will be judged on a case-by-case basis according to the importance, the sensitivity and the scope of the work to be undertaken.

2.4.1 Information System

The objective is to provide a reference service that meets the safety and road management requirements. Broadcasting of information on occurrences having a bearing on safety and general road traffic conditions targets both road users getting ready to set out and those already on their way. Thus, several ways of conveying information are used to inform road users and those living or working along roads, among which are:

- Information boards with variable messages
  They are indispensable for spreading information in real time (time currently needed to cover a road section, alerts or advice) that is most needed by road users.

- Radio and television broadcasting
  Radio and television are the most direct means of conveying information in real time (general traffic conditions and all traffic flow disrupting events) to users on the road.

2.4.2 Road Information Monitoring System

What is meant here is all the systems for conveying information relating to roads and road traffic. In the road information monitoring system a distinction should be made between the information systems used to inform road users on road traffic conditions and systems for monitoring such road information.

Development of communication techniques and information techniques should make it possible to considerably improve both traffic management methodes and information for road users.

Information for road users on the road tries to meet three objectives:

- Warn them of immediate potential dangers to get them to drive more carefully than usual
- Regulate traffic by persuading road users either to change their itineraries or to follow new guidance and new recommendations
- Inform road users of traffic conditions and the impact thereof on the flow of traffic

1) **Information Systems**

The information systems used are the followings:

- Horizontal and vertical visual information (zebra crossings, kilometer markers, continuous and discontinuous lane separation lines, vertical signs for road gradient, bridges and their load limits, dangerous curves, seriously deteriorated road sections, speed bumpers, barriers for closing roads because of the impact of rain, slippery road surfaces, touristic sites, service stations, hotels, restaurants, parking areas, speed limits, men at work on the road, and places of detours, flooded zones, landslides, etc.);

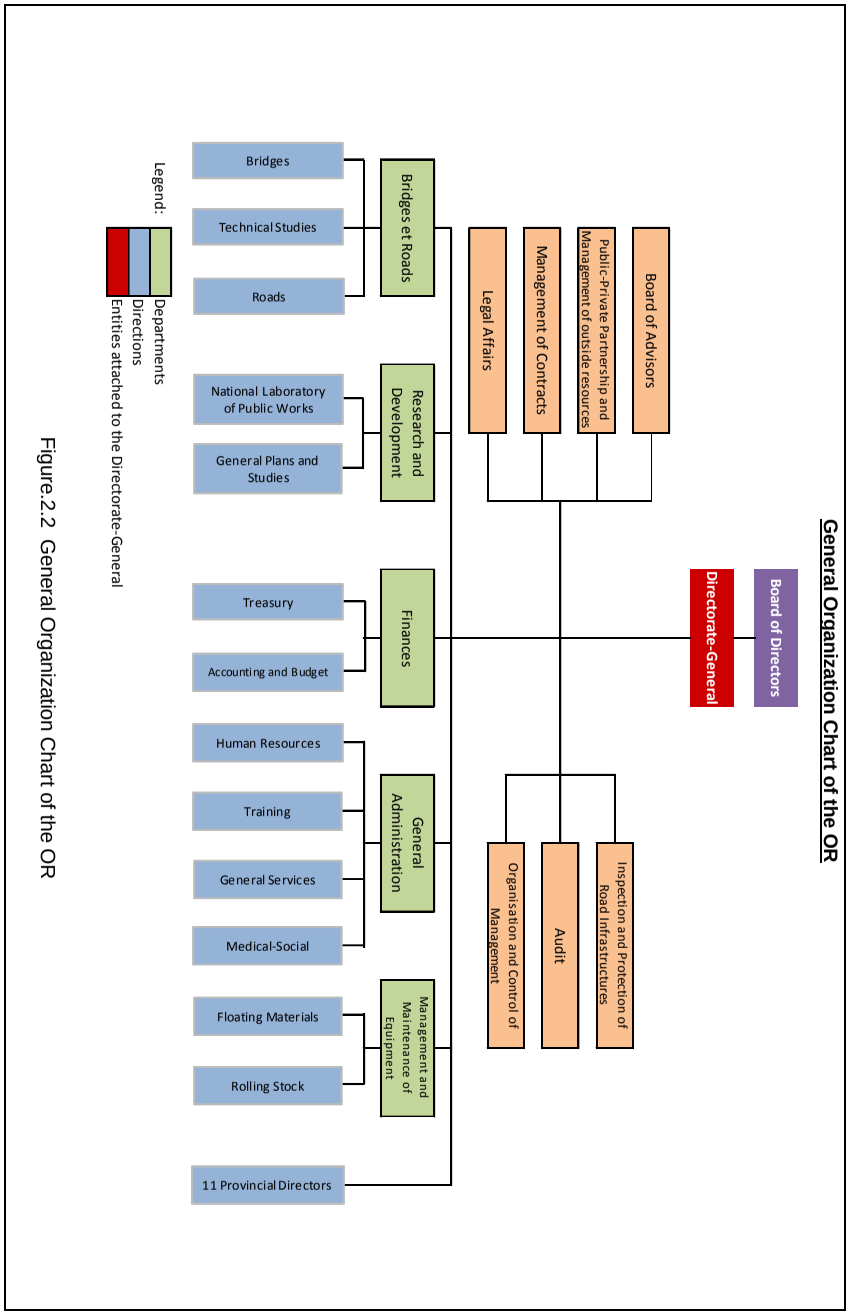

Figure.2.2 General Organization Chart of the OR

- Road data bases accessible to road work implementation agencies;
- Satellites that furnish information on weather and road closings;
- Traffic lights at crossroads ;
- Green and red lights for managing assignment of crossroad levels;
- Roundabouts on national roads and highways;
- Local radio and television stations (information on weather, road conditions, etc.);
- Itinerary isofrequency radios along national roads and highways;
- Beacons and 'green waves' installed along roads to furnish radio information on the general state of monitored roads and beacons installed on gantries;
- Variable message boards (PMVs) ;
- Centralized traffic guidance from control centers;
- Automatic guidance by equipment installed on vehicles;
- Car telephones, smart badges, smart cards and electronic toll devices;
- Car radios ;
- Coaxial radiating cables placed along roads for emission of emergency information received and sent by car radios;
- Navigation panels ;
- GPS with road map, destination code and navigation display;
- Detectors and closed-circuit television for controlling access to main roads in case of serious accidents that block traffic;
- Meter with camera installed on the roadside to count the number of vehicles passing;
- Automatic vehicle counting and weighing with transverse cables;
- Video systems placed along the road with display on variable message boards;
- Radar systems placed along the road with display on variable message boards;
- Magnetic loop systems ;
- Accident emergency assistance systems for alerting the police.

2) **Road Information Monitoring Systems**

Road information monitoring systems include the followings:

- Engineer operators for control and coordination of sophisticated computer programs
- Engineers for controlling traffic regulation systems
- Automatic systems for multiprogramming a number of roads and crossroads
- Plans for traffic lights are put in the memories of central computers and run for differentiation of different periods of the day.
- Computer-coordinated traffic lights for large cities
- Traffic regulation systems equipped with television closed circuits for keeping operators current on traffic situations
- Terminal decoders that recover information by voice synthesis
- Road police for handling accidents
- Speed measuring devices for speed control
- Schedules for making regular rounds of road sections to monitor state of deterioration
- Programming of road work and monitoring of execution thereof by road agencies
- Terminals of operating systems. There are many of them, and they are to be found in every European country nowadays. Transnational highways are managed by common systems such as RDS/TMC, GSM, CARMINAT, EUROSCOUT, etc.
- Road agencies, which furnish detailed information on the state of the roads under their management by local radio and television and prepare substantial works
- Vehicle counting and weighing campaigns for verifying the results obtained by electronic devices (cameras, optical cables, etc.)

- In situ verifications of satellite video images of serious accidents, floods, landslides and rockfalls, aquaplaning, skidding, etc.

2.5 Machines and Installations necessary for Implementation of the Work

A light brigade charged with maintenance of paved roads, which is a special unit specifically for maintenance and repair work on roads with bituminous surfacing, has to have the necessary minimum of equipment and personnel, for example:

2.5.1 Type and Assignment of Machines

2.5.1.1 Transport of Materials:

No.	Designation	Summary characteristics	Quantity	Functional operations
01	Liaison vehicle	Double-cabin 4 x 4 pick-up	1	Mobility of brigade foremen
02	Motorized wheelbarrow (dumper)	1.5 m^3 bucket	1	Movement of materials within the work area
03	Agricultural tractor + trailer	• 75 hp motor • 4 t tipping tractor	1	Movement of materials and removal of work waste
04	Towable water tank	Capacity: 4 m^3	2	Reserve of water at the work site for use in the work
05	Dump truck	Capacity: 20 t	1	Transportation of materials from quarries to work sites
06	Water tank truck	o 145 hp motor o 12 m^3 tank	1	Transport of water

2.5.1.2 Compacting Equipment

No.	Designation	Summary characteristics	Quantity	Functional operations
01	Smooth-drum vibrating roller-compactor	Capacity: 8-12 t	1	Compacting of materials (base and surfacing courses)
02	Tire roller-compactor	Capacity: 10 t	1	Finishing of the surfacing course by compacting
03	Manual 2-drum mini compactor	Capacity: 1.5 t	1	Compacting of isolated spaces and spaces bordering the road edge
04	Plate compactor	Capacity: 250 kg	2	Compacting of isolated spaces and spaces bordering the road edge
05	Frog compactor	Capacity: 50 kg	1	Compacting of targeted small spaces

2.5.1.3 Clearing Equipment

No.	Designation	Summary characteristics	Quantity	Functional operations
01	Motor pump	Capacity: 2''	2	Removal of water on spaces that work is to be done on
02	Sweeping truck	Bin capacity: 8 m^3	1	Cleaning of road surfaces
03	Hydro-emptying truck	o 225 hp drive motor o 72-90 bar auxiliary hydraulic motor o 2-compartment tank: – 9 m^3 1st compartment for evacuated mud – 3 m^3 2nd compartment for service water for the gutter unstopping monitor	1	Unstopping of gutters and underground mains
04	Backhoe loader	o 135 hp motor o 1.2 m^3 front bucket o 0.50 m^3 rear bucket	1	Loading and mechanical excavation of targeted spaces
05	Road grader	o 245 hp motor o 3 m blade o 5-tooth scarification ramp	1	Leveling of surfaces in preparation for application of different courses of the road structure

2.5.1.4 Concreting Equipment

No.	Designation	Summary characteristics	Quantity	Functional operations
01	Towable autonomous mixer	Capacity: 500 l	1	Preparation of concrete
02	Autonomous motor-driven concrete mixer	Capacity: 1,500 l	1	Preparation of concrete
03	Autonomous concrete vibrator		3	Concrete Finish

2.5.1.5 Asphalting Equipment

No.	Designation	Summary characteristics	Quantity	Functional operations
01	Autonomous melter with heating by fuel nozzle	Capacity: 4 m^3	1	Preparation and movement of emulsions
02	Asphalt distributor truck	Capacity: 8-10 m^3	1	Preparation of emulsions
03	Multi-purpose truck	8 m^3 thermal tank	1	Asphalt repairing in point-in-time mode
04	Mini finisher	o 7 m ramp o 185 hp motor	1	Asphalt reinforcement on large deteriorated spaces
05	Work site compressor + jackhammer	Service pressure: 12-16 bar	1	Stripping and other surface excavation work connected with clearing
06	Circular saw	Capacity: 8-10 m^3	2	Stripping of asphalt and cutting of concrete

2.5.1.6 Quarry Industrial Installation

- Mini crusher with a capacity of 10 tons per an hour

2.5.1.7 Equipment and Apparatus Indispensable for Inspection, Collection of Road Data and Laboratory Tests

- **Mapping**
  - Helicopter drone
  - eBee drone
  - Helicopter drone (multiple functions)
- **Hydraulic Studies**
  - Velocimeter
- **Geotechnical**
  - Dynamic penetrometer (10 kg, 15 kg, etc.)
  - 'Swiss plate'
  - Benkhelman beam
  - Gamma density meter
  - RIS ONE (measurement of differential settling)
  - 'Aladin'
  - HWB
  - IRI
  - HIPAV
  - Lidar
- **Technical inspection of civil engineering works**
  - Mechanical sclerometer
  - Digital sclerometer
  - Concrete scanner (sonic transducer)
  - Microscope for cracks
  - Hi-Bright RIS: scanner for concrete structures
  - FOIESCAN (detection of reinforcing rods) (HILTI)
  - Helicopter drone
- **Topography and routes**
  - Complete differential GPS (Stonex x S4)
  - 3D civil software and Geomensura (TOPO)
  - Total station (TS 5, TS 6, TS 9)
  - Lidar
- **Traffic counts**
  - Cable counter
  - Lasar counter (WAVETEC)
  - Traffic simulation software (AIMSUN)
- **Detection of underground networks**
  - RD 7000
  - RD 9000
  - Opera duo 2 Wheel

2.5.2 Personnel

Regarding personnel, the number of staff to be mobilized will vary according to the case and will depend on the volume and nature of the work to be performed. In general, a light unit should include:

- A site manager;
- Two team leaders;
- A liaison vehicle driver;
- A truck driver;
- A driver of the spreader;
- A vibrating compactor operator;
- A grader driver;
- A backhoe loader driver;

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- A paver driver;
- Two skilled workers;
- Three unskilled workers;
- A mechanic repairing machinery.

2.6 Planning and Implementation of the Work

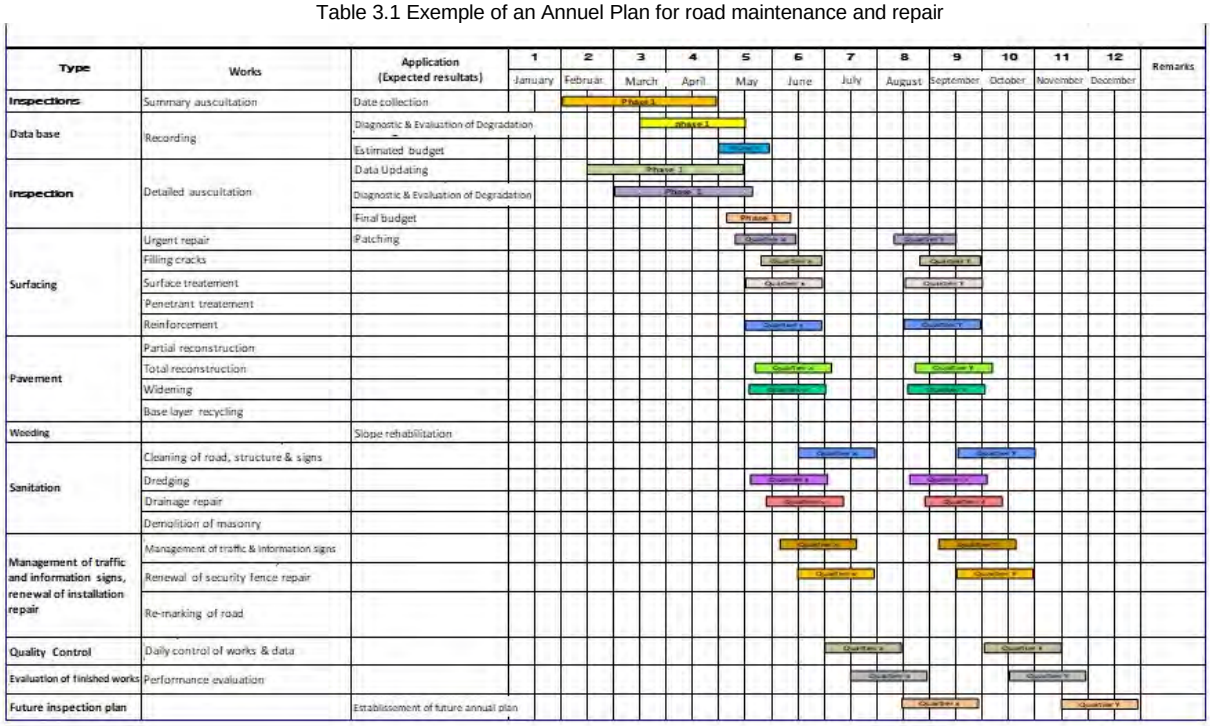
The work will be done with strict observance of the time allowed in the planning and of road safety.

Considering that the work is to be done efficiently on roads open to traffic, particular attention must be given to the synergy to be put in place between the police, road users and those who live or work along the road.

MANUAL FOR MAINTENANCE AND REPAIR OF ASPHALT PAVED ROADS

CHAPTER 3
PLANNING AND IMPLEMENTATION OF WORK

Table 3.1 Exemple of an Annuel Plan for road maintenance and repair



Type	Works	Application (Expected resultats)	1 January	2 Februar.	3 March	4 April	5 May	6 June	7 July	8 August	9 September	10 October	11 November	12 December	Remarks
Inspections	Summary auscultation	Date collection		Phase 1											
Data base	Recording	Diagnostic & Evaluation of Degradation				Phase 2									
		Estimated budget													
Inspection	Detailed auscultation	Data Updating		Phase 1											
		Diagnostic & Evaluation of Degradation			Phase 2										
		Final budget					Phase 3								
Surfacing	Urgent repair	Patching													
	Filling cracks														
	Surface treatement														
	Penetrant treatement														
	Reinforcement														
Pavement	Partial reconstruction														
	Total reconstruction														
	Widening														
	Base layer recycling														
Weeding		Slope rehabilitation													
Sanitation	Cleaning of road, structure & signs														
	Dredging														
	Drainage repair														
	Demolition of masonry														
Management of traffic and information signs, renewal of installation repair	Management of traffic & information signs														
	Renewal of security fence repair														
	Re-marking of road														
Quality Control	Daily control of works & data														
Evaluation of finished works	Performance evaluation														
Future inspection plan		Establissement of future annual plan													

Note :
This schedule is illustrative: The types of work and their applications are carried out according to this manual. However, the illustrated deadlines for the different activities are indicative and must be complemented annually. The activities planned for each year will be detailed in the monthly schedule.

3.1 Overwiew

Since road maintenance and repair involve a wide variety of work but is small in scope, it is therefore necessary to make a work program for an effective implementation of maintenance and repair.

However, as road maintenance and repair are generally carried out on roads in use, it is then important that watchful preparation and care, including consultation with the road traffic control authority, coordination with companies operating the right of road and the information on residents, are required.

3.2 Work Planning

3.2.1 Plan of Work

The following will be used for the development of the work plan : previous maintenance and repair work, the coating and structure register, traffic survey, climate data and others.

3.2.2 Annual Plan and Monthly Plan

3.2.2.1 Annual Plan

The annual plan shall be made in a way that works are not done at the same period while taking into account the appropriate repair, the appropriate period, according to the type of work and the available financial resources.

The methodology for establishing the plan is as follows :

i) Select the most appropriate and effective period, taking into account the particularity of the work, the traffic situation and the environmental situation of the sites ;
ii) Effectively and rationally allocate equipment and personnel ;
iii) Establish a plan adapted to the climatic conditions of the region ;
iv) Early maintenance of the pavement throughout the year to prevent deterioration of the seal and / or crack and irregularity of the pavement from rapid degradation after rain ;
v) Establish an appropriate plan for the repair and cleaning of the drainage system in order to prevent water from stagnating on pavement and consequently the claims of the local residents, if the sanitation system do not operate properly in rainy weather ;
vi) Monitoring and evaluation of planned work.

3.2.2.2 Monthly Plan

The monthly plan help planning works on a daily basis from the reception of the annual plan. Particular attention will be paid to :

vii) Monthly dispatch the annual volume of work ;
viii) Ensure traffic continuity (police, diversion, traffic signs, etc.) ;
ix) Take to account of noise and vibration when choosing the type of equipment involved in the work ;
x) Regularly update the monthly plan in case of changes in the type of work.

The Tables 3:1 and 3:2 illustrate clearly the Annual and Monthly Plans.

3.3 Arrangements to take before the Implementation of the Works

In the case that some measures have to be taken while taking into account the implementation of maintenance and repair works, it is important to list them clearly. Impacts on current traffic will be minimized as much as possible. The procedure to minimize these impacts is as follows:

1) Consulting the Traffic Police
The following points shall be defined: Periods and work schedule, type of works, diversions.

2) Sensitization of Road Users and Local Residents
Road users and local residents should be informed about the description of the works, the period of work, possible diversions, etc. It will be a matter of making the residents understand the importance of the work to be carried out. In the event of traffic restrictions, provide for a diversion and prior notification to road users via media to avoid disturbance.

3) Inspection of Underground Utilities

Particular attention will be paid to the prevention of accidents through consultation with road users and local residents in the presence of some observers. Some road inspections are carried out if necessary in order to verify the position and depth of the underground utilities.

4) Sensitization on Environmental and Social Impact
Explanations will be given to local residents and road users if noises and vibrations are inevitable. In this case, it will be necessary to make the local residents and road users understand the importance of this work in order to obtain their support.

5) Meetings with Work Officials
Before works begin, meetings will be scheduled between the supervisory staff and the work officials in order to discuss the conditions for the implementation of the works under better conditions.

6) Work Guidelines
The supervisory staff will inform the workers of the content of the work on the same day through the work officials. Indeed, the work guidelines shall provide a flexible approach for risk preventions, unforeseen disasters and accidents.

7) Worker Risk Prevention
Controllers will be assigned to regulate traffic during work. In the case of night work, it will be desirable to provide lighting equipment. Particular care should be put on workers' dress (wearing uniforms, work boots and work helmets).

8) Work Sites Organization
Aggregate and other materials will be temporarily stored in certain construction site places. Any other material from the preparatory work shall be quickly evacuated from the work area.

During the execution of coating, the following provisions must absolutely be taken :

- o select the locations of materials' temporary or permanent stores ;
- o take drainage measures to prevent the aggregates from being carried away by the water;
- o make safety arrangements for bitumen facilities (bitumen heater, bitumen storage) ;
- o have absorbent products in the work site in case of toxic spills ;

Table 3.2 Exemple of a Monthly Plan for road maintenance and repair

Type	Works	Application (Expected resultats)	1 Mon	2 Tue	3 Wed	4 Thu	5 Fri	6 Sat	7 Sun	8 Mon	9 Tue	10 Wed	11 Thu	12 Fri	13 Sat	14 Sun	15 Mon	16 Tue	17 Wed	18 Thu	19 Fri	20 Sat	21 Sun	22 Mon	23 Tue	24 Wed	25 Thu	26 Fri	27 Sat	28 Sun	29 Mon	30 Tue	31 Wed	Remarks
Inspections	Summary auscultation	Date collection																															
Data base	Recording	Diagnostic & Evaluation of Degradation																															
		Estimated budget																															
Inspection	Detailed auscultation	Data Updating																															
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Surfacing	Urgent repair	Patching																															
	Filling cracks																																
	Surface treatement																																
	Penetrant treatement																																
	Reinforcement																																
Pavement	Partial reconstruction																																
	Total reconstruction																																
	Widening																																
	Base layer recycling																																
Weeding		Slope rehabilitation																															
Sanitation	Cleaning of road, structure & signs																																
	Dredging	Cleaning of sanitation facilities																															
	Drainage repair																																
	Demolition of masonry																																
Management of traffic and information signs, renewal of installation repair	Management of traffic & information signs																																
	Renewal of security fence repair																																
	Re-marking of road																																
Quality Control	Daily control of works & data																																
Evaluation of finished works	Performance evaluation																																
Future inspection plan		Establissement of future annual plan																															

Note:
This schedule is illustrative: The types of work and their applications are carried out according to this manual. However, the illustrated deadlines for the various activities are indicative and must be complemented monthly on the basis of the overall programming presented in the annual planning.

- prepare a suitable safety sign ;
- avoid carrying out works in villages on market day.

At the end of the works, the company shall pull down all the necessary work to restore the premises. The company shall refold all his equipment, machines and materials.No equipment nor materials can stay on or near the site.

After the material has been pulled down and the remaining materials have been removed, a report of the site restoration must be written and sent with the report for the receipt of works.

3.4 Construction Site Log

This is a document in which all the daily important information on activities related to the work progress are recorded, such as :

- personal staff number ;
- quantities of the materials supplied ;
- available materials ;
- atmospheric conditions ;
- authorities' inspection visits ;
- information on the carried out works ;
- any other information relevant to the site (accidents, illnesses, disturbances, strikes, roles, etc.)

This compulsory site document must be signed everyday by the contractor and the control mission and work supervision.

3.5 Daily Attachment

This is a document in which the quantities actually carried out during a working day are entered. It also contains the following information :

- contract object ;
- contract reference ;
- delegated client ;
- contract holder ;
- works starting date ;
- require time for completion ;
- works hours ;
- weather conditions ;
- site of work execution ;
- number of personal staff involved in the execution of works ;
- work carried out ;
- materials supplied;
- assigned equipment.

CHAPTER 4
ROAD SECURITY AND ENVIRONMENTAL MEASURES

4.1 Overview

As part of the achievement of maintenance and repair, it is necessary to analyse the flow of traffic, to examine the stretch of places and road width as well as the times of work to select the best method with regard measures the traffic management.

To extend that the maintenance and repair will be carried out on the roads open to traffic, it is important thus ensuring the security of workers during the execution.

In order to fix the ideas, it is necessary to well identify the terms relating to the road safety as danger, risk, incident, accident.

4.2 Definitions of some concepts

1) Danger

A danger is a property or intrinsic capacity by which one thing is likely to cause injury, damage or loss.

2) Risk

A **risk** is the probability that a danger manifests itself to a level of intensity or severity given vis-à-vis the people, goods exposed or an environment to preserve.

3) Incident

An incident is an undesired event that, under conditions slightly different from accidents, could result in a body lesion for people, property damage or loss in a manufacturing process.

4) Accident

An accident is an undesired event causing body lesion to people, damage to property or loss in a manufacturing process. Risk is therefore a threat that, with some probability of occurrence, may be harmful consequences and undesired.

Thus, it appears required to identify before and during the work, the security risks for the staff as well as road users and residents.
It is necessary to set security plan to allow that works occur in compliance with the imposed security measures.

4.3 Preventive measures of accidents at work

4.3.1 Safety Staff

Dispositions to be taken before the implementation of work

Measures to be taken on the occasion of the implementation of maintenance and repair are as follows:

- ***Daily Meetings on Worksite***

Daily meetings on worksites shall be held every morning before the work. Particular attention must be drawn to staff on the risk of tasks to execute the day and the practical dispositions to be taken to avoid those risks. The meeting shall be held by the worksite chief.

- ***Consultations with the Police***

The police authorities should be informed and associated by the administer in the execution of the work regarding the work period, time zone, kind of the works and diversion. The support of the police will comprise security and regulation of traffic in the area of work.

- ***Informing the Road Users and Residents***

The road users and residents must be informed regarding the execution of the work. For this purpose, to ensure that the area of the work is clearly delimited by means of signs, to implement specific element of signalization if necessary

4.3.2 Safety for Equipment

The damaged equipment should be prohibited to mobilize on site. The manager of the work must make sure of the good condition of equipment available before authorizing its usage by a staff member of conduct assigned. Condition of the equipment on the worksite must be in accordance with the planning of work.

Related to safety for equipment, measures to take on the occasion of the maintenance and repair implementation are as follows :

- All machines must be equipped with fire extinguishers;
- filling of fuel tanks must be done when engine are stopped and in particular before the work begin in the morning. If the tank capacity does not allow to work all day without hkkrefuel, it is necessary to ensure when filling that fuel is not in contact with the burning elements of the machine. Smoking shall be prohibitated in the storage areas and manipulation of fuel and lubricants;
- Make sure that the equipment is in good operating condition before commencement of work;
- Never use of water for the extinguisher purpose in case of fire originated from the derivatives of petroleum products (bitumen, fuel and lubricants, etc.); petroleum products and water being enemies. Even a little quantity of water causes dangerous projections of bitumen at a high temperature;
- put out the surfaces in fire by using the provided sand or the powder extinguisher or CO2.

4.3.3 Safety of the Work Area

To avoid the inherent risks at work, including those due to traffic, in contact with the underground utility, to the loss of machine control, to the clashes with workers or passengers and with vehicles, facades or various objects, it is necessary to take some suitable measures for the conduct of work.

Measures to be taken on the occasion of the implementation of maintenance and repair work are as follows:

- Signals and the boundary of the work area are properly arranged;
- There should be enough space for equipment and materials movement at the work area in order to avoid accidents;

- Equipment and machines must be regularly checked and properly maintained and keep in the parking beforehand arranged;
- Underground utilities are clearly identified;
- The electric cables and other obstacles are reported;
- Pedestrians, visitors and vehicles are excluded from the equipment workspace;
- Barriers limiting the workspace are reported to passengers.

4.4 Schedules for Implementation Work

4.4.1 General considerations

Schedules will be decided by taking into account the following points :

- Schedules work will be established according to evaluations of the traffic collected at its lowest level of traffic flow. And at the moment of traffic extremely high, it is necessary to provide a diversion or consider night work;
- Noise and those due vibration must be a specific treatment for not disrupt the environment of residents;
- In the case it would be difficult to ensure a safe environment during work; work schedules shall be modified emphasizing the use of machines likely to produce a minimum of noise and vibration.

4.4.2 Schedules for Implementation Work

The points to keep in mind with regard to the schedules for the implementation of maintenance and repair work:

The appropriate work schedules vary depending on the type of work, including :

- Maintenance of asphalt pavement;
- Emergency repairs;
- Cleaning of the asphalt pavement, cleaning water channel;
- Weeding, grading of shoulder.

4.5 Sign Boards, Facilities and Safety Devices

4.5.1 Sign Boards

Traffic signs board mentioned "road blocked", "slow down", "deviasion," etc. will be installed on the sites of work.

Examples for reference

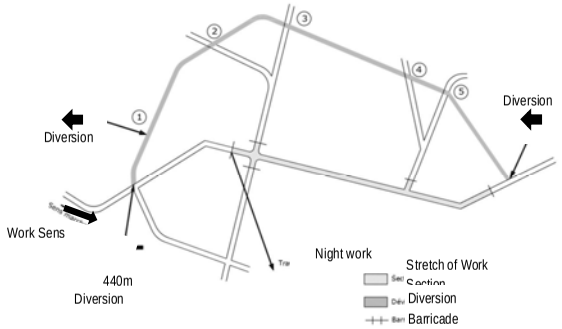

Figure 4.1 Examples of the diversion plan of the road

4.5.2 Traffic Control Person

Traffic control person will be affected on the work sites to ensure road safety and workers. Red and Green flags shall be provided.

Figure4.2 Sight of a servant to the road traffic

4.5.3 Istallations of Safety Borads

Lopes and other tools will be used to delimit the trenches of excavation in order to prevent any foreign person to the worksite may not in approach.

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Figure4.3 Sight of installation road safety

4.5.4 Traffic Regulation During the Work

Example 1: Closure traffic to 2 lanes consist of 4 lanes road :

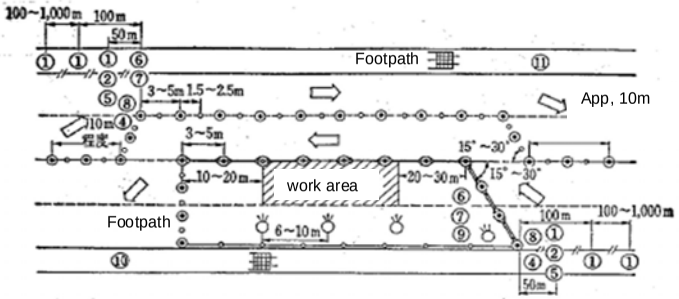

Figure 4.4 Example of one-way traffic closure for a 4-lane road

Remarks :

Concerning the number and spacing of the panels ①are determined according to the traffic and other conditions of the project ;

In case of the daytime work will not use lighting lamps or safety lighting;
If the work areas are close, we will have the sign ⑩ in front of the first work area or after signs ⑥ and ⑦, after the last area.

Example 2: closure traffic to 1 lane consist of 2 lanes road :

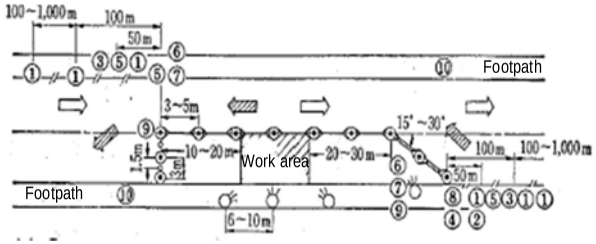

Figure 4.5 Example of closure traffic to 1 lane for 2 lanes road

Remarks:

Concerning the number and spacing of the panels ①are determined according to the traffic and other conditions of the project ;
In case of the daytime work will not use lighting lamps or safety lighting;
Traffic personnel or traffic sign shall be arranged light according to the length of the working zone.

(Legend)

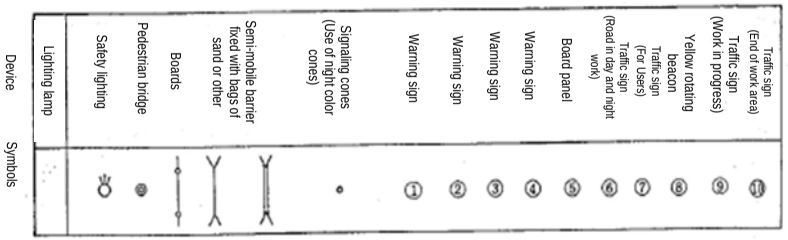

Figure 4.6 Example of the safety signs during work on a road section
(Example for reconstruction work of the road surface at night)

4.6 Environmental and Social Measures

Environmental and social measure are to eliminate, to mitigate or compensate unavoidable residual impacts in the light of various environmental issues on asphalt repair works.

The main mitigation measures of these impacts during the maintenance work are mentioned in the table below :

CHAPTER 5
DIURNAL AND NOCTURNAL PATROL

Table 4.1 Mitigation measures for environmental and social impacts in the case of maintenance work on an asphalt road

Specific activities	Potential impacts	Mitigation measures of negative impacts
Mechanical Works: (Compaction, loading, transport of materials, ...)	- Air pollution through the flight of dust (respiratory diseases); - Air pollution by issuing toxic gases and greenhouse gas emissions (CO_2, CO, NOx, Pb, ...); - Noise pollution by the noise of vehicles and equipment; - Risks of soil erosion phenomena; - Modification of structure and soil characteristics; - Environment disfigurement by mountains of aggregate, trashes and other construction materials; - Risk of accidents during work; - Nuisance related to vibration: • Harm to the health and welfare of the local residents; • Dysfunction of electronic equipment; - Risk of disruption of the local traffic and extra caused by: • Possible diversions of traffic related to the success of the work at the worksite.	- Regular watering of different layers and wearing masks by the workers against dust; - Possession of absorbent products allowing to bearing the accidental spill cases of toxic products. - Wearing ear muffs and installing noise barriers - Prohibit the spill of vehicles and equipment along the road or on the soil road; prohibit also maintenance and cleaning of equipment on the worksite; - Maintain vehicles and machinery in good operating condition without oil leaks; - Avoid fuel supply in the worksite or near watercourses; - Provide on the site the bins storage to avoid at any spill pollutant products. - Equipment and adequate materials to workers (helmets, boots, gloves, cache-nose, appropriate working uniform)
Application of Hot Asphalt	- Air pollution by: a) The emission of toxic gases and greenhouse gas emissions (CO_2, CO, NOx, Pb, ...) and b) The flight of dusts (respiratory diseases) - Burns	- Wear of dust mask by workers who must be supplied by the company; - Useful equipment and materials to workers (helmets, boots, gloves, nose mask, appropriate working uniform) - Sensitization to workers by the worksite chief regarding the precautions to take for the application of hot asphalt mix.

5.1 Overview

5.1.1 Purpose of Patrol (Visual Auscultation)

a) Main Purpose

For road users can use the road safely and securely, To confirm road condition, road facilities condition and roadside condition.

b) Specific Purposes

(i) Record the condition of the pavement surface and its outbuildings;
(ii) Collect all information (types and causes of degradations, etc.) on the pavement condition for the road history and Database update;
(iii) Make the maintenance plan according to the inspection outcome.

5.1.2 Types Patrol

Depending on the nature of the degradations, two types of Patrol can be distinguished :

Summary and detailed Patrol:

- **Summary Patrol :**

  Carried out in a non-exhaustive way by a maintenance team.

- **Detailed Patrol**

  Perform in-depth by a team of qualified agents with specific equipment.

The Patrol is classified according to the timing of implementation as follows:

- **Daily Diurnal Patrol :**

  Perform in daytime by maintenance team by visual.

- **Daily Nocturnal Patrol:**

  Perform in the night time by a maintenance team in order to control the visibility, particularly road lighting and the traffic signs.

- **Periodic Patrol :**

  Carried out periodically according to a period defined depending on the meteorological, environmental and traffic conditions.

- **Emergency(Urgent) Patrol :**

  Carried out in case of emergency phenomena strongly disrupting the traffic occur (torrential rains, earthquake and other natural calamities). This patrol is carried out in order to help the implementation of appropriate disaster prevention measures and post-disaster reconstruction.

5.1.3 Patrol Staffs Training

Patrol plays an important role in the maintenance and management of pavement. The essential points must be defined and the inspection staff must be knowledgeable with the objectives and methods of this work.

Concerns about the patrol work is patrol staff as gain more experience. Patrol staff sometimes become less careful. So, upgrade training will be conducted once or twice a year.

5.2 Daily Diurnal Patrol

5.2.1 Points to Inspect

The main points to be inspected in daily and diurnal patrol are as follows :

- Pavement condition : dirt and damage on the surface of pavement;
- Condition of the verges : difference of the level between the pavement and the verges of the road as well as the degradations observed along the latter;
- Condition of the sanitation system: dysfunction and the structural elements rupture of the sanitation works;
- Stability of slopes: risks of sliding slopes, falling stones, etc. ;
- Road security facilities : security slides, lighting, road signs and other related facilities;
- Uncontrolled use and use of the right-of-way: terraces, garages and makeshift markets, etc.

5.2.2 Frequency of Patrol

The frequency of these patrols shall be determined in advance. The frequency decision will take into account the importance of the road, the condition of the pavement, the number of years in use, etc.
For information, the patrol can be carried out in about once a month.

5.2.3 Planning and Implementation of Patrols

1) Planning of Patrols

The objectives of inspections will be defined by making the weekly or monthly patrol planning.

2) Teams Composition

More than two people per team. When implementing maintenance work, increase members.

3) Report on Patrols

Before departure, the patrol team will receive necessary instructions from the supervisor after reporting the including area to inspect, the main points to check, the itinerary and the estimated time of return to the office.

Upon completion of the inspection, the patrol team will report to the supervisor by recording all the observed elements in the diary or inspection sheet.

4) Equipment and supplies

According to the need, the patrol team will bring with them a set of equipment including :

- a notebook ;
- a pen and / or pencil;
- a road map ;
- signaling cones;
- a cyclometer;
- a length measuring instrument;
- a camera ;
- a lineajr diagram, etc.

5.3 Night Patrol

5.3.1 Points to Inspect

Main points for the inspections of nocturnal patrol :

- Condition of road lighting facilities;
- Condition of road signs (horizontal and vertical).

5.3.2 Frequency of Patrol

The frequency of nocturnal patrol shall be treated in accordance with the above point 5.2.2 and shall also consider the nocturnal traffic throughput.

In general, the nocturnal patrol is carried out in the jurisdictional area one cycle in about two weeks to one month.

5.3.3 Planning and Implementation

The planning and implementation of nocturnal patrols will be done in accordance with those of diurnal patrols.

5.3.4 Equipment and supplies

It should be *noted that nocturnal patrol* requires appropriate equipment, such as a fluorescent pattern, a patrol vehicle, etc.

The patrol team will bring the following equipment, as required:

- Notebook ;
- pen and / or penci l;
- road map ;
- signaling cones ;
- cyclometer ;
- cameras ;
- distance-meter ;
- linear diagram ;
- torches ;
- Surveillance vehicle spotlights.

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5.4 Periodic Patrol

5.4.1 Points to Inspect

The main points to inspect are the damage and aging standard of pavement surfaces, structure of the road structures (bridges, tunnels, culverts, etc.), road facilities (road lighting, sanitation facility, Security, etc.). These will be divided into daily and diurnal inspections and periodic ones as described in each related subchapter.

5.4.2 Patrol Frequency

The frequency of implementation of the periodic patrols will be decided according to the type of works after evaluation of the structure importance, their condition of aging, the degree of impact on road users in the case of damage to structures and by level of difficulty of repair works.

5.4.3 Planning and Patrol Implementation

The following points will be developed with a particular attention in the context of planning and implementation of periodic patrols :

- Periodic patrols are mainly concerned with the implementation of detailed inspections of roads. Except on the which inspections will be essentially carried out by engineers;
- Inspection maps will be developed for each location to be inspected. Special care will be put on a delineation on the plan, dangerous areas;
- The inspections outcomes shall be reported in writing to the superior;
- In the case that an anomaly is observed during an inspection, a detailed and deep study, depending on the extent of the anomaly, should conducted;
- The inspection period also depends on the type of the road concerned. For example, embankments and sewage works shall be inspected before the rainy season.

5.5 Extraordinary Patrol

5.5.1 Points to Inspect

Places potentially sensitive to natural phenomena should be inspected as the case of extraordinary patrol. However, a synoptic study should be carried out in advance in order to name the particular points to be inspected and targets for inspections.

5.5.2 Implementation Period(s)

Extraordinary patrols are implemented on case-by-case according to the needs. Thus, this may be carried out in the following cases:

- in the case of an assessment of the implementation of traffic control;
- in the case of suppression of traffic control;

However, if a disaster has already occurred, the traffic control will be implemented immediately. The patrol frequencies for the suppression of traffic control will be minimal.

Moreover, during an earthquake of a certain magnitude expressed on a given scale, patrols will be organized in order to inspect the damage in terms of rock fall, landslide and embankments at the slope at risk in works and dangerous areas, depending on the size of the earthquake.

5.5.3 Patrol Implementation

The following points will be developed with a particular attention in the context of implementation of the extraordinary patrol:

- During the patrols, the communication with the base shall be ensured at all times and the adopted chain of command shall be that of the superior giving instructions to his team ;
- Since extraordinary patrols are often necessary for emergency measures and involve, as appropriate, the implementation of traffic control. It is necessary to provide adequate barricades, road signs, etc. ;
- If the incident is likely to pose a risk to the population, measures will be taken to inform and evacuate the residents;
- The patrol staff shall record the situation of the traffic control, the situation of implementation of the emergency measures, etc. immediately after his round in the diary or the provided sheet.

MANUAL FOR MAINTENANCE AND REPAIR OF ASPHALT PAVED ROADS

CHAPTER 6
MAINTENANCE METHOD

6.1 Overview

The present chapter concerns:

- Identifying different types of deterioration of asphalt-paved roads, definition thereof, their causes and how they are treated;
- identifying common road drainage works, their respective degradations and treatments;
- Procedures to analyze and study deteriorations of the road surface noted in daily and periodic technical inspection;
- Maintenance planning and choice of the method of repair best suited to the cause and/or state of the observed deteriorations.

It should be noted that deterioration is defined as a decline in the structural performances of the road for various reasons (aging, aggressiveness of external influences, poor operational use, etc.)

6.2 Diagnosis

To be able to proceed to maintain and repair the road surfacing effectively and economically, there is a need to precisely analyze the deterioration of the surfacing and its underlying courses (roadbed(Subgrade), subbase course and base course).

6.2.1 Objectives

The objectives are:

- to analyze the type, extent and causes of the deterioration of the surfacing so as to determine the most appropriate maintenance and repair method;
- to draw up a maintenance and repair program.

6.2.2 Diagnosis of the Road Surface

Examination of the road surface essentially involves visual observation and a detailed technical inspection of the road to identify deteriorations such as those described in 6.3, Table 6.1.

6.2.3 Diagnosis of the Road Structure

This means examining the internal state of the courses constituting the road (surface, base and subbase courses) to evaluate deflections and the state of the road structures via deflection measuring by Benkelman beam, curviameter, falling mass deflectometer, Lacroix deflectometer and coring tests.

6.2.4 Diagnosis of road sanitation works

The first road sanitation devices were designed to remove water from the road, both for the comfort of users and for the durability of structures.

Draining the road structure, the subgrade and the subbase is a goal often mentioned, because any professional of the road knows well that "the water and the road do not mix well".
Runoff water on the surface of the roadway causes a significant drop in the level of service offered to the user. The water contained in the structure of the pavement which comes from

infiltrations of various origins is a decisive element of the acceleration of the deteriorations of the structures of the road.
It will be a question of examining the maintenance and the good functioning of the sanitation works in order to note the different degradations and / or dysfunctions.

6.3 Classification of Road Deteriorations

To draw up a maintenance and repair program, it is necessary to check whether the causes of the deterioration are attributable to the surfacing course or to be found in the underlying courses.

Deteriorations are therefore classified into two categories from the perspective of their origins:

- Surface deteriorations :
  They can be found in the surfacing course and are essentially due to the poor properties and/or application of surfacing.
- Structural deteriorations :
  These are deteriorations resulting from inadequate structural capacities of the road. In other words, they are all of the other deteriorations due to different causes affecting the courses underlying the surfacing course.

  The following four (4) large families of deteriorations are distinguished from the perspective of their manifestations:
  - Deformations
  - Cracks
  - Stripping and tearing
  - Rising or movement of materials

These deteriorations are defined and classified in Table 6.1 below:

Table 6.1 Classification of Deteriorations of Road Surfacing

Types of deterioration of asphalt-paved roads		
1. Surface deteriorations	Localized cracks	Fine/Hairline cracks
		Linear Crack/(Longitudinal cracks, Transverse cracks)
	Gaps/Faulting	Gaps with structural elements/ Irregularity in the vicinity of structures
	Deformations	Ruts/Rutting
		Rippling/Corrugation
		Swelling
		Settling/Hollow
		Flushing
	Stripping and tearing/Abrasion	Fretting/Raveling
		Glazing/Loss of skid resistance
		Patch stripping/Exfoliation
	Collapsing/Disruption	Potholes
		Removal of surfacing material/Stripping
		Wear/Aging
	Others	Catching/Scrach
		Blistering
2. Structural deteriorations	Generalized cracking /Wide range of cracks	Alligator cracks
	Structural Deformation	Ruts

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		Subsidence
		Depressions
	Others	Pumping

Remarks:

- If insufficient bearing capacity is feared because of the appearance of cracks and ruts associated with settling, the road structure should be studied**.**
- When studying the structure, direct confirmation of the extent of the deterioration is frequently obtained by coring or a falling weight deflectometer (FWD[13]) investigation , which allows the condition of the subbase course and/or base course to be assessed nondestructively.
- When examples of previous similar deteriorations and data on them exist and the types and causes of deterioration can be determined by studying the road surface, the study of structure can be dispensed with.

6.3.1 Surface Deteriorations

"Deteriorations due to the properties of the surfacing course" essentially concern the serviceability of those properties.

They mean direct deterioration of the road environment in terms of ride quality, road safety and user comfort that could shorten the service life of the road.
These degradations originate and evolve in the surface layer.

6.3.1.1 Surface Deteriorations

A. Localized Cracks

These are fine/hairline or linear cracks that appear in a localized manner and openings not more than 2 mm wide. A localized crack is illustrated in Figure 6.1.a and b below. Such cracks can be transverse, longitudinal or oblique.

Figure 6.1.a Fine/Hairline Cracks

Figure 6.1.b Linear Cracks

B. Gaps/Faulting

They are level differences that emerge in contact zones with structures, most often along underground works. They are illustrated in Figure 6.2 below.

[13] Falling weight deflectometer.

Figure 6.2 Gaps/Faulting

C. Deformations

C.1 Ruts/Rutting

They designate, by definition[14], longitudinal deformations of the road, occurring regularly at the most frequent point of passage of the wheels of the vehicles.
This deformation is to be evaluated in both directions but at best in the transverse direction.
There are two types of ruts: small and large radius.
Figure 6.3 better illustrates a case of ruts.

Figure 6.3 Ruts /Rutting

C.2. Rippling (Corrugation)

As shown in Figure 6.4 below, This refers to regular unevenness with a relatively short freaquency in the longitudinal direction of the road.
This deformation is to be evaluated in both directions but at best in the transverse direction.

[14] Laboratoire Central des Ponts et Chaussées, Catalogue des dégradations de surface des chaussées, méthode d'essai n°52, mars 1998.

Figure 6.4 Rippling /Corrugation

C.3 Swelling

Localized swelling on the road surfacing, as illustrated in Figure 6.5 below.

Figure 6.5 Swelling

C.4 Settling/Hollow

Localized hollows on the road surfacing, as illustrated in Figure 6.6 below.

Figure 6.6 Road Settling /Hollow

D. Flushing /Bleeding

Where asphalt rises to the top of the surfacing course, as illustrated in Figure 6.7 below

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Figure 6.7 Flushing /Bleeding

E. Stripping and Tearing / Abrasion

E.1 Fretting /Raveling

This refers to conditions in which aggregate becomes segregated in the surface layer of the pavement and the mortal are separated, resulting in a rough surface , as illustrated in Figures 6.8 and 6.9.

Figure 6.8 Fretting/Raveling

Figure 6.9 Other Example of Fretting/Raveling

E.2 Glazing/Loss of skid resistance

This refers to conditions in which the mortal and aggregate of the surface become smooth due to abrasion, with the surface tending to slippage.

Figure 6.10 Exemple of Glazing

E.3 Patch Stripping/Exfoliation

This refers to the exfoliation of the surface of the pavement due to abrasion from wheels, as illustrated in Figure 6.11 below.

Figure 6.11 Patch Stripping/Exfoliation

F. Aging

This refers to conditions in which the asphalt cement in the asphalt mixture have aged, causing the texture to become rough. A case of such wear is illustrated in Figure 6.12 below.

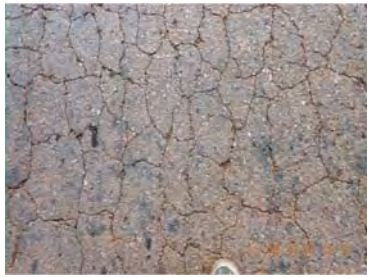

Figure 6.12 Wear/Aging

G. Potholes

This refers to small holes locally developed on the surface of the pavement, as illustrated in Figure 6.13 below.

Figure 6.13 Potholes

6.3.1.2 Structural Deteriorations

a) Generalized Cracking (Alligator Cracks)

Alligator cracks due to the development of cracks as mentioned in 6.3.1.1.A.
That family also includes linear cracks of bridge surfacing, the cause of which is connected with the structure of the deck. That latter case is illustrated in Figure 6.14.

Figure 6.14 Generalized Cracks/Aligator cracks

Figure 6.15 Cracks Observed on the Deck of the N'SELE Bridge on National Route 1

b) Structural deformations (Ruts, Depressions, subsidence, etc.)

These are degradations that occur in the lower layers (the layers underlying the surfacing) and evolve in the surface layer. They are thus manifested on the surface layer in a manner almost similar to those of the surface degradations described previously.

c) Pumping

Water containing fine particles and ejected onto the top of the surfacing at cracks on it.

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Figure 6.16 Illustration of the Phenomenon of Pumping

6.4 Observation of Surfacing

To precisely determine the road condition, there is a need to draw up a checklist of the important points and make observations at the time of inspection to obtain observation notes that are as objective as possible. An example of the key points to be observed is given in Table 6.2 below.

Table 6.2 Degree of Seriousness of the Deteriorations on a Paved Road (depending on the road in question)

Points to be observed (non-exhaustive list) / **Types of roads**	Cracks	Gaps	Rutting	Corrugation	Polishing	Potholes
Roads with a large traffic volume (>3,000 vehicles/day)	○	○	○	○	△	◎
Roads with a low traffic volume (<300 vehicles/day)	○	△	—	△	—	◎

Degree of importance: ◎ : High ○ : Medium △ : Low — : N/A

Note:

This table is given only for reference and the inspector must adapt it to the circumstances of the road in question.
The information connected with this table is as follows:

- Cracks that directly impact on the durability of the road constitute a key element to be observed.
- Gaps cause big jolts of vehicles as they pass and can cause serious accidents, particularly for two-wheeled vehicles.

The shocks caused by vehicles passing over gaps lead to deteriorations in the road surfacing or bridge decks and other road architectural structures.
The shocks also generate noise and lead to the road environment deteriorating, particularly in residential zones, which therefore require the most attention.

- Obvious ruts (including fretting/Raveling, etc.) on roads can lead to splashing and aquaplaning at high speeds when it is raining and even serious accidents. They require the utmost attention since they can lead to drivers losing control of their vehicles.

- Obvious rippling/Corrugation on roads not only detracts from driver comfort but also leads to lower adhesion during braking and causes lateral instability, which seriously jeopardizes safety. The shocks from that cause vibrations and noise and have a damaging impact on road surfacing, bridges and the road environment in general.
- The degree of glazing/polishing is indicated by a skidding friction coefficient. The lower the skidding friction coefficient, the longer the distance needed for vehicles to come to a stop and hence the less safe the road traffic.
- Potholes have a serious impact on passing automobiles and two-wheeled vehicles. Particular attention must be paid to them in inspections since they frequently cause traffic safety problems.

6.5 Investigation of Road Surface

Technical inspections of roads are performed to obtain information on the road condition, the deterioration of the road surfacing and its causes. They take place periodically on all roads as well as being performed on an exceptional basis when anomalies emerge.

On road sections with uniform characteristics, environmental conditions, structure and traffic conditions, the technical inspection can be limited to part of the section and the documents and results extrapolated to cover the whole uniform section.

(1) Cracks

The investigation of cracks is indispensable for understanding the level of damage to the pavement, and for determining the timing, method, and thickness of overlay and/or replacing the damaged area. They must therefore be measured when it is considered that they have spread enough to warrant it. The investigation of cracks will be conducted at the entire section by every 100m. When cracks extend over the same surface of a long stretch of road, the results of the investigation of cracks can be summarized by every 500-1,000m.

Cracks can be measured using either sketches or a road surface condision survey vehicle (continuous photography or crackmeter).

Sketching

The road surface is divided into grids with sizes 0.5m x 0.5m, and sketches of the conditions of cracks are made for each traffic lane.
When the results of the cracking ratio will converge within the range of several percent of the forcasted rates after this inspection method will be conducted repeatedly(it means that each inspector has same evaluation criteria in their minds), the average of the evaluation results by 3-5 inspectors' direct visual inspection can be available as the results.

The rate of cracking is calculated with formula 6.1 below:

$$Rate\ of\ cracking = \frac{Cr + P}{A} x100\%$$

(2) Gaps

Gaps/Faulting are to be measured if the inspectors feels jolty in the vehicle during the inspection. Faulting is measured at the deepest point or at three different points in one lane, with maximum value D (mm), taken as the fault value, as shown in Figure 6.17. The length of the leveling cord should be 10m.

The ability to evaluate the measured value on the basis of a jolt felt makes it possible to rationalize inspections.

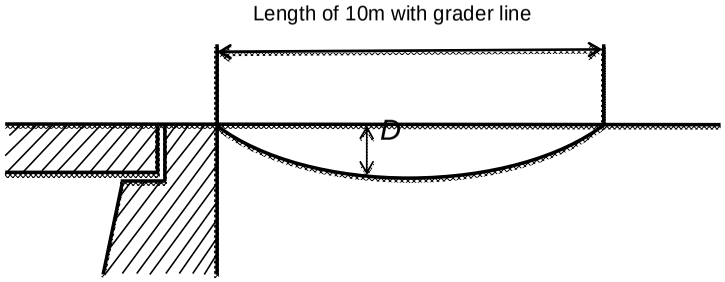

Figure 6.17 Measurement of Gaps

(3) Rutting and Fretting/Raveling

Ruts are measured by 100 m stretches of road for each lane along the inspected section of the road.

When the road surface condition is almost same situation, surface condition can be measured by every 50-100m of a typical stretch (selected as around 1km) and the average maximum values measured at each section is taken as the measured value for the inspected stretch.

At the section before intersection, a stretch of road corresponding to the section of congested traffic (200-400 m) during congestionis to be targeted for the inspection, the measurements being performed every 50-100 m and where the average of the maximum values obtained for the different lengths is taken as the value measured for that stretch of road.

Method of Measurement

D1 and D2 are to be measured with a cord or a straight edge perpendicularly to the axis of the road and for each lane as indicated in Figure 6.18.

Take the measurements in mm. The depth of the ruts is to be taken as the average of the maximum values at each cross section (the larger values D1 and D2).

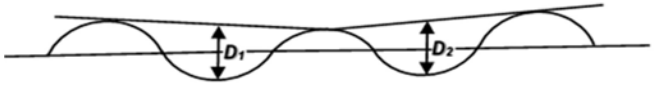

Figure 6.18 Measurement of Ruts

(4) Corrugation

The measurements are to be taken on the stretches of road where rippling/corrugation can be seen, the rippling generally appears on short lengths of road with a gradient of several percent. Such inspection is to be performed on all lanes.

The inspection method is as follows. Use a 3 m straight edge in the road axis and take a vertical measurement D1 from the straight edge corresponding to the deepest point of the rippling, as in (3) above. Then move the straight edge 1.5 m to measure D2 and so on and so forth to measure the rippling over the whole stretch of road, taking values D1, D2, …, Dn, the arithmetic average or standard deviation of which will constitute the value of the rippling.

By making a straight edge equipped with a trestle about 50 mm high at each end, measurements can be taken, even at the highest points.

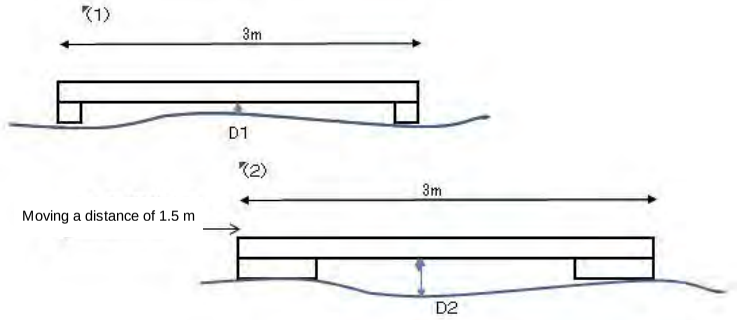

Figure 6.19 Technique to Measure Flatness

(5) Glazing

Lowering the skidding friction coefficient by glazing tends to involve reduced serviceability of the road. However, since that is only problematic at high driving speeds, not many roads need to have it measured. It can be measured by:

- o An adhesion measuring vehicle and
- o A Portable Friction Tester

(6) Potholes and Settling/Hollow

When several potholes or settling places are present, where the average length value or shortest diameter can be measured in centimeters, take down their number, average diameter and depth.

6.6 Road Maintenance and Repair Procedure

The procedure for maintaining and repairing roads follows the organizational chart indicated in Figure 6.20 below.

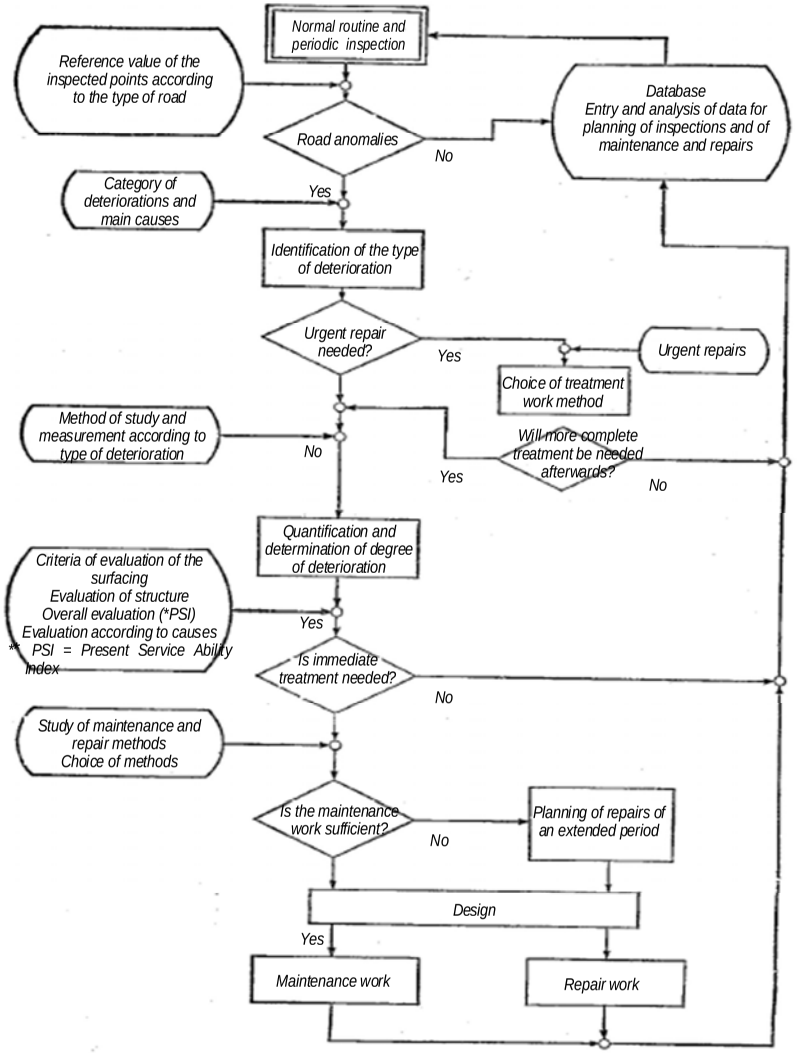

Figure 6.20 Organizational Chart of Road Maintenance and Repair

6.7 Evaluation of Deterioration of the Asphalt Paving

6.7.1 General Information

If the properties of an asphalt-paved road surface change after the road is put in service, the base course and subbase course become susceptible to rain damage and the road's riding quality, safety and comfort could deteriorate. Accordingly, it is crucial to understand the road's characteristics with maintenance and repair in mind. Its weaknesses are in evidence, particularly when it is raining and rain exacerbates the deterioration. Consequently, it is crucial to treat deterioration as soon as it is discovered.

6.7.2 Deterioration of the Asphalt Paving and the Causes Thereof

The key when maintaining asphalt-paved roads is to fully understand the phenomena of destruction of the courses comprising the road and causes thereof. The following four factors interact in the destruction of the road: insufficient bearing capacity of the subbase course, considerable heavy-vehicle traffic, decline in the quality of the surfacing materials and the composition of the road.

The causes of deterioration of asphalt-paved roads are complex because they correlate with the road characteristics and structure and, furthermore, serviceability can decline as a result of deformation of the asphalt mix if the road accommodates considerable heavy-vehicle traffic. Table 6.3 summarizes the types of deterioration and causes thereof.

Table 6.3 Types of Deterioration and Their Causes

Type of deterioration			Main causes
Deteriorations connected mainly with the characteristics of the road	Localized cracks	Fine/Hairline cracks	Poor mixture quality of the surfacing, cracks occurring soon after compacting as a result of inappropriate compacting/ Incorrect temperature during early stages of compaction
		Linear cracks	
		Longitudinal cracks	Poor quality work, uneven subsidence at the joint of cut/embankment settling, Cracks in the subbase and subgrade layers
		Transverse cracks	
		Construction joint cracks	Uneven bearing capacity of the subbase and subgrade layers
			Improper spreading and compaction
	Gaps	Differences in height of structural elements	Poor quality of the compacting of the subgrade, subbase course and/or the asphalt surfacing and Unevenness due to uneven subsidence of the ground
	Deformations	Ruts	Excessive heavy-vehicle traffic volume, poor mixture quality of the surfacing
		Longitudinal deformations/roughness	Poor mixture quality of the surfacing, uneven bearing capacity of subbase and subgrade
		Corrugation	Improper construction of prime coat

		Hollow, swelling, flushing	and tack coatPoor quality of the surfacing (in particular poor quality of the asphalt)
	Stripping and tearing	Fretting/Raveling	Low temperature of laying of the surfacing (under 135° C) Strong penetration of the bitumen used (greater than 80/100)
		Glazing/Loss of skid resistance	Poor quality of mixture of the surfacing or its aggregate
		Patch stripping/Exfolitation	Poor mixture quality of the surfacing or compacting
	Collapses	Potholes	Poor mixture quality of the surfacing or compacting
		Stripping	Lack of adhension between the aggregate and asphalt, impregnation of water into the surfacing
		Aging	Aging of the bituminous material of the surfacing
	Others	Tire marks	Abnormal temperature, poor quality of the surfacing
		Scratch	Accidents, etc.
		Surface blistering	Poor quality of the surfacing, expansion of air trapped under the surface course
	Cracks over the whole road surface	Alligator cracking	Insufficient thickness of the surfacing, inadequacy of the surfacing, the subbase or subgrade, Excessive traffic volu,e. Presence of groundwater.
Deteriorations connected mainly with the road structure	Others	Pumping	Insufficient thickness of the surfacing, Presence of groundwater.

6.7.3 Evaluation of the Road Surface

In practice, three following steps are to be followed in the analysis of the condition of the road[15]:

- o History of the road: which can easily be determined through the road data bank or the various information that can be obtained through research and surveys to be carried out on previous work;
- o Visual inspection: to reveal the visual state of the road and to specify some useful geometric characteristics of the road. The visual state of the road thus detected makes it possible to formulate the first hypothesis on the probable causes of the appearance of degradations namely, if these degradations are due to the weaknesses of the surface layer or the structure;

[15] E.Phanzu, cours d'entretien des routes, inbtp, unreleased, 2018

- o Auscultation: this step makes it possible to measure, in particular, the bearing capacity of the structure and the variation thereof throughout the alignement of the road. Since a flexible pavement is adaptable, its ability to work at punching under an applied load will be measured by the value of the deflection.

After inspecting the asphalt-paved road using measurement instruments:

- o proceed to an overall evaluation of each inspected route or road section;
- o maintain or repair it promptly or with a long-term vision following a determined plan and using a present serviceability index (PSI) calculated in accordance with the formula (6.2) AASHO adapted in Japan below :

$$PSI = 4{,}53 - 0{,}518\ log\sigma - 0{,}371\sqrt{C - 0{,}174\ D^2} \quad (6.1)$$

Where:

PSI : Present serviceability index
σ : Standard deviation of transverse flatness (mm)
C : Rate of cracking (in accordance with formula 6.1)
D : Average rut depth (cm)

The use of that formula requires the procurement of appropriate equipment.

Table 6.4 Techniques to Be Used According to the Present Serviceability Index Tableau

Present Serviceability index (PSI)	**Technique to be used**
Between 3 and 2.1	Surface treatment
Between 2 and 1.1	Overlay
Between 1 and 0	Reconstruction

According to the AASHO standards, we get:

$$PSI = 5{,}03 - 1{,}91\log(1 + SV) - 0{,}01\sqrt{(C + P)} - 1{,}38\ RD^2 \quad (6.2)$$

Where:

PSI : Present serviceability index
SV : Variance in the gradient of the longitudinal profile on the axis of passage of the vehicle wheels

C : Proportion of the surface, in 1/1000%, on which alligator cracking (Class 2) and stripping and tearing (Class 3) occur

P : Proportion of the surface, in 1/1000% , that has been repaired (patching)

RD² : Mean square depth, evaluated in inches, of rutting where vehicles have passed

Regarding roads in the DRC, in-depth studies can be performed to determine which of the two methods would be the more appropriate and what changes should be made in one or other to adapt to our local realities.

The present serviceability index makes it possible to accomplish an overall evaluation of the road and get an idea, in terms of planning, of the order of priority and techniques to be used for maintenance or repair work.

Depending on the extent of the different types of deterioration, either maintenance or repairs will be necessary, regardless of the value of the present serviceability index (for example, in the case of gaps or potholes), in which case reference to the target values according to the road type is possible, as indicated in Table 6.5 below.

Table 6.5 Target Values to Evaluate the Need for Maintenance or Repairs

Element to be observed / Type of road	Rutting, Ravelling (mm)	Gaps (mm)		Skidding friction coefficient	Unevenes s (mm)	Rate of cracking (%)	Pothole diameter (cm)
		Bridges	Ditches				
High traffic volume	30-40	30	40	0.25	4-5	30-40	20
Low traffic volume	40	30	—	—	—	40-50	20

6.7.4 Selection of the Repair Method

As a general rule, it is possible to choose repair techniques based on the present serviceability index mentioned in 6.7.3 while referring to Figure 6.20 and Table 6.6; indicating maintenance techniques according to the type of deterioration of asphalt concrete surfacing as well as based on past experience.

To evaluate roads where the rate of cracking is low and there is low heavy-vehicle traffic volume (250 trucks/lane/day) reference can also be made to Table 6.6 below.

Table 6.7 gives the maintenance techniques according to the rate of cracking.

Table 6.6 Repair Techniques According to the Type of Deterioration of Asphalt-Paved Roads

Category	Method of repair
Fine/Hairline cracks Linear cracks	Sealing of cracks, fog seal, seal coat/ Relatively large crack, such as openings at the construction joints, should be filled with asphalt mortor after applying the V-cut method/ Linear cracks due to cracks in the binder course should be milled and partially replaced.
Gaps at structural elements	Patching, partial reconstruction
Rutting	Cutting out of the raised part, overlays or resurfacing after cutting out the raised part, cutting out and reconstructing the surface course, reconstruction according to the road condition
Longitudinal roughness, Corrugation	Armor coat, carpet coat
Swells	Cutting out of the protruding portion
Hollow	Patching, partial reconstruction
Flushing/Bleeding	Spreading of crushed stone/gravel or course sand
Raveling	Patching, armor coat, carpet coat, overlays, in-place recycling
Loss of skid resistance	Sealing coat, reinforced surfacing, overlays, safety grooves, resin-based surface treatment
Exfolitation	Patching, partial reconstruction

Potholes	Patching, partial reconstruction
Stripping,Aging	Sealing coat, armor coat, fog seal, slurry seal, carpet coat, overlay
Alligator Cracks	Armor coat, carpet coat, overlays, reconstruction, in-place recycling
Pumping	Reconstruction

Table 6.7 Maintenance Techniques in Accordance With the Rate of Cracking (250 trucks/lane/day)

Rate of cracking (%)	Maintenance and repair method
5-10	Partial sealing coat
11-30	A sealing coat is needed over the whole surface, or else partial patching or both
≥ 31	Overlay or removal of existing surface and overlay or reconstruction

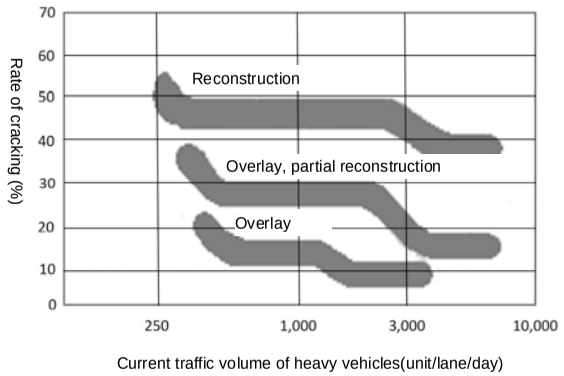

Figure 6.21 Selection of Maintenance and Repair Methods according to Cracking Ratio and Current Traffic Volume

6.8 Classification and evaluation of deterioration of road drainage structures

6.8.1 Presentation and classification of common road drainage structures

The road drainage structures are generally made of masonry with rubble aggregate walls, solid concrete blocks, and non-reinforced or reinforced concrete.

The common road drainage structures used for the paved roads in the DRC are:

- Longitudinal and transverse ditches (gutters);
- Box culverts;
- Metal or concrete barrel culverts;
- Mains;
- Sumps.

6.8.2 Degradation of road drainage structures

The road drainage structures are subject to the following common deteriorations:

- Cracks in walls;
- Disbonded coating;
- Destroyed slabs;
- Solid blocks broken or removed;
- Schist foliation of rubble aggregate;
- Worn pavement;
- Mortars destroyed by acidic waters;
- Invasion by grasses, shrubs, branches;
- Energy dissipators eroded, dug, or destroyed;
- Accumulation of sand due to low speed;
- Water overflow due to reduction of sections by obstacles or due to water above the capacity of gutters (arrival of external waters).

6.8.3 Maintenance of road drainage structures

Water runoff from the pavement surface to low points can result in the formation of a water layer of a certain thickness. This water layer results in infiltration through weak points (joints, cracks, etc.) and in the risk of hydroplaning (loss of traction of a vehicle due to the presence of a thin film of water between the pavement and tires). Water must therefore be evacuated as quickly as possible.

Table 6.8 Slope in cross section to be adopted for the reduction of the water layer

Landform	Paved Roads
Flat	2 to 3%
Hill	3 to 5%
Mountain	3 to 5%

These infiltrations can be reduced by ensuring that:

- Joints are watertight (binding of the longitudinal construction joints);
- Sealing of cracks is impermeable;
- Construction joints are watertight;
- Low points are avoided.

Ultimately, keeping the road drainage in good working condition means:

- Ensuring the safety of users that could be compromised by stagnation or flow of water on the pavement;
- Maintaining in good condition the pavement and its surroundings which may be affected by excessive water content in the foundation layers and the bearing soil;
- Ensuring the effectiveness of treatment works and the preservation of surrounding environments.

The drainage structures are intended to collect and remove water from the pavement. They must be correctly located and properly dimensioned. But, the function of these structures can be disrupted by obstructions, deposits of materials, and degradation.

Thus, the maintenance of drainage is synonymous with:

- Maintaining the characteristics of structures to ensure the proper flow of water;
- Creating or modifying some structures to best solve the problem of water retention or treatment.

The main purpose of the maintenance of road drainage is to maintain the characteristics of the structures to always ensure the proper flow of water.
There are two types of maintenance: scheduled maintenance and corrective maintenance.

1. Scheduled Maintenance

A drainage network consists of different structures, each playing an active role in overall efficiency. The level of function of each structure must therefore be identical. For example, it would be futile to clear a ditch without worrying about the state of the grips upstream or the channels downstream.

The periodic maintenance of a drainage network must therefore:

- Examine the system in its entirety;
- Be scheduled in advance.

It will be possible to take the opportunity of the renewal of the surface pavement to also clear the ditches, lower the level of shoulders, clean the channels, etc.

These planned operations constitute scheduled maintenance.

2. Corrective Maintenance

Sometimes, however, the function of a structure is suddenly compromised by an accidental failure (obstructions due to deposits of materials, for example).
Actions must be taken without delay in order to avoid the retention of water upstream and, at worst, the overflow on the pavement. Such actions that cannot be planned constitute corrective maintenance.

The maintenance of drainage includes:

- Maintaining the structures in good condition;
- Improvement (if needed) of function;
- Improvement of ease of maintenance;
- Elimination of structural dangers (for road users).

To properly maintain a drainage network, it is necessary to:

- Organize and schedule maintenance tasks;
- Observe often (especially when it rains);
- Take action in case of emergency;
- Design facilities to improve functions of the network (a preliminary reflection is always necessary to verify the real effectiveness of the planned facilities).

CHAPTER 7
MAINTENANCE METHODS

7.1 Overview

Maintenance of a road in a sustained way requires repair of surface deterioration and keeping of traffic at its normal level.

It also involves the maintenance of sanitation works associated with this road.

Maintenance work must therefore not consist of rehabilitation but rather of carrying out the emergency repairs.

Some road maintenance methods and operations are presented below and their details are given in the Table 7.1.

7.2 Patching Method

This refers to a method that consists in urgent filling of potholes, gaps and other cracks or local subsidence with surfacing materials.

7.2.1 Patching with Hot mix

This important method, which uses hot surfacing characterized by good adhesion to the preexisting surfacing and by durability and excellent stability, is particularly suitable for roads with heavy truck traffic.

Such a patchwork method makes it possible to use a relatively small volume of surfacing materials when and where most needed. However, hot surfacing materials often are subject to considerable decline in temperature, which must be avoided by use of means of maintaining the temperature, particularly container (thermos) vehicles or tarpaulins.

7.2.2 Patching with Cold Mix

This method is characterized by use of ambient-temperature surfacing, which is easy to transport and store. However, cold surfacing lacks stability and initial strength, and that makes a short curing period necessary.

7.3 Filling of Cracks

This is a repair method consisting in filling wide cracks or reflection cracking that can appear on a bituminous surfacing course on top of a cement concrete course.

7.4 Surface Treatment

In case of local occurrence of cracks, deformations (ruts, transverse subsidence), tears or collapsing (fretting, stripping, wear) a thin surfacing layer of less than 2.5 cm is applied on the surfacing already in place.

When if it's done before the rainy season, such treatment makes it possible to keep the surface in good condition and constitutes a particularly effective preventive measure.

In the case where the roughness decreases, it is advisable to proceed with nailing, by providing a carpet of rough asphalt with the 0/14 for example.

Surface treatment can be implemented according to the following methods:

- o Sealing or reinforced surfacing layer
- o Overlaying
- o Very light bitumen coating

i) Sealing or reinforced surfacing layer

This method consists in covering the road surface with bituminous materials, covered subsequently with sand or gravel. This operation can be repeated once or more than once to obtain a thicker layer called “reinforced surfacing”.

This method should not be used when the temperature could drop below 10 ° C or when there might have rain.

ii) Overlaying

This surface treatment method consists in covering the road surface in place with a thin (3 cm) layer of hot surfacing materials. This method makes the road reopen very soon.

iii) Very light bitumen coating

This method consists in covering the road surface with a thin layer of diluted asphalt emulsion to fill small cracks or holes on the road surface and makes it possible to renovate aged asphalt roads.

For the implementation, use a dosage of 0.5 - 0.80 liters of emulsion per m².
It is recommended to open the road to traffic one (1) to two (2) hours after implementation.

7.5 Reconstruction partielle

When it is not possible to do repair work by other methods because of major deterioration of the road surface in place, the partial reconstruction of the surfacing course, the binder course and possibly also the base course is undertaken by a method close to those of reconditioning.

This method is one of the most costly one for the national budget, therefore it has to be selected after very detailed study of the deterioration status and causes before this method put into action.

7.6 Treatment of Flushing

For roads with visible signs of flushing, dry gravel can be spread, followed by compacting by roller in order to restore the road’s adhesion.

The gravel can be asphalt precoated for greater effectiveness.
Table 7 below describes the above methods for different kinds of the deterioration status.

Table 7.1 Description of the Maintenance Methods

No.	Maintenance method	How to work	Materials	Equipment
7.1.1	**Points-in-time method with hot**	i) Marking out (fixing the location of) the zone to be treated; ii) Tracing the rectangular geometric forms with a white paint by using a batten and square; **Remarks**: Care is to be taken to ensure that the sides are parallel or perpendicular to the axis of the road. It is also necessary to have an extension of about 20 cm beyond each end of the zone that is actually affected. iii) Stripping of the zone in question by using a saw or a jackhammer; iv) Removal of the materials of the deteriorated zone for the required depth; v) Elimination of any debris or mud inside or around the excavation; **Remarks**:Particular attention is to be paid to the walls, which must remain vertical, and to the surface of the bottom of the excavation, which must be relatively horizontal and flat. vi) Compacting the bottom; **Remarks**:If the walls are wet, take care to dry them first vii) Refill each course in the depth of the excavated hole with new materials having the same characteristics as those that have been removed; viii) Cleaning and sprinkling of the base course if necessary; ix) Impregnation of the base course and the walls; x) Laying of the binder course; xi) Refilling, spreading and leveling of the surfacing. The leveling must be done keeping a surplus of materials for future settling, and the surfacing must be less than 1 cm thickness after compacting; xii) Compacting of the surfacing course by water-jet compactor or manual compactor. In case of	o Class 60/70 bitumen; o 0/10 or 0/14 coating; o 0/1 cutback for impregnation or 400/600 or 800/1400 cutback o White paint or spray.	o Concrete saw; o Jackhammer with compressor; o Points-in-time truck; o Shovels; o Street brushes; o Dump truck; o Battens and squares; o Frog compactor; o Mini compactor ; o -Mini dumper.

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		potholes deeper than 7 cm, apply two separate layers; xiii) Reopen the road to traffic after the road surface has reached ambient temperature.		
7.1.2	**Points-in-time method with cold surfacing**	The order of procedure can be the same as for hot surfacing, but it must be taken into considering the following points: i) To stabilize the cold surfacing, it must lose its moisture and the solvents that it contains. ii) For acceleration of its evaporation, after having been leveled, the surfacing must be exposed to the ambient air and hardened for a sufficient amount of time, i.e. about forty-eight (48) hours.	o Class 60-70 bitumen o Emulsion with a bitumen content of 60-65%	Same as for hot surfacing
7.2.	**Filling of Cracks[16]**	i) Opening of the cracks; ii) Cleaning of the inside of the cracks by compressed air to eliminate deposits or mud and any debris from deterioration; iii) Drying out of the wet parts; iv) Filling with a sealing coating or a slip (liquefied asphalt or bituminous emulsion mixed with sand)	Asphalt mortar or a slip	Air-jet compressor
7.3.	**Surface Treatment**	Follow steps viii to xiii of 7.1.1 above. However, this time those operations are applied on the existing surface course. i) Cleaning and sprinkling if necessary ii) Application of the binder coating iii) Laying of the surfacing. Leveling must be accomplished in keeping a surplus of materials for future settling, and the surfacing must be less than 1 cm after compacting. iv) Compacting by water-jet compactor or manual compactor v) Reopening of the road to traffic after the road surface has reached to ambient temperature.	Same as in 7.1.1 above	o Points-in-time truck o Shovels o Street brushes o Dump truck o Compactor o Mini compactor

[16] this method is specific.

7.4.	**Partial reconstruction**	Same as in 7.1.1 above The following few particularities are to be observed: The width of the zone to be treated must be at least 2.5 m to make it possible for the equipment to operation. If the work is done manually, allow for about 25% settling.		o Retro-equipped excavator o Grader o Roller and drum compactor o Water tank truck o Backhoe loader o Water-jet compressor o Water-jet compressor o Spreader o Pavers o Concrete saw o Manual compactor
7.5.	Treatment of Flushing	o Spreading of the gravel o Compacting	o Gravel o 0/4 sand	o Fine gravel spreading truck or towed fine gravel spreader. o Shovels o Compactor

7.7 Maintenance methods for road drainage structures

Maintenance work consists of the following operations:

- Clearing ditches;
- Repointing joints in masonry walls;
- Removal of shrubs, branches;
- Repair of box culvert slabs, ditches, and mains;
- Replacement of broken plates and blocks;
- Preventing the arrival of unplanned external water.

The clearing of ditches is a simple cleaning intended to restore the initial characteristics of the ditches and not a general deepening. In this respect, clearing has two simultaneous objectives:

- Maintain the water stream:
  - Close to the initial shape (except to temporarily store the water: ditch for keeping stormwater);
  - On a regular slope (except to change the flow speed).

- Maintain the flow capacities:

The ditches must be able to evacuate all of the stormwater in a short period of time. The water must not be slowed down locally by narrow passages or smaller sections (mowed grasses, deposits left by water reduce the sections of ditches).
The clearing of ditches consists therefore of removing the soil and vegetation that, since the last cleaning, have accumulated on the water line (even if locally) and reduced the section of ditches. The cleaning must not change the shape of the ditch except to improve the subsequent ease of maintenance (mowing for example).

1. Cleaning of structures

The cleaning of barrel culverts and box culverts includes the removal and disposal of vegetation and materials obstructing the interior of the barrel culverts or box culverts as well as the collection work upstream and the outlet downstream, over a length equal to 10 times the inner diameter of the barrel culverts or the inner height of the box culvert. All of the vegetal wastes shall be carefully removed and evacuated to designated areas in order to burn them safely. The disposed materials shall not interfere with the normal flow of water and shall be levelled.

2. Clearing of drainage

The entire existing drainage system shall be cleared of deposits and/or trash that could cause obstructions. The scrub and trash shall be evacuated to the disposal places approved by the Engineer. The clearing of the structures in small sections under the pavement may require the use of special means such as pressure washers.

3. Demolition of masonry

A large part of longitudinal drainage structures shall be demolished to make room for better-sized structures. Some preserved ditches, after clearing, will be repaired or coated with mortar on their inner walls to improve the roughness coefficient. The demolition products shall be evacuated to a disposal place.

After these operations, no counter-slope or obstacles to the flow of water shall remain. The connections between shapes of different types and between ditches and barrel culverts or inlets shall be executed particularly carefully.

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CHAPTER 8
REHABILITATION METHODS

8.1 Overview

Rehabilitation methods are intended to extend the service life of roads and can comprise means of reinforcing or reconstructing the road.

Overlay is carried out particularly when considerable deterioration is visible on the road surface and urgent repair thereof at points would not prevent general future deterioration or the thickness of the road surface is not sufficient to bear possible increase in traffic.

Reconstruction is often undertaken when the road has suffered major deterioration and other methods would not ensure that it will be in good condition.

As a general rule, a decision is made regarding reinforcement or reconstruction, based on the results of deflection tests carried out *in situ* and the CBR index of the structure, both of which are associated with visual inspection of the road and traffic studies.

In certain cases, it is important to widen the road to accommodate a possible increase in traffic, to improve the distribution of loads and facilitate the traffic flow.

8.2 Overlay

Reinforcing a road involves rehabilitating the road, which may include laying a base course but centers on a bituminous surfacing course (which may also be a coating).

Reinforcing a road allows one or more surface and/or structural defects to be remedied, as well as adapting the bearing capacity of the road to future traffic.

In this manual, we focus on the fact that only usual flexible or semi-rigid road structures with old (or existing) base courses comprising natural materials or crushed gravel or materials stabilized with cement or bitumen are considered.

Furthermore, in this manual only two of the many known reinforcement techniques are adapted :

- Reinforcement by simple laying of the surfacing (asphalt concrete or surface coating)
- Reinforcement with crushed gravel or natural gravelly materials under the surface.

8.2.1 Brief Overview of the Calculation Method Used

There are several different dimensioning methods outlined in available literature, which can be divided into the following two main categories:

- Classical or empirical methods based on experimental observation of roads and their behavior under traffic (CBR, CEBTR and AASHO methods, etc.)
- Theoretical methods based on a study of stresses exerted by traffic at different levels on the body of the road and comparing those stresses with the probable performances of the constituent materials of the road.

The latter theoretical methods are based on the assumption that a road structure is determined by *n* layers of thickness that are finite except for the last one, which features an infinite plane. The materials show elastic linear behavior and the mechanical strains are tensile or shearing in nature.

Each course (surfacing, base, subbase, underlying soil) is characterized by the following parameters:

- Its thickness (e)
- Its modulus (E)
- Its Poisson's ratio (Y)
- Its binding with the neighboring course

As a priority the calculation principle consists, as for a new road, in modeling structures to evaluate strains or displacements caused by a typical unit load. The maximum stress likely to cause the structure to rupture is then sought and compared with the permissible limit of the material considered for the desired or foreseen future traffic.

Determining the appropriate thickness of a reinforcement layer involves repeating the calculation to determine the thickness corresponding to the admissible stresses and deformations of the constituent materials of the road.

In this manual, the CEBTR (Building and Public Works Study Center) method shall be followed, which is a practical method meant for tropical countries. The given method for calculating reinforcement is taken from Section V of "Zaire Road Design: Guide for Reinforcement of Paved Roads".

That method proposes precalculated reinforcement structures in tabular format, tested by experience on a national level and depending on both classes of characteristic deflection and traffic classes.

8.2.2 Deflection and Traffic Classes

Characteristic deflections mirror the mechanical road behavior. The following five (5) classes are used to calculate reinforcement thicknesses:

Table 8.1 Classes of Characteristic Deflection

Class	Characteristic deflection (1/100 mm)
D1	< 60
D2	60– 80
D3	80 – 100
D4	100 – 150
D5	> 150

Likewise, the following five (5) classes of cumulative heavy-weight (vehicles with a driving weight exceeding three tons) traffic have been adopted in the Congolese traffic classification.

Table 8.2 Traffic Classes by Cumulative Total of Heavy Vehicles

Classes	Daily Flow Annual Average<	Cumulative Traffic in Heavy Vehicles*
T1	T < 300	$T < 5.10^5$
T2	300 <T <1000	$5.10^5 < T < 1{,}5.10^6$
T3	1000 <T < 3000	$1{,}5.10^6 < T < 4.10^6$
T4	3000 <T < 6000	$4.10^6 < T < 10^7$
T5	6000<T < 12000	$10^7 < T < 2.10^7$

* Considering a 13-ton equivalent axle

8.2.3 Typical Reinforcement Structures

When reinforcements are applied by simply resurfacing an old road with a natural material base course, the additional thickness of surfacing to be applied is revealed in practice by the table below:

Table 8.3 Practical Reinforcement Thickness of Asphalt Concrete Surfacing - for an Old Natural Material Base Course

	T1	T2	T3	T4	T5
D1	Two layers or 3 mm BB	4 cm BB	5 cm BB	2x4 cm BB	2x5 cm BB
D2	4 cm BB	5 cm BB	2x4 cm BB	2x5 cm BB	
D3	5 cm BB	2x4 cm BB	2x5 cm BB		
D4	2x4 cm BB	2x5 cm BB			
D5	2x5 cm BB				

Legend
BB: asphalt concrete
T1; T2; T3; T4; T5: Classes of cumulative heavy-vehicle traffic
D1; D2; D3; D4; D5: Classes of characteristic deflection

Just as when reinforcing a crushed-gravel base course, the additional thicknesses of the base course and surfacing to be put in place are given in practice by the table below:

Table 8.4 Practical Reinforcement Thicknesses of the Base Course and Asphalt Concrete Surfacing - For a Crushed-Gravel Base Course

	T1	T2	T3	T4	T5
D1	Two layers or 3 cm BB	4 cm BB	5 cm BB	-	-
D2	4 cm BB	5 cm BB	5 cm BB + 18 cm	-	-
D3	5 cm BB	4 cm BB + 18 cm	5 cm BB + 20 cm	-	-
D4	3 cm BB + 18 cm	4 cm BB + 20 cm	5 cm BB + 22 cm	-	-
D5	3 cm BB + 20 cm	4 cm BB + 22 cm	5 cm BB + 25 cm	-	-

Remarks :
For T4 and T5 traffic, the CEBTP method can not be used. In these cases, it is recommended to use the rational analytical method (the charts, the LCPC catalogs 1994 and 1998 and the software ALIZÉ)

8.3 Reconstruction Work

Since reconstruction work is the most costly work when rehabilitating roads, very detailed study is required beforehand. Furthermore, in urban zones or places subject to considerable road traffic, reconstruction work must be planned and implemented in such a way as to minimize the impact on traffic and inconvenience caused to those living or working along the road.

8.3.1 Brief Overview of the Calculation Method Used

The calculation method and its assumptions are the same as those presented above in the method to calculate reinforcement (CEBTP method). However, here, the entire structure of the road may be involved in the reconstruction and the essential parameters affecting the re-dimensioning of the structure now include the bearing capacity index (CBR) of the roadbed and the traffic, as well as the material characteristics.

8.3.2 Some Considerations to Be Borne in Mind

It is crucial to determine the causes of deterioration beforehand and design a structure that also remains durable long term.
This requires a detailed study of the roadbed soil, the structure of the road requiring reconstruction and its drainage, as well as determining whether or not any groundwater is present and the projected future traffic. The following remarks are useful in that connection:

- Regarding the structure of the road or the soil underlay, previous study results or tests carried out in the design work can be referenced. However, the studies must be updated by observing possible changes in the groundwater level, for example.
- The underlying soil should not be studied during the rainy season and samples should only be taken at sites specifically relevant to the reconstruction work.

8.3.3 Classes of Bearing Capacity of the Underlying Soil

The bearing capacity of the soil is usually evaluated in terms of CBR, Californian Bearing Ratio, which depends on the density and water content of the soil.

The underlying soil is the foundation on which a road is built. It is generally 30 cm thick and comprises materials in place (naturally occurring ground) or those brought in, whether improved or not, when the soil bearing capacity is lacking in places.

There are five classes of soil, categorized according to bearing capacity:

Table 8.5 Classes of Bearing Capacity of the Underlying Soil

Classes de CBR	Valeur courante (%)	Description des sols
S1	CBR < 5	Sol silteux, argileux ou sol tourbeux
S2	5 < CBR < 10	Argile, sable argileux, limons, argile latéritique
S3	10 < CBR < 15	Sable et graves
S4	15 < CBR < 30	Graviers et arênes à grains moyens
S5	CBR > 30	Arênes à grains grossiers

Remarks :
In the case of a rock platform, the CBR is generally greater than 80 and ipso facto constitutes the base course.

8.3.4 Typical Road Reconstruction Structures

The following table proposes structures that can be adopted according to local material resources, traffic and the bearing capacity of the underlying soil.

Those structures are chosen so that:

- o The compression stresses at the level of the underlying soil do not result in punching.
- o The tensile stresses at the base of the improved or treated layers do not result in flexural failure mode.
- o Deformations caused by traffic remain acceptable considering the fatigue resistance of the materials, etc.

Table 8.6 Typical Road Reconstruction Structures

Traffic CBR of the underlying soil	T_1		T_2		T_3		T_4	
	Subbase course cm	Base course cm	Subbase course cm	Base course cm	Subbase course cm	Base course cm	Subbase course cm	Base course cm
5-10	20	15	25	15	25	20	30	20
10-15	15	15	20	15	20	20	25	20
15-30	10	15	15	15	15	20	20	20
30-80	0	15	0	15	0	20	0	20
< 80	0	0	0	0	0	0	0	0
Surfacing course (thickness)	Type I. 2cm		Type II. 2cm		Type III. 4cm		Type IV. 5cm	

Remarks :
In case the platform CBR is less than 5, it is recommended to improve the bearing capacity of the subbase course by a filler material.

8.4 Road Widening Work

As mentioned above in the introduction to this chapter, rehabilitating a road may, under certain circumstances, mean it has to be widened to accommodate increased traffic, improve the distribution of loads and thus facilitate traffic flow.

Except for some particularities connected with the binding between the old part of the road and the new post-widened part, the method of widening to be used will resemble that proposed above for the entire structural reconstruction.

8.5 Description of the Rehabilitation Methods

Compared to maintenance methods, successive operations to be followed for various means of road rehabilitation (reinforcement, reconstruction, widening) are presented in the following table, with comparisons to maintenance methods:

Table 8.7 Description of Road Rehabilitation Methods

NO	Rehabilitation method	How to carry out the work	Materials	Equipment
8.2	Reinforcement	i) Marking out of the zone to be worked on ii) Tracing of rectangular geometric forms using white paint or chalk **Remarks**: It is important to ensure that the sides are parallel with or perpendicular to the road axis. It is also necessary to allow an extension of the area actually affected by about 20 cm at both ends. iii) Stripping of the relevant zone using a saw or jackhammer. iv) Emptying of materials in the deteriorated zone to the required depth. v) Careful removal of any debris or mud occurring within or around the excavation. **Remarks**: Particular attention must be paid to the walls, which must remain vertical and to the surface bottom, which must be relatively horizontal and flat. vi) Compacting at the bottom of the excavation. **Remarks**: If the walls are wet, take care to dry them out first. vii) Refilling the base course with new materials, featuring characteristics identical to those having been removed and in accordance with the depth to which they have been removed. viii) Cleaning and sprinkling of the base course as required. ix) Impregnation of the base course and sides and removal of excess coating with a rag. x) Application of the bond layer. xi) Refilling, spreading and leveling of hot surfacing. For the leveling, a surplus of materials must be kept in reserve for future settling and the thickness must be less than 1 cm after compacting. xii) Compacting of the surfacing course using a water-jet or manual	o Class 60/70 bitumen o 0/10 or 0/14 coating o 0/1 cutback for impregnation or 400/600 or 800/1400 cutback o White paint or spray o Crushed gravel	o Backhoe o Grader o Roller and drum compactor o Water tank truck o Dump truck o Pelle chargeuse ; o Air-jet compressor o Spreader o Frog compactor o Road finishers o Concrete saw o Manual compactor

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		compactor. Apply in two layers for potholes deeper than 7 cm. xiii) The road can be re-opened to traffic once the road surface reaches a temperature bearable to the palm of the hand.		
8.3	**Reconstruction**	See 7.1.1 above	See 7.1.1 above	See 7.1.1 above
8.4	**Road widening**	See 7.1.1 above	See 7.1.1 above	See 7.1.1 above

8.6 Recycling of base course on-site

8.6.1 General

Using a road stabilizer, the existing pavement will be crushed, and the materials thus stripped will be mixed with the cement and/or asphalt emulsion in order to construct a new stabilized base course.

8.6.2 Benefits of recycling

- Less wasted pavement compared to the reconstruction of the roadway;
- Shorter working time compared to the reconstruction of the roadway;
- Reduction in the cost of the work and CO2 emissions compared to the reconstruction of the roadway;
- Possibility of recycling even base course stabilized by cement;
- Possibility of reinforcing the structure of the pavement without raising the pavement.

8.6.3 Preliminary study

Since a part of the existing pavement is used as recycled base course materials, the quality of the existing pavement influences the quality of the work. Therefore, it is necessary to carry out a preliminary study on the quality of existing materials (CBR of foundation, thicknesses of base course and of pavement) and on the site conditions (volume of heavy vehicle traffic, possibility of road closure, parking space for equipment, underground facilities).

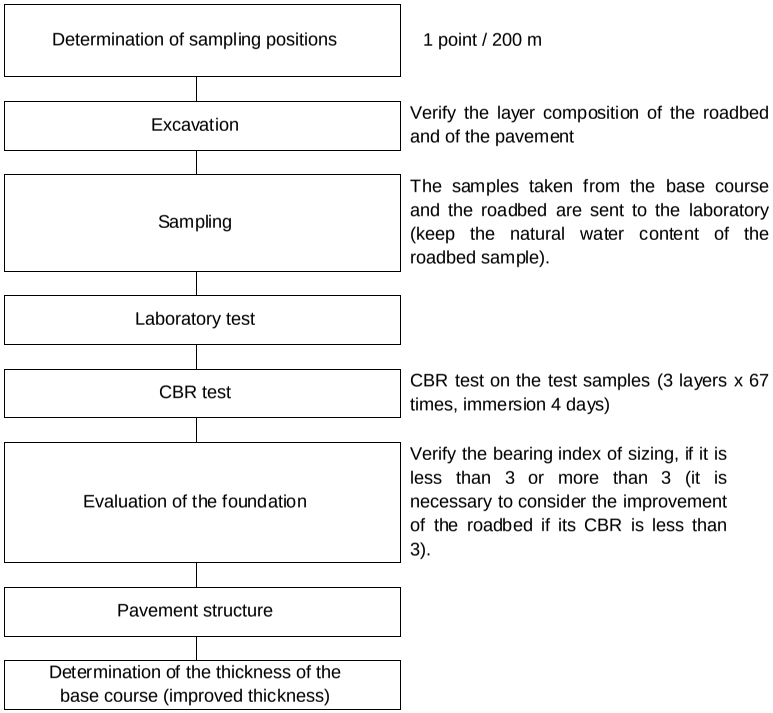

Figure 8.1 Workflow of the study

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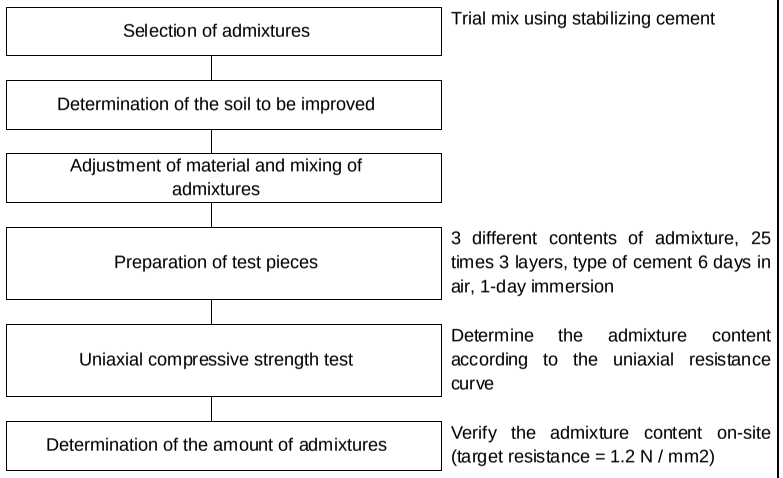

Figure 8.2 Trial mix

8.6.4 Classification of works

Examples of basecourse recycling work on-site include:

- Work using only cement as stabilizer;
- Work using cement and special asphalt emulsion.

As to the method, the work can be classified as:

- Stabilization work with the existing pavement: in cases where the traffic volume is less than 1,000 vehicles per day, where it is possible to raise the pavement, and where the existing pavement is relatively less thick (Figure 8.3);
- Stabilization work after preliminary treatment (leveling): in cases where the traffic volume is less than 3,000 vehicles per day, where it is difficult to raise the pavement, and where the existing pavement is relatively thick.

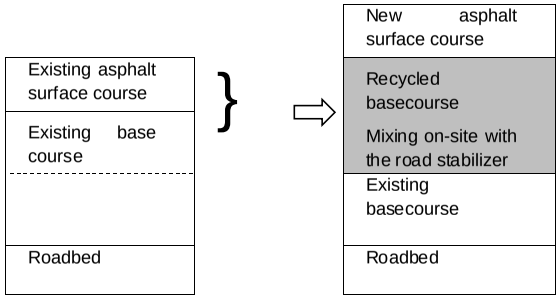

Figure 8.3 Example of existing pavement stabilization work

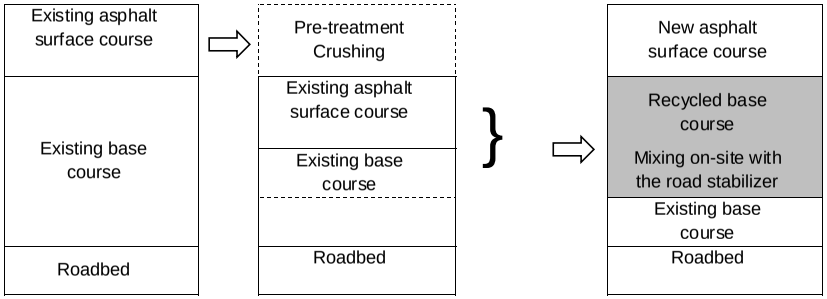

Figure 8.4 Example of stabilization work with pre-treatment (leveling)

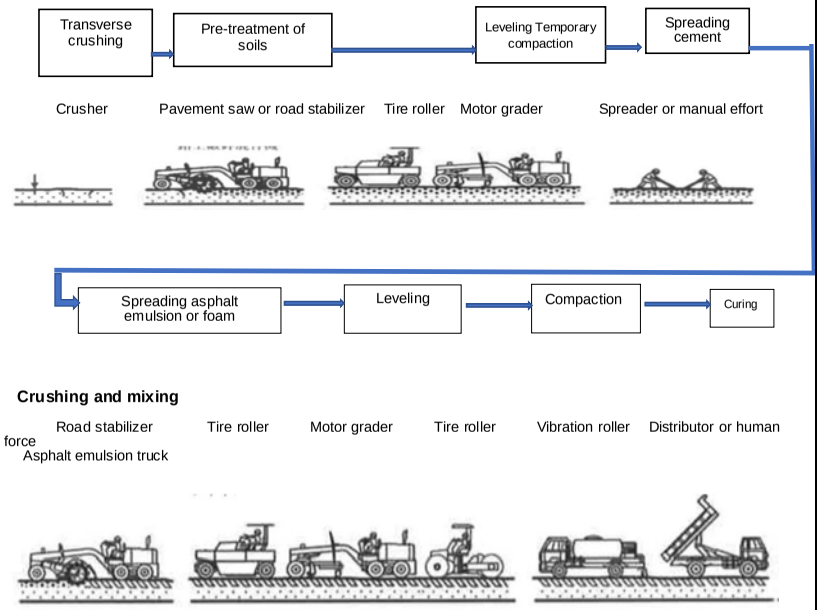

Figure 8.5 Example of the crushing procedure

Figure 8.6 Photo of road stabilizer

Figure 8.7 Photo of road stabilizer

Figure 8.8 Photo of road stabilizer

CHAPTER 9
QUALITY CONTROL

9.1 Overview

The paved roads of the DRC and particularly those of the city Kinshasa Province and its surroundings are essentially characterized by the short service life of their asphalt paving.

That inadequacy has a number of causes, including:

- Insufficient maintenance
- Many unqualified laboratories
- Many different road work clients
- Non-involvement of specialized permanent government entities in the design and coordination of the work
- Overloading of the road network (insufficient control of axle load and heavy-vehicle traffic)
- Insufficient quality control before, during and after implementation of the work (personnel, materials and equipment)
- Lack of civil ethics on the part of road users and those living or working alongside, as manifested by the non-observance of environmental and social norms
- The unqualified nature of some control missions
- Non-observance of the city planning norms
- Inexperience on the part of some private road work enterprises
- Non-observance by administrative authorities of the conclusions of studies, particularly because of budget problems
- Insufficiency and obsolescence and disrepair of the equipment of the National Public Works Laboratory (LNTP)
- Failure by administrative entities to monitor paved roads

It is therefore important that the permanent government entities specialized in work control, meaning in this case the Technical Control Authority (BTC) and the National Public Works Laboratory (LNTP), be properly equipped to better perform their duties.

Furthermore, the administrative entities must also be effectively involved in seeking sustainable solutions to the above-mentioned weaknesses.
Control of roadwork is a complex task and crucial for the success and ongoing utility of our roads. In principle, it comprises technical and administrative control of all road work contracts and can be classified into the following three phases:

- Control before the work,
- Control during the work and
- Control after the work.

As regards the present manual and this chapter on quality control, it is essentially a matter of presenting a general outline of some technical requirements to implement road work and quality control thereof as regards maintenance and repair work on asphalt-paved roads.

As is well known, quality control must include carrying out a certain number of studies and requires testing of the conformity of the materials used in the work and in-situ checking of the applicable conditions thereof.

Unless otherwise indicated, the applicable standards and tests are those of the AASHTO, ASTM and AFNOR.

It should be noted that the above-mentioned tests and studies represent only some of the necessary tests to maintain and repair asphalt-paved roads and that some of the tests mentioned in the following can be done not just before but also during and after the work is carried out.

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9.2 Purpose of Quality Control

Quality control aims generally maintain the structure's quality for its perpetuation.

Specifically, quality control aims to ensure that:

- the materials used comply with those described in the technical prescriptions;
- the implementation and its control are carried out in conformity with the rules of the art within the limits of the Market.

9.3 Quality Control Before the Work

Control before the work comprises:

- Certifying the various prior studies, particularly concerning traffic, dimensioning of structures, formulation of materials (surfacing materials, emulsions, crushed materials, concrete, etc.) and socioeconomic impacts and topographical, hydrological, climatic and hydraulic studies before the work is carried out at the work sites
- Verifying conformity of the materials to be used for the road structure and
- Checking various prerequisites to implement the work effectively (equipment, supplies, required personnel, etc.).

9.3.1 Testing of the Roadbed Soil

The tests adopted as regards the roadbed soil are essentially the following:

- identifying the nature of the soil through probing;
- granulometric analysis (fines, d, D);
- Atterberg limits ;
- modified Proctor test ;
- CBR test after four days of soaking;
- organic matter.

a) CBR Test

There are three (3) CBR tests:

- the regular CBR test: immersion for 4 days: used for dimensioning because the conditions are not very good then. If the CBR value does not exceed 5, the roadbed has to be improved;
- the in-situ CBR test: it is carried out for preliminary dimensioning or control;
- the modified CBR: that value is obtained in the laboratory in CBR molds without immersion. It can be used, but it is high.

9.3.2 Testing of Conformity of the Materials to Be Used

The following tests are required for the materials of the road body (identification test, compactness test and bearing capacity test):

- granulometric analysis ;
- Atterberg limits ;
- organic matter content ;
- natural water content ;
- optimum water content ;
- maximum dry density ;
- attrition resistance (crushed and natural gravel);

- o flattening coefficient ;
- o crushing coefficient.

9.3.3 Characteristics of the Surfacing

Table 9.1. Characteristics of the Surfacing

Granulometric Ranges (% of material that passes through the screen)		
Screen (mm)	0/12	0/14
20	-	100
14	100	90 – 100
10	90 – 100	85 – 100
6.3	70 – 95	60 – 90
2	30 – 70	25 – 60
0.2	10 – 25	6 – 20
0.08	3 – 7	3 – 8
Specific surface area (m²/kg)	7 – 15	7.5 – 17.5
% of crushed or semi-crushed material	> 50	> 50
Sand equivalent of the 0/2 part of the mineral mixture	> 40	> 40
Los Angeles hardness	< 40	< 40
MARSHALL stability (kg)	≥ 800	≥ 800
Accelerated polishing coefficient	55 - 70	55 - 70
Creep (mm)	3 – 4	3 – 4
Compactness (%)	94 – 97	94 – 97
Added filler (%): cement or lime	1 - 2	1 - 2
Bitumen prescribed for tropical climate	60/70	60/70
Mix		
Filler/bitumen ratio	0.8 – 1.20	0.8 – 1.20
Richness modulus	3 - 4	3 - 4
Bitumen content (%)	4.5 – 6.5	4.5 – 6.5
Characteristics of the bitumen 60/70		
Penetration at 25°C, 100g, 5s	60 – 70	60 - 70
Loss after heating to 163°C over a 5h period	1%	1%
Ductility at 25°C, minimum	100%	100%
Solubility in carbon tetrachloride, minimum	99.5%	99.5%
Paraffin Content	1% - 2%	1% - 2%
Mixing temperature in the asphalt plant, °C	160 - 175	160 - 175
Spreading temperature, °C	135 - 150	135 - 150

a) Characteristics of liquefied 60/70 bitumen for impregnation and tack coats

- o ***Impregnation: very fluid bitumen of class 0/1***
  - Viscometer orifice with 4 mm diameter: at 25°C: under 30s
  - Tack coats: very viscous bitumen (400/600 or, still better, 800/1400)
  - Viscometer orifice with 10 mm diameter: at 25°C: 400-600s
  - Viscometer orifice with 10 mm diameter: at 25°C: 800-1400s
  - Relative density in pycnometer: 0.90-1.02
  - Square plate for quality control of 'cut-backs'

- o **Control in the mixing plant (see flow sheet previously given)**

Figure 9.1 Mixing Plant

- o Control of the surfacing materials during mix-in (observance of quality, the proportions of the materials and temperature during mixing in the asphalt plant following the laboratory recommendations).

  The quality of the asphalt mix is certified by the geotechnician's signature on the premises

Transport

- For tarpaulin-covered trucks the distance between the asphalt plant and the road work site must not exceed 25 km to avoid cooling and bad weather. In town, peak traffic hours and traffic jams have to be taken into account.
- For containers with a system for constant internal heating, a maximum time of ten days is recommended to reduce maintenance costs (prices).
- To reduce the risk of accidents en route, drivers should be selected based on their seriousness and dedication to the job.

9.3.4 Characteristics of the Other Materials

a) Fill materials

Fill materials must have the following characteristics:

- Dimension of the largest element: ≤ 80 mm
- Liquidity limit (LL): ≤ 55%
- Plasticity index: ≤ 30%
- CBR at 90% of optimum and after four days of soaking: > 5 (five)
- Weight percentage of organic materials: < 1%

b) Excavation bottom materials

The excavation bottom materials must have a CBR bearing capacity of at least ten after 96 hours of soaking and at 92% of optimum dry density, as determined by the modified Proctor test, greater than or equal to 10.

The thickness of the layer with those characteristics is to be 30 cm.
In all cases in which the materials in place do not meet those conditions, the road work contractor must, with the prior approval of the Engineer, undertake extra excavation and placement of substitute materials.

Thickness of the substitute materials:

- In certain cases in which the layer with low bearing capacity is less than 30 cm thick, the Engineer can have the contractor undertake substitution of soil less than 30 cm thick;
- In general, the thickness of the substitute layer is to be thirty (30) centimeters above excavation materials with a CBR bearing capacity exceeding 5 at 90% of optimum and after four days of soaking;
- After removal of 30 cm, the extra thickness to be replaced is to be determined by the Engineer if the upper part of the excavations does not attain a CBR of 5 at 90% of optimum and after four days of soaking.

c) Subgrade

The last 30 cm of the roadbed, filled or excavated, must have:

- a CBR of at least 10% at 95% of optimum maximum dry density and after four days of soaking;
- a plasticity index (IP) not exceeding 25%;
- a liquidity limit (LL) not exceeding 40%;
- grain size between 40 and 0.08mm (less than 35% of materials traversing the screen);
- a weight percentage of organic materials of less than 2%;
- a deformation modulus (ME), as calculated in accordance with Swiss standard SNV 670317, with a plate of diameter 30cm.

That subgrade shall comprise one of the following, depending on the case:

- Stripped natural soil;
- A 30 cm layer of substitute excavated bottom materials;
- A layer of 30 cm or less placed at the top of the fill.

d) Subbase of selected materials

The subbase materials are to be selected sands with the following characteristics:

- liquidity limit < 35;
- plasticity index < 25;
- grain size between 80 and 0.08mm (less than 25% of materials traversing the screen);
- CBR of at least thirty (30) after four days of soaking and at 95% of optimum of maximum dry density;
- weight percentage of organic matter under 0.1%;
- deformation modulus (ME) exceeding 1500kg/cm², as calculated in accordance with Swiss standard SNV 670317, with a plate of diameter 30cm.

e) Subbase and shoulder comprising crushed materials

The materials for the subbase are to be selected natural crushed materials with the following characteristics:

- liquidity limit under 35;
- plasticity index of 10-20;
- grain size between 40 and 0.08 mm (less than 25% materials traversing the screen);
- CBR of at least fifty (50) after four days of soaking and at 95% of optimum of maximum dry density;
- weight percentage of organic materials under 1%;
- deformation modulus (ME) higher than 1500 kg/cm² as calculated in accordance with Swiss standard SNV 670317 with a plate of diameter 30 cm.

For certain borrow materials, the Engineer (head of the control mission) can exceptionally accept materials that are more plastic or which comprise finer content, provided that the contractor has reconfirmed after searching in the field that there are no materials of the required quality within the zone in question.

f) Base course of run-of-crusher materials

The materials are to be extracted from hard-rock quarries. The run-of-crusher materials must have:

- a grain size of class 0/31.5;
- a granulometric curve within the following range:

	% materials traversing the screen	
	Minimum	maximum
40mm	100	100
31.5mm	95	100
20mm	64	90
10mm	40	70
6.3mm	30	60
2mm	20	42
0.5mm	10	26
80μm	2	10

- Los Angeles hardness < 35
- Plasticity index IP = 0
- Sand equivalent ES > 40

Remarks:
In the case of a zone without the required gravel and where the available materials or selected soils lack the required characteristics for use as base course materials, selected local materials can be stabilized using bitumen, polymers, lime or, if absolutely necessary, cement.

It should be noted that stabilization with cement is a tricky practice for which appropriate studies are needed before implementation. Practical experience in the DRC shows that that technique should be discouraged for soils with very fine or silty sands and very clayey soils. From the economic perspective, stabilization with polymers is most advisable, although stabilization with bitumen, which is costlier, yields better results.
In addition, stabilization with lime is also applicable for clayey soils.

However, it should be noted that stabilization of soils with cement leads to cracks in the stabilized course that rise and seriously affect the upper bituminous layers. High regular maintenance costs and vibrations that affect vehicles, detracting from road travel comfort, not to mention the adverse effect of infiltration water on bearing capacity and length of service life on the road stretches in question, are valid reasons for discarding that technique as an option.
To avoid reflection, Italian geotechnical engineers advise inserting a layer of 9/31.5 or 0/40 crushed materials 8 to 10 cm thick between the base and surface courses.

9.4 Quality Control During the Work

Quality control during the work involves reconfirming the application conditions of materials in accordance with those recommended by prior studies.

The different checks and in-situ tests to be adopted in maintenance and repair work on asphalt-paved roads are essentially the following:

- Topographical control consisting of ensuring observance of the transverse and longitudinal profiles of the road in accordance with those prescribed by the studies. A degree of tolerance is therefore necessary.
- Control of the laying thicknesses of the different road courses.
- Payment of the amount invoiced by the contractor shall be contingent on at least 98% of the work performed being evaluated as meeting the quality set by the technique requirements.
- Control of the degree and conditions of compacting of the roadbed and different road courses by verifying the modulus of compressibility via the plate test and/or controlling the density (sand or membrane densitometer).
- Control of the impregnation and tack coats.
- Control of the temperatures for preparing and laying the hot surfacing.
- Control of the implementation conditions of the work (materials used, personnel, atmospheric conditions, etc.).

When the surface area of the road work site is extensive, a plan for performing a trial section of the work should be drawn up at the request of the client, indicating the kind and extent of the work and the materials and equipment earmarked for implementation thereof. That will make it possible to determine certain parameters for implementing the work, including the number of compacting passes for the different courses.

9.4.1 Control of Implementation of the Surfacing

[17]The effectiveness of the compacting can be verified by in-situ measurements using a nuclear density gauge. The client reserves the right to take a sample core for at least each thousand square meters of asphalt concrete laid or at least four cores for each day of laying. The coring sites shall be determined by the contractor with client approval.

Longitudinal checking of the surface regularity of the asphalt concrete is to be done in the axis of the wheel paths.
Transverse flatness checking is to be accomplished either by a 4 m rule, by 'planum' or by a transverse profilograph.

If the asphalt concrete does not meet the requirements, the client can require:

- either that it be removed and replaced
- or that a new asphalt concrete layer of a quality he/she defines be laid.

However, considering technological progress in that field, other solutions can be proposed to the client by the contractor.

If the average temperature of the asphalt concrete of a truck (three measurements performed) does not lie within the required tolerances, the entire batch can be rejected.

The following tests are recommended for quality control of the surfacing applied at the road work site:

[17] Service de ponts et chaussées, Office de l'entretien : Cahier des charges :revêtements en béton bitumineux, Neuchâtel, march 2009

- Optimum content of the binder and its characteristics
- Granulometric range and Los Angeles
- Marshall stability, creep and compactness
- Temperature of application: > 135°C

Required equipment:

- The same equipment as used in the laboratory as defined in the following point 9.3.3
- Gamma densimeter (Troxler)
- Thermometer for surfacing materials

In addition, extraction of bitumens by distillation with the Kumagama Extractor and screening of aggregates for quality control of the bitumens, range, creep and compactness are accomplished based on sampling at the road work site to prepare the test specimens.

9.4.2 Control of Compacting of the Surfacing Materials

The compacting must be done by a compacting assembly comprising road rollers with smooth tires with a load of at least two (2) tons per wheel and 6-8 ton metal-rim smooth tandem or static rollers with three (3) wheels and a service weight of twelve point five (12.5) tons.

The samples taken after compacting must have a density exceeding 95% of the LCPC reference compactness. The use of equipment with the following characteristics is required:

a) 3-wheel static roller:

Characteristic	Value		Unit
Service weight	>	12.5	tons
Service weight tested with water	>	14	tons
Maximum weight	>	15	tons
Specific linear load			
Front	>	45.5	kg/cm
Rear	>	65	kg/cm
Work width			
Total	>	1,900	mm
Front ball	>	1,100	mm
Each rear wheel	>	500	mm
SAE power motor	>	60	CV
Negotiable gradient	About 25%		
Steering	Hydrostatic power steering		
Speed	0-10 km/h forward and reverse		
Drive	Hydrostatic rear wheel drive. Differential lock of the corresponding wheel by braking.		

b) Pneumatic road roller

Characteristic	Value		Unit
Service weight	>	14.5	tons
Maximum weight	>	28	tons
Maximum wheel load	>	3.5	tons
Work width	>	1,980	mm
Tires	4 x 11 x 20 / 12 PR		
Wheel suspension	Downward and oscillating suspension		
Motor power	>	130 HP at 2,800 rpm	
Speed	0-20 km/h, switching with load while in motion		

Negotiable gradient	Without ballast: 35% With full load: 20%
Steering	2-point hydrostatic
Drive	Hydrodynamic (power shift)

The following recommendations should be taken into account when compacting the asphalt surface course.

- Pneumatic road rollers must do the compacting immediately behind the road finisher and smooth tandem rollers are to accomplish the final surfacing.
- The surfacing materials do not adhere to tires when those materials are hot. However, it is necessary to avoid them cooling by sprinkling or moving on cold surfacing materials at the rear of the road work zone.
- The compacting must start as soon as possible after spreading the materials. Compacting of a strip after spreading when it is next to a strip of road surface already in place must start from the joint between those strips.
- The temperatures at the time of compacting by road roller must be sufficiently low to obtain good surfacing and all precautions must be taken to prevent the mix from sticking to the wheels of the compacting machines. The road roller must not be allowed to fall more than fifty (50) meters behind the road finisher.
- The compacting machines must make sufficiently long passes to minimize the number of stops, with reversing performed progressively to avoid formation of waves. Changes in direction must be staggered by at least one (1) meter at each pass. Travel of the compacting machines must be as continuous as possible and they must be driven such as to ensure all parts of the surfacing undergo roughly equal compacting.
- The compacting is to be followed by treatment by smooth drum tandem roller, particularly at the joints, until it no longer leaves any lateral trace in passing.
- In cases in which the Engineer has agreed, manually implemented compacting of bituminous surfacing materials can be done by a manual vibrating roller or a vibrating plate with a minimum weight of fifteen (15) kilograms for a surface of at least three hundred (300) cm² (points in time repair work, repair work on small surfaces).
- Alongside edges, gutters and ditches and similar places as well as wherever rollers lack access, the compacting must be done by vibrating plates, focusing particularly on the tightness of the joints between them and the surfacing.
- No traffic must be allowed on the finished surfacing before it cools off sufficiently, the degree of cooling being left to the Engineer's judgment.

9.4.3 Some Conditions Regarding the Implementation of Asphalt Paving[18]

- Unless otherwise prescribed by the client , asphalt paving is to be put in place by a road finisher. Alignment, profiles and thicknesses must be strictly observed.
- The surfacing materials are to be delivered at a rate such that laying thereof is uninterrupted. The road finisher must not be stopped while the materials are being loaded into the hopper. The road finishers must accomplish preliminary compacting to at least 85% of the Marshall value.
- The road finisher must not be stopped while the materials are being loaded into the hopper, except in extreme cases such as when going steeply uphill. At such different places it is preferable that the trucks supply the road finisher and leave it following the movement rather than stopping it at each delivery.
- Manual work is not recommended other than in the case of finishing of joints, edges and manholes and similar.

[18] Bridges and Roads Services, op. cit.

- The surfacing materials must be manually applied as an exception in the case of extra widths, intersections, forks (exits/entries) and sidewalk areas, etc., which are inaccessible to the road finisher.
- Applying diesel oil to laying tools (shovels, rakes, etc.) must take place away from any surface that has been or is going to be paved and particularly not above the asphalt paving materials loaded in the road finisher.
- As far as possible, differences in longitudinal level on the road at the end of the laying stages of the paving materials are to be avoided. If they cannot be avoided, they are to be reported.
- The asphalt surfacing materials are to be laid with constant thickness.
- In the case of an additional profiling coat, restoring the road back to its normal state is, in principle, to be accomplished without plans or longitudinal and transverse profiles, except in the case of new roads or major corrections.
- Laying of the asphalt surfacing materials must be organized such as to minimize the number of repair joints and the repair joints of superimposed layers are to be staggered with respect to each other by at least 15 cm. Particular attention is to be given to compacting of joint zones.
- When the surfacing is laid over half the road width, vehicles must be prevented from traversing the edge of the longitudinal joint if possible. The edge laid on the axial side is to be cut with a disk mounted on a roller and the cut is to be coated with a bituminous strip.
- The joints of longitudinally laid surfacing are to be staggered by about 15 cm with respect to the road axis to avoid application of road marking on the joint.
- When laying surfacing over an extended period, the asphalt paving is to be milled or otherwise vertically cut through the entire thickness of the course to make routine repair joints possible. A longitudinal check by a 4 m batten is also to be carried out on the zone preceding stopping of laying to verify the quality of the work. If necessary, such a check will determine the extent of the zone to be overlapped. The cut is to be coated with a bituminous strip.

9.4.4 Height Tolerances[19]

The height tolerance is:

- Subbase: plus zero or minus two centimeters (+0 or - 2 cm) with respect to the project value);
- Base course: plus two or minus zero centimeters (+2 or -0 cm) with respect to the project value);

The tolerance with respect to the surfacing as measured at any surface position of the courses by the 3 m rule is:

- Subbase: maximum deflection: < 2 cm ;
- Base course: maximum deflection: < 1.5 cm.

The tolerance with respect to the slope of the course is :

- Subbase: plus fifteen or minus two centimeters (+15 or - 2 cm) as measured horizontally with respect to the theoretical profile;
- Base course: plus fifteen or minus zero centimeters (+15 or - 0 cm) as measured horizontally with respect to the theoretical profile.

[19] Office des Voiries et Drainage, Cahier des Prescriptions Techniques, Bureau d'études et de Développement, Travaux de réhabilitation et modernisation du Boulevard Lumumba, Kinshasa, july 2009

9.5 Quality Control After the Work

Quality control after the work makes it possible to ensure that the road can be kept in good condition after being put into service and is necessary on tentative or final acceptance of the work. Following visual inspection of the road performance, several of the above-mentioned tests can be carried out for that purpose at the request of the inspecting engineer.

In the case of concrete parts (edges, etc.) the Engineer can have the contractor carry out in-situ control tests at his expense by combined ultrasonic testing and coring if the prescribed strengths at 28 days are not obtained on control test specimens. Depending on the results of those tests and the actual stresses in the product of the work, the Engineer may order demolition of all or part of the structure.

9.6 Frequency of Tests [20]

The quality control tests on the materials are to be carried out in accordance with the frequencies indicated for the following different designations of this paragraph.

- ***Fills :***

o **Preliminary identification**

The identification files of the borrow pits and the excavated materials to be used for fills must be submitted to the Engineer for approval by thirty (30) days after the order to start the work and must include, among other things, the following test results :

Designation of the tests	Minimum frequency of the tests
Granulometric analysis	1 test for every 2,000m^3
Atterberg limits	1 test for every 2,000m^3
Modified Proctor	1 test for every 5,000m^3
CBR	1 test for every 5,000m^3

However, if a borrow pit or excavated materials offer useable quantities less than those indicated above, a complete series of tests is to be carried out.

o **Control at Implementation**

For each layer of ordinary fill material, the following tests are to be carried out with the frequencies indicated below :

Designation of the tests	Minimum frequency of the tests
Granulometric analysis	1 test for every 2,000m^3
Atterberg limits	1 test for every 2,000m^3
Modified Proctor	1 test for every 5,000m^3
CBR	1 test for every 5,000m^3
Compactness in place	1 test per layer (maximum length of 500m)

For the subgrade (the upper 30cm of the roadbed) the test frequencies are to be as follows :

[20] Office des Voiries et Drainage, Cahier des Prescriptions Techniques, Op cit.

Designation of the tests	Minimum frequency of the tests
Granulometric analysis	1 test for every 1,000 l.m. (linear meter)
Atterberg limits	1 test for every 1,000 l.m.
Modified Proctor	1 test for every 2,000 l.m.
CBR	1 test for every 200 l.m.
Compactness in place	1 test for every 200 l.m.
Deformation modulus, Me	1 test per kilometer

If the origin of the above materials changes, one or two series of tests at a lower frequency may be necessary. Samples to verify the material are to be taken from the road after unloading and before evening and compacting.

It is up to the contractor to ensure the material qualities extracted from a quarry so that they meet standards regarding grain size, plasticity or nature.

- ***Contiguous Fills***

Depending on the implementation method, the tests frequencies are higher for contiguous fills than ordinary fills.

Moreover, if requested by the Engineer, the contractor must have measurements of aggressiveness (anion content, pH per meter of pH paper) of the fill materials for the work and water of the watercourses made at his/her own expense.

o ***Subbase***

The following tests are to be carried out at the specified frequencies :

Designation of the tests	Minimum frequency of the tests
Granulometric analysis	1 test for every 500 l.m.
Atterberg limits	1 test for every 500 l.m.
Modified Proctor	1 test for every 1,000 l.m.
CBR	1 test for every 1,000 l.m.
Compactness in place	1 test for every 200 l.m.
Deformation modulus, Me	1 test per kilometer

o ***Base course***

The following tests are to be carried out at the specified frequencies :

Designation of the tests	Minimum frequency of the tests
Granulometric analysis	1 test for every 250 l.m.
Atterberg limits	1 test for every 250 l.m.
Modified Proctor	1 test for every 250 l.m.
CBR	1 test for every 250 l.m.
Compactness in place	1 test for every 100 l.m.
Deformation modulus, Me	1 test for every 500 l.m.

The samples to verify the material quality are to be taken from the road after unloading and before evening and compacting.

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It is up to the contractor to ensure the material quality after it is prepared so that it will meet standards regarding grain size, plasticity and nature.

- ***Bitumens*** *(same as the preceding points).*

- ***Gravel and bitumens*** *:*

Designation of the tests	Minimum frequency of the tests
Composition with extractor (binder content, grain size, filler percentage:	1 test for every 1,000 m
Marshall stability	1 test for every 1,000 m
Compression, Devriez immersion	1 test for every 1,000 m
Compactness on test specimen	1 test for every 1,000 m
Thickness on core sample	1 test for every 500 m

- ***Surfacing materials:***
  - **Bitumens:**

    The contractor must provide the Engineer with duplicate copies of the bills of delivery and the producer's certification of conformity of the supplies with the required specifications.

    At each delivery of the products to the road work site, acceptance tests of the hydrocarbon binders for the pure and liquefied bitumens respectively are to be carried out at the choice of the Engineer, particularly:
    - measurements of density
    - measurements of viscosity at 25°C (B.R.T.A.)
    - fractional distillation
    - measurements of penetration and ring and ball softening point

  - **Granulates for surfacing materials:**

    For the granulates for surfacing materials, the following characteristics are to be measured at the quarry and, if applicable, the storage site :

Designation of the tests	Minimum frequency of the tests
Dimensions	1 test for every 100m^3
Shape	1 test for every 100m^3
Homogeneity	1 test for every 100m^3
Purity	1 test for every 100m^3
Los Angeles	1 test for every 100m^3
Micro-Deval wet	If requested by the Engineer
Vialit adhesion(Determination of binding-aggregate adhesiveness by measuring cohesion)	If requested by the Engineer

  - **Impregnation and surfacing materials**

    The following checks are to be carried out on the impregnation and single- or double-layer surfacing:

Designation of the tests	Minimum frequency of the tests
Binder dose	1 test for impregnation and for each surfacing layer for every 300 m and/or fraction thereof
Gravel dose	1 test for each surfacing layer for every 300 m and/or fraction thereof

  - **Asphalt Mix**

Designation of the tests	Minimum frequency of the tests
Composition with extractor (binder content, grain size, filler percentage)	1 test per kilometer
Marshall stability	1 test per kilometer
Compression, Duriez immersion	1 test per kilometer
Compactness on test specimens	1 test per kilometer
Thickness on core specimens	1 test for every 500 l.m.

  - ***Concrete aggregates***

    The following tests are to be carried out with the specified frequencies :

    - **On the sands** :

Designation of the tests	Minimum frequency of the tests
Granulometric analysis	At the Engineer's choice
Sand equivalent purity test (N.F.P. 18.301 or equivalent currently in effect)	At the Engineer's choice

    - **On the aggregates** :

Designation of the tests	Minimum frequency of the tests
Granulometric analysis	At the Engineer's choice
Los Angeles	At the Engineer's choice
Micro-Deval wet	At the Engineer's choice
Angularity, shape coefficient	At the Engineer's choice
Purity test (N.F.P. 18.301 or equivalent currently in effect)	At the Engineer's choice

  - ***Cements***

    If a quantity of cement is delivered to the road work site on date D, the contractor is obliged to have the complete acceptance tests carried out by an approved laboratory by the following dates:

    D + 1 month, D + 2 months, D + 3 months, etc. until the entire lot is used up.
    The acceptance tests are to be carried out as per the operating procedures defined in the standards N.F.P. 15 300, 301 and 302 (or equivalent presently in effect) and in accordance with CCTP.
    The cement acceptance sampling will be carried out in the presence of the Engineer and contractor or their representatives.
    Those tests are the responsibility of the contractor.

- ***Batching water***

  The water used for batching the mortars and concretes must have its qualities verified (N.F.P 18.301 or equivalent presently in effect) as decided by the Engineer.

  The following tests are to be carried out:
  Determination of suspended matter and dissolved salts content.

  In case of work in zones where treated water is scarce, other possibilities can be considered, including the use of water from springs and boreholes.

- ***Concrete***

  Note:
  The different concretes are designated with symbols using one or two letters followed by a number of three digits. The first letter C or Q indicates the class to which the concrete belongs. The second letter indicates the particular purpose of the concrete:
  C = common concrete
  F = concrete for foundation
  Q = quality concrete
  E = concrete for elevation

  The number (150, 350, etc.) indicates the minimum weight of cement expressed in kilograms that one cubic meter of this concrete must contain, the volume considered after execution. C150 class common concrete is used as lean concrete. Q350 class concrete is required for crossing and drainage structures. The latter must have a nominal strength at 28 days of 27 MPa in compression and 2.2 MPa in traction.

  It is brought to the attention of the Contractor that he may need to dose more cement to obtain such resistances for certain concretes. The Contractor shall not raise any claim in case of such necessity.

o **Verified concrete**

Determination of the composition of the concrete is the responsibility of the contractor. The tests are to be carried out by a laboratory approved by the Engineer.

The composition of C 150 common concretes is to be such that the volume of medium and large granulates is nearly twice that of the sand.

The contractor must submit the composition of the C 150 and C 250 common concretes to the Engineer promptly and after examining the proposals the Engineer will grant his approval for the quantity of incorporated water per cubic meter of each of those concretes.

The contractor must submit to the Engineer and his study on the composition of the Q 350 concrete with respect to sand, medium and large granulates and water at least fifteen (15) calendar days before the scheduled date for use thereof. The study is to be based on a water/cement ratio not exceeding 0.5 and an Abraham's cone plasticity not exceeding 5 cm.

The Engineer has ten (10) calendar days in which to inform the contractor of his/her approval thereof or any remarks or conditions concerning the same.

The study tests must include at least:

- Complete identification of the granulates ;
- Gravel: specific weight, granulometric analysis, shape coefficient, Los Angeles coefficient;
- Sand: specific weight, granulometric analysis, sand equivalent;
- Physicochemical analysis of the batching water (in accordance with currently applicable French standards); determining the setting retarding effect on normal mortar. Comparative tests are to be carried out with the potable water of the urban water distribution network and the water of the water supply site recommended by the contractor;
- Determination of optimum shape ;
- Optimum (Abrahams cone) fresh concrete consistence;
- Preparation of concrete crushing test specimens (cylindrical 6 x 32):
  - Compression : Three specimens in three days
    : Six specimens at seven days
    : Ten specimens at 28 days
  - Bending tensile strength: Three specimens at seven days

Or Brazilian test 3 specimens at 28 days

Total : 25 specimens

The theoretical formulas must be adjusted per m³ based on the densities obtained.

o **Approved concrete**

Before the work starts, an 'approved concrete' must be prepared at the road work site for each concrete 'plant'.

'Approved concrete' means a concrete prepared by the contractor and approved by the Engineer at the work site before the road work starts for each concrete plant based on the results of the concrete study submitted beforehand by the contractor.

A 'concrete plant' is considered to be a particular assembly of equipment, whether stationary or transferable from one work site to another, as operated by a particular team of personnel.

Under the work site conditions and with the equipment that the contractor intends to use for each part of the work, the Engineer is to have 'approved concretes' made at the site that are meant to prove that the means used make it possible to obtain results in agreement with what has been foreseen by the study tests.
The permissible range of water doses must be determined at the time of such approval test. Two batches of the same dry composition are to be prepared:

- The first batch is to be moistened to obtain the minimum admissible test slump for all the work. A pouring test is to be carried out for one of the densest parts of the reinforcement provided for in the contractor's plans. The ease of handling of the concrete is to be verified at the time of pouring using the type of formwork determined by the contractor for all the work. After the concrete sets and the formwork is removed, the appearance of the crude surfaces is to be analyzed by the Engineer, who will then give his/her opinion on the ease of handling of the concrete and the equipment used. If the spacing between reinforcement bars

always exceeds 9.5cm, the Engineer has the option of accepting that the contractor not carry out any pouring test of a reinforced piece.

- The second batch is to be moistened so as to obtain the maximum admissible test slump for all the work. The test specimens are to be prepared for tests at 7 and 28 days respectively and the minimum number of test specimens to undergo the test is that prescribed for the study test.

The contractor is responsible for providing the necessary materials and carrying out the tests.

The Engineer will give his/her approval if the ease of handling of the concrete is sufficient and the nominal strength at 28 days is at least equal to the corresponding required strength.

However, the work can start on the Engineer's approval, provided the nominal strength at 7 days is at least equal to 85% of the required strength at 28 days.

If not, the results at 28 days must be awaited. If the tests at 28 days do not show the prescribed strengths, the contractor must prepare a new 'approved concrete' at his/her own expense after making the necessary improvements.

o **Control of production**

Samples are to be taken for control test specimens to determine the probable strengths of the concrete of the work at a given time so as to be able to judge the possibilities of lowering and removing formwork, stressing, etc.

The above-mentioned verification involves:

- Test of consistency of the fresh concrete: 1 Abraham's cone test every two hours of preparation of the concrete, with a minimum of three tests for each portion of the work, including a test on starting preparation. For reference, the required plasticity corresponds to a test slump of between 3 and 5 cm in the case of vibrated concretes.
- Crushing tests: samples for the production control test specimens are to be taken to determine the probable strengths of the concrete of the portion of the work at a given moment so as to be able to judge the possibilities of lowering and removing the formwork, stressing, etc. At least six vibrated concrete cylindrical test specimens are to be prepared for each portion of the work (or sub-portion thereof in case of redoing of preparation of the concrete) and kept in water at 25°C. The specimens are to be tested at the following ages:
  - at 7 days: 3 cylinders
  - at 28 days: 3 cylinders

If the concrete is supplied by truck mixers, a consistency test is to be carried out for each truck mixer on commencement of pouring and again when preparing test specimens. At least one test specimen is to be prepared for each truck mixer if more than six batches of truck mixers are involved. Those test specimens are to be kept by the control mission in accordance with the applicable standards.

If the strengths at 7 days are under 85% of the prescribed strength at 28 days, the contractor must stop the concrete work and not resume it until the Engineer has authorized him/her to do so.

- **Mortars**
  The M1 class mortar, dosed at 250kg of cement per one cubic meter of dry sand, shall be used as bed for laying ripraps, curbs, milestones, etc. The M2 class, dosed at 400kg of cement per one cubic meter of sand, shall be required for repointing joints in drainage structures, downspouts, ripraps, etc.

- **Admixtures for mortars and concrete**
  The use of admixtures shall be subject to the prior agreement of the Engineer.

CHAPTER 10
DATABASE

10.1 Outline of Construction of a Database for Road Maintenance

Road maintenance operations in the Democratic Republic of the Congo are characterized by certain weak points, including, on the one hand, an inadequate budget, inefficient and inadequate use of the available budget and insufficient basic data on the road network to be managed and, on the other, nonexistence of common official manuals for inspection and repair work. That being the case, even when visual inspection is carried out for the purpose of inspection of the roads, the data is not stored in an objective manner and a maintenance plan based on the inspection findings is not developed.

In view of that situation, it is clearly indispensable to construct a continuously practicable PDCA (Plan – Do – Check – Act) cycle mechanism (management system) on the basis of an integrated road maintenance database. Such a mechanism is illustrated in Figure 1. Such a maintenance system, taking advantage of a database and information and communication technologies, will make it possible to improve the reliability and effectiveness of operations. It should be necessary to keep in mind that, designing and operating such a system will make it possible to carry out adequate operations with the human resources in the Democratic Republic of the Congo, that are presently under-exploited.

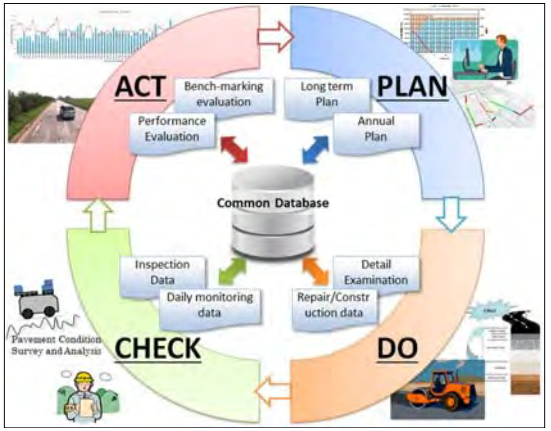


Figure 10.1 Maintenance Cycle (PDCA Cycle)

10.2 Implementation Guidelines

The operation consists in designing the functionality of a structured database providing the functions of input (data entry interfaces) and updating of data as well as exploitation of information contained in that a database for the sake of managing information on roads (inventory, inspection and repair) in a unified and coordinated manner.

This database for road inspection is not of an independent type. It must be accompanied by development of interface for easy input of diverse data and by a function that makes it possible to directly link data to be used and to be enhanced for the purpose of establishment of the maintenance plan.

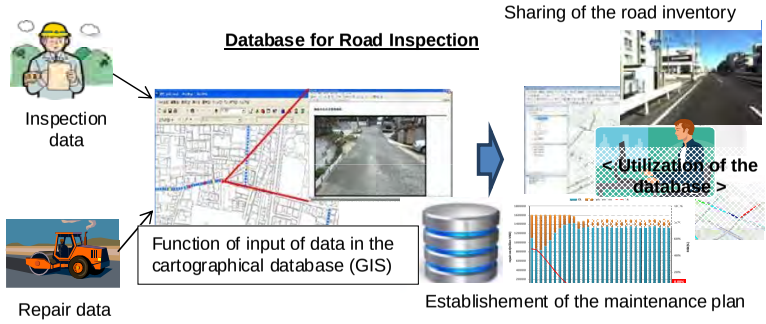


Figure 10.2 Overall Configuration of a Road Inspection Database

10.2.1 Establishment of a Data Input Function for Facilitation of Correct Updating

This is a function making it possible for the central server administrator to easily accomplish input of inspection and repair data in a database.

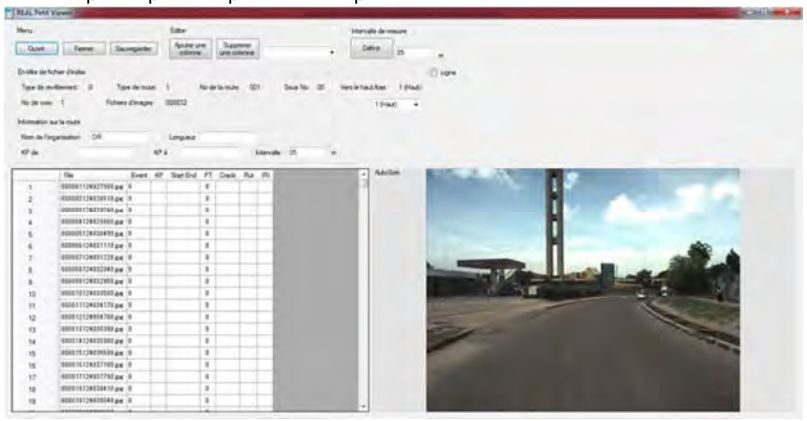


Figure 10.3 Example of the Dialogue Box for Input of Inspection Data

10.2.2 Input of Road Imaging Data for Sharing Information and Communication Between the Different Stations Concerned

Through input of road deterioration identification information in the road imaging database as the main data, a platform (database) will be conceived for the purpose of

drawing up an objective maintenance plan and creating appropriate communication between different stations concerned with maintenance.

Figure 10.4 Example of Data on Road Surface Deterioration Based on Road Imagery Data

10.3 Application Guidelines

10.3.1 Rationalization of Road Inspection With the Help of Imaging

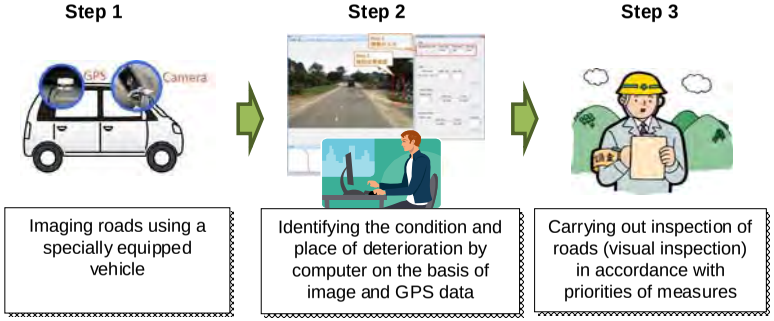


Figure10.5 Rationalization of Road Inspection Using Imaging

10.3.2 Utilization and Development of Imaging as Road Inventory Data

Imaging of roads using specially equipped vehicles and GPS data information can be used not only for rationalization of road inspection but also as road management inventory data. Road imaging contains geographic coordinates data of GPS, and because of that, can be developed on the GIS, which makes it possible for anyone in daily road maintenance operations to consult the data regarding the situation of roads.

It is also possible to understand simultaneously the position and the situation of roads and those of surrounding installations (water removal installations, crossroads, bridges, slopes, etc.) that can be identified by imaging along the road.

10.3.3 Ensuring Reliability by Establishing Unified and Coordinated Management of Data and the Management System

To ensure the reliability of data for road inspection at user stations, it is recommended to have a structured and single database that all users that road maintenance concerns can access and use.

Furthermore, management and application of this database must be performed continuously after the end of the present Project, and it is therefore necessary of establish a management system for that database by, for example, assigning a specialist engineer for facilitation of its seamless updating and application.

10.4 Data to Be Accumulated

- Results of inspection of the road surface (visual surveying by imaging)
- Information on the history of repairs
- Road imaging data + GPS
- Road inventory
- Other data (traffic volume, etc.)

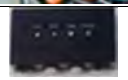
10.5 Necessary Equipment

10.5.1 Data Collection Equipment

- Portable imaging system (equipment to be mounted on vehicles)

Figure10.6 Portable Imaging System

Tableau 10.1 Description of equipment

Equipment and software	Photo	Specifications	Operating mode
Vehicule		4 x 4 vehicle, preferably TOYOTA brand	**1. Connection of motor pulse wires** This step consists of harmonizing the number of revolutions of the engine and of the tires. **NB:** The inspection vehicle must be set up in advance according to the relevant standards. **2. Installation of inspection equipment** Installation consists of: - Placing the camera on the roof of the vehicle; - Connecting the two cables to the camera (Power and Internet signal); - Placing the GPS on the roof of the vehicle; - Connecting the motor pulse wires; - Connecting the external hard disk; - Connecting the inverter cable to the cigarette lighter; - Turning on the UPS, the inverter, and the control unit. **3. Distance calibration** This step consists of calibrating the inspection kit (the camera, the GPS, and the Real Petit Viewer software) in order to harmonize the data recording following the number of revolutions of the engine and of the tires, in relation to the states of them. **4. Data recording** The image data is recorded at a rate of 5 meters by the camera placed on the roof of the vehicle..
Camera		2 million pixels 1 / 1.8 "CCD	
Computer			
GPS		(GNSS / RS Weather, GPS Receiver)	
External hard disk drive		3 TB	
UPS			
Inverter		Power Supply Device, 400W, Frequency 50Hz / 60Hz	
Operation and control unit			
Digital camera		**Type:**CMOS 22.3 × 14.9 mm **Number of effective pixels**: about 18 million **Aspect ratio:**3:2	

10.5.2 Equipment and software for data processing and production

Equipement:

- Computers;
- Printers for printing inventories;
- Large format printer (plotter) + Large format paper cutter, to produce maps of geographic situations;
- Overhead projector + rolling screen, to be placed in a suitable room so as to have a close-up when monitoring and updating the data and using the Geographic Information System (GIS).

Software:

- Database Management System (Real Small Viewer Software);
- CSV format file for calculating the provisional budget for activities

Tableau 10.2 Typical model of a criteria table for cracking

Criterion per lane*	Classe	Rate of cracking	
No cracks	1	0%	
Few cracks	2	10%	Target to be repaired
¼	3	30%	
½	4	50%	
> 1/2	5	80%	

Criterion per lane*	Classe	Rate of cracking	
Small pothole	3	30%	Target to be repaired
Large pothole	5	80%	

Note (*):
The **criterion per lane** evaluates the proportion of cracking in one traffic lane according to the extent of cracks observed there. The cases considered are as follows:

- If there are no cracks in the studied lane, the corresponding rate of cracking is 0% and the level (class) to be attributed to the state of this lane is 1;
- If there are few cracks in the studied lane, the corresponding cracking proportion is 10% and the level (class) to be attributed to the state of this lane is 2;
- If the cracks occupy approximately 1/4 of the surface observed in the studied lane, the corresponding cracking proportion is 30% and the level (class) to be attributed to the state of this lane is 3;
- If the cracks occupy approximately half (1/2) of the surface observed in the studied lane, the corresponding cracking proportion is 50% and the level (class) to be attributed to the state of this lane is 4;
- If the cracks are greater than half (1/2) of the surface observed in the studied lane, the corresponding rate of cracking is 80% and the level (class) to be attributed to the state of this lane is 5.

Table 10.3 Example of presentation of the output data

	Road Catego	Road Numbi	Branch Numbe	Road Name	Directic	KP_Fror	KP_To	Lengt	Latitude_Fro	Longitude_Fro	Latitude_T	Longitude_T
1												
16	1	1	1	0 Mitende_Cité verte	D	562,28	562,3	20	-4,50540500	15,1946417	-4,50525500	15,1948400
19	1	1	1	0 Mitende_Cité verte	D	562,34	562,36	20	-4,50502167	15,1951217	-4,50494167	15,1952133
20	1	1	1	0 Mitende_Cité verte	D	562,36	562,38	20	-4,50494167	15,1952133	-4,50486000	15,1953033
22	1	1	1	0 Mitende_Cité verte	D	562,4	562,42	20	-4,50469000	15,1954850	-4,50460167	15,1955750
23	1	1	1	0 Mitende_Cité verte	D	562,42	562,44	20	-4,50460167	15,1955750	-4,50451000	15,1956617
30	1	1	1	0 Mitende_Cité verte	D	562,56	562,58	20	-4,50361333	15,1964817	-4,50351000	15,1965717
31	1	1	1	0 Mitende_Cité verte	D	562,58	562,6	20	-4,50351000	15,1965717	-4,50340333	15,1966667
33	1	1	1	0 Mitende_Cité verte	D	562,62	562,64	20	-4,50330167	15,1967617	-4,50320167	15,1968617
34	1	1	1	0 Mitende_Cité verte	D	562,64	562,66	20	-4,50310500	15,1969600	-4,50301000	15,1970600
44	1	1	1	0 Mitende_Cité verte	D	562,84	562,86	20	-4,50218833	15,1983467	-4,50212500	15,1984783
48	1	1	1	0 Mitende_Cité verte	D	562,92	562,94	20	-4,50186667	15,1989933	-4,50180167	15,1991183
50	1	1	1	0 Mitende_Cité verte	D	562,96	562,98	20	-4,50168000	15,1993783	-4,50162167	15,1995100

	Pav	Inspection Ye	Inspection Mon	Crac	Ru	Fi	Area	Key1	Key2	Repair Me	Unit Cost	Cost
	0	2018	3	2	1	1	70	1	2	Scellemen	3,75	262,5
	0	2018	3	2,25	1	1	70	1	2	Scellemen	3,75	262,5
	0	2018	3	2,25	1	1	70	1	2	Scellemen	3,75	262,5
	0	2018	3	2,25	1	1	70	1	2	Scellemen	3,75	262,5
	0	2018	3	2	1	1	70	1	2	Scellemen	3,75	262,5
	0	2018	3	2,5	1	1	70	1	2	Scellemen	3,75	262,5
	0	2018	3	2	1	1	70	1	2	Scellemen	3,75	262,5
	0	2018	3	2	1	1	70	1	2	Scellemen	3,75	262,5
	0	2018	3	2,5	1	1	70	1	2	Scellemen	3,75	262,5
	0	2018	3	2	1	1	70	1	2	Scellemen	3,75	262,5
	0	2018	3	2	1	1	70	1	2	Scellemen	3,75	262,5
	0	2018	3	2	1	1	70	1	2	Scellemen	3,75	262,5
	0	2018	3	2,25	1	1	70	1	2	Scellemen	3,75	262,5

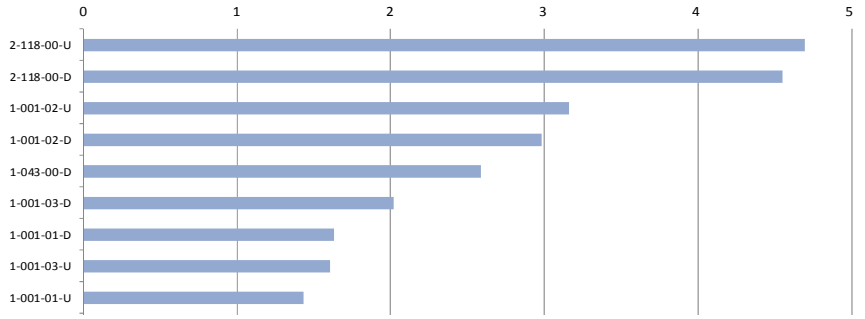


Figure 10.7. Examples of graphical presentations of results on cracking average of road condition

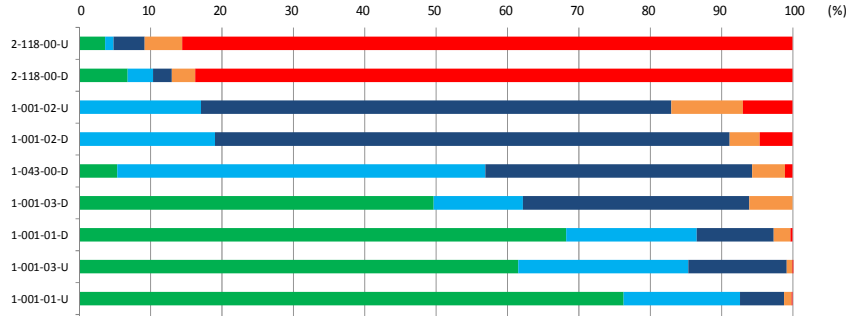


Figure 10.8. Examples of graphical and cumulative results of road condition

MANUAL FOR MAINTENANCE AND REPAIR OF ASPHALT PAVED ROADS

Table 10.4 Example of presentation of the estimated budget for repair by class and type of pavement deterioration

National Road (RN)

N°	Road Name		Road No.	Lane No.	Width (m)	Degradation and intervention type												Budget and Repair	
						5 Very bad		4.9~4.0 Bad		3.9~3.0 Medium		2.9~2.0 Good		1.9~1.0 Very good		Degradation average	Length inspected by lane	Lane amount	Total amount
						Réconstruction				Surfacing		Sealing		-					
						Mètre	%	Mètre	%	Mètre	%	Mètre	%	Mètre	%				
1	Mitende - Cité verte	Forward	RN1	1-001-00-D	3,50	40,00	0,33	280,00	2,29	1 325,00	10,82	2 240,00	18,29	8 360,00	68,27	1,6	12 245,00	**636 535,20**	**980 897,40**
		Return		1-001-01-U	3,50	20,00	0,16	120,00	0,98	760,00	6,23	2 000,00	16,39	9 300,00	76,23	1,4	12 200,00	**344 362,20**	
		Round trip			7,00	**30,00**	**0,25**	**200,00**	**1,64**	**1 042,50**	**8,53**	**2 120,00**	**17,34**	**8 830,00**	**72,25**	**1,5**	**12 222,50**		
		Budget/Type				**58 863,00**		**392 420,00**		**399 319,20**		**130 295,20**		**0,00**					
2	Bypass (Cité verte - Echangeur Limete)	Forward	RN1	1-001-02-D	3,50	0,00	0,00	0,00	0,00	0,00	0,00	2 395,00	16,78	11 880,00	83,22	1,3	14 275,00	**73 598,40**	**185 363,00**
		Return		1-001-03-U	3,50	0,00	0,00	40,00	0,28	0,00	0,00	2 360,00	16,55	11 860,00	83,17	1,2	14 260,00	**111 765,00**	
		Round trip			7,00	**0,00**	**0,00**	**20,00**	**0,14**	**0,00**	**0,00**	**2 377,50**	**16,66**	**11 870,00**	**83,20**	**1,3**	**14 267,50**		
		Budget/Type				**0,00**		**39 242,00**		**0,00**		**146 121,00**		**0,00**					
3	Echangeur Limete - Nsele	Forward	RN1	1-001-04-D	12,50	18,13	0,05	646,53	1,62	6 145,02	15,36	9 619,34	24,05	23 569,00	58,93	1,7	39 998,00	**7 032 270,00**	**9 510 618,60**
		Return		1-001-05-U	12,50	0,00	0,00	169,18	0,42	1 861,03	4,64	7 365,56	18,38	30 679,76	76,55	1,4	40 075,53	**2 478 348,60**	
		Round trip			25,00	**9,06**	**0,02**	**407,85**	**1,02**	**4 003,02**	**10,00**	**8 492,45**	**21,21**	**27 124,38**	**67,75**	**1,5**	**40 036,77**		
		Budget/Type				**58 863,00**		**2 648 835,00**		**5 075 280,00**		**1 727 640,60**		**0,00**					
4	Nsele - Pont Lufimi	Forward	RN1	1-001-06-D	3,50	0,00	0,00	20,00	0,02	60,00	0,07	3 380,00	3,77	86 215,00	96,14	1,1	89 675,00	**67 489,80**	**194 539,10**
		Return		1-001-07-U	3,50	0,00	0,00	80,00	0,09	580,00	0,65	2 100,00	2,34	86 975,00	96,92	1,1	89 735,00	**127 049,30**	
		Round trip			7,00	**0,00**	**0,00**	**50,00**	**0,06**	**320,00**	**0,36**	**2 740,00**	**3,05**	**86 595,00**	**96,53**	**1,1**	**89 705,00**		
		Budget/Type				**0,00**		**49 052,50**		**61 286,40**		**84 200,20**		**0,00**					
5	Pont Lufimi-Kwango	Forward	RN1	1-001-08-D	3,50	0,00	0,00	0,00	0,00	0,00	0,00	8 180,00	34,12	15 795,00	65,88	1,5	23 975,00	**125 685,70**	**338 300,20**
		Return		1-001-09-U	3,50	0,00	0,00	0,00	0,00	420,00	1,75	11 220,00	46,77	12 350,00	51,48	1,7	23 990,00	**212 614,50**	
		Round trip			7,00	**0,00**	**0,00**	**0,00**	**0,00**	**210,00**	**0,88**	**9 700,00**	**40,44**	**14 072,50**	**58,68**	**1,6**	**23 982,50**		
		Budget/Type				**0,00**		**0,00**		**40 219,20**		**298 081,00**		**0,00**					
6	Nsele - Maluku	Forward	RN43	1-043-00-D	7,00	285,00	1,12	1 160,00	4,57	9 480,00	37,37	13 100,00	51,65	1 340,00	5,28	2,6	25 365,00	**3 635 789,85**	**8 179 311,70**
		Return		1-043-01-U	7,00	225,00	0,89	860,00	3,40	17 020,00	67,21	7 140,00	28,19	80,00	0,32	2,9	25 325,00	**4 543 521,85**	
		Round trip			14,00	**255,00**	**1,01**	**1 010,00**	**3,98**	**13 250,00**	**52,29**	**10 120,00**	**39,92**	**710,00**	**2,80**	**2,7**	**25 345,00**		
		Budget/Type				**500 335,50**		**1 981 721,00**		**5 075 280,00**		**621 975,20**		**0,00**					
Total by intervention type of RN						**5 729 332,00**				**10 651 384,80**		**3 008 313,20**		**0,00**					
National roads Total						**294,06**	**0,14**	**1 687,85**	**0,82**	**18 825,52**	**9,16**	**35 549,95**	**17,29**	**149 201,88**	**72,58**	**1,6**	**205 559,27**		**19 389 030,00**

CHAPTER 11
SUPERVISION OF WORKS

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11.1 Objective of supervision of works

At the start of the works, a thorough examination of the methodology (human resources, materials, equipment, work methods, availability of funds) to be used for realization of the works in strict compliance with the deadline and the schedule for the the work implementation is required.

To this end, the following points shall be observed: (1) Schedule control of the works, (2) Control of topographic tolerances (altimetric and planimetric), (3) Quality control, (4) Control of the cost of the works, (5) Security check.

The objective of supervision of the works is to establish and harmonize the work implementation program for realization of quality works at a reduced cost and in accordance with the schedule.

11.2 Function of supervision of works

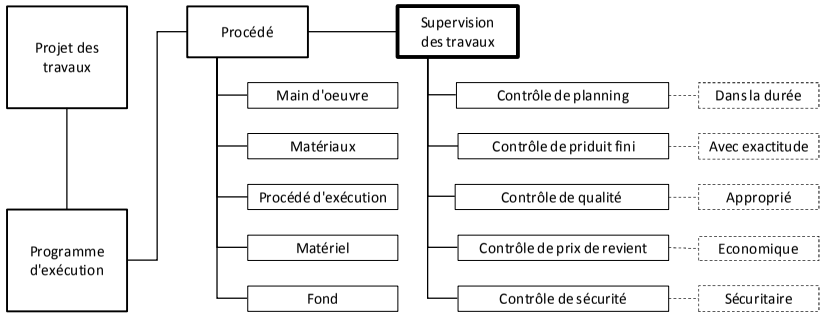

Figure 11.1 Function of supervision of works

With regard to the control of the work implementation schedule, the topographical (altimetric and planimetric) tolerances, the quality, the cost of the works and the safety, it is necessary to be carried out at each stage of the Project.

However, it should be noted that these control functions are interrelated and not independent.

During the implementation of the works, the following relations can be established between the quality, the schedule and the cost of the works.

The relationship between the schedule and the cost of the works is shown in Figure 11.2 by the curve " a ". It is noted that the cost of works decreases as the elements of the schedule increase. However, when it is necessary to carry out emergency works (in case the schedule must be respected in an unusual way), the cost of the works is high.

(1) The relation between the cost of the works and the quality is shown in Figure 11.2 by the curve " b ". Poor quality is generally cheaper while the better is more expensive.

(2) The relation between the quality and the schedule is shown in Figure 11.2 by the curve " c ", the best quality is a function of time and schedule. Poor quality is dependent on emergency work, in addition to speeding up the schedule.

There are contradictory characters and synergistic characters on the quality, the schedule and the cost of the works.

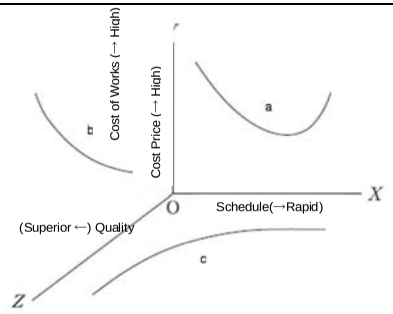

Figure 11.2 Relation between schedule, cost price and quality

11.3 Cycle of management

The supervision of the works is carried out according to the cycle indicated in figure 11.3 below:

(1) Plan

Plan the supervision program to define the criteria values or the standard values.

(2) Do

Carry out or implement the works in accordance with the plans.

(3) Check

Record and put in order the data obtained after the works, examine and check the conformity between the plans and the realization.

(4) Act

If, after checking, the results obtained are not satisfactory compared to those defined in the plans, the cause shall be sought and the necessary corrective measures shall be taken.

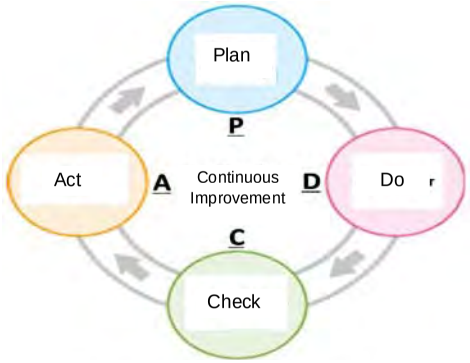

Figure 11.3 Cycle of management

(5) Recycling

Plan→Do→Check→Act (P→D→C→A） is a cycle that requires continuous repetition.

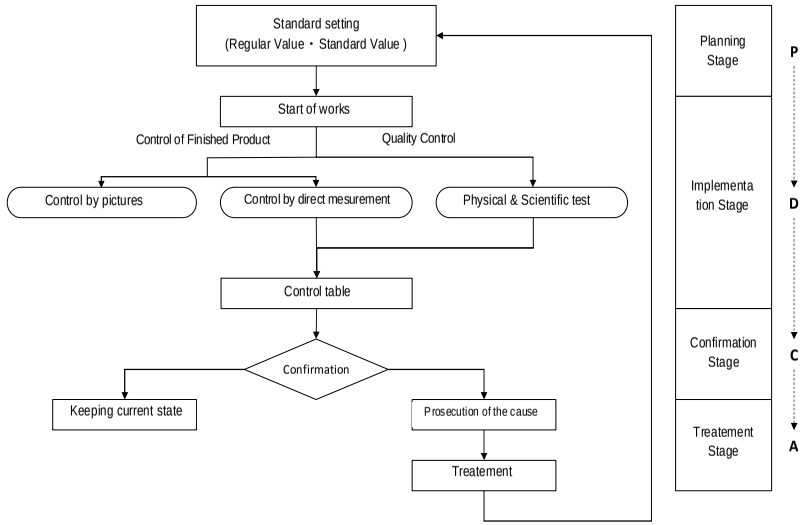

Figure 11.4 Diagram of the supervision of the works

11.4 Components of the supervision of the works

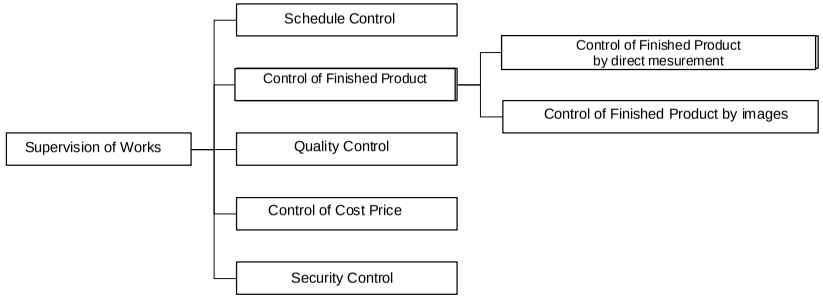

Figure 11.5 Components of the supervision of the works

Finished product means completed works.

11.5 Schedule control

The schedule control shall allow a comparison between the current and the original schedule.

If there is a difference, the cause of the delay shall be sought and remedied. The control makes it possible to make the adjustment for a progress of the schedule as envisaged in the plans.

11.6 Control of the topographical tolerances (altimetric and planimetric)

(1) Control of topographic tolerances (altimetric and planimetric) by direct measurement

The control of topographical (altimetric and planimetric) tolerances by direct measurement is used to confirm whether the dimensions and shapes conform to the documents and plans by measuring the completed works (dimensions, shapes, base level and axis offset) according to the order of Implementation of the works. The results of each measurement will be recorded in a control chart or diagram chart.
The confirmation of these results implies, in case of defects, a study and a careful treatment of the corresponding causes.

(2) Control of topographic tolerances (altimetric and planimetric) using images (photos)

The control of the altimetric tolerances with help of images makes it possible to control the quality of the Implementation works of the underground works, which is hard to assess after embankments. (see "Chapter 9: Quality Control"). This image shall be taken according to the relevant standards.

This control also makes it possible to follow the progress of the work for each stage of the works.

11.7 Quality Controle

The purpose of the quality control is to carry out the works which meet the quality standards mentioned in the plans.
Following the quality control standards, the physical and chemical tests are carried out to obtain the results.

By applying statistical methods, existing problems can be discovered to propose solutions.

Quality control is an identical control in the supervision of works; it allows schedule and altimetric tolerances to be controlled in parallel to ensure initial quality, stable schedule and suitable altimetric tolerances (see "Chapter 9: Quality Control").

11.8 Controle of the cost of the works

The control of the cost of the works is intended to lower the cost of the construction work so as to include it in the initial budget. For this purpose, the cost of the works practiced on the site may not exceed that provided in the plans.

11.9 Security Controle

The security control is used to program the organization and the work environment for Implementation of the works in the safest conditions. The security of civil works will be ensured on the basis of a realistic scheduling, a good methodology of construction and reasonable expenses, while adapting it to the situation of the works following a possible modification of the schedule.

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ANNEXE

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1. Equipment of Control (Testing) [21]

The following outlines some control equipment adopted particularly for this manual. Tables Annexe I and II below describe the essential control equipment in asphalt-paved road maintenance and repair work, at the laboratory and work sites, respectively.

1.1. Testing Equipment at Laboratory

Table Annex 1. Equipment of Control (Testing) at the Laboratory

No.	Task to be accomplished	Type of control/testing	Necessary equipment/ supplies	Results expressed in:
01	**Identification of the materials (excavated materials, borrow materials, roadbed and aggregates)**	• Water content (determination water content of the materials by weight), Densities, Absorption coefficients	 Picture 9.1. Laboratory Ovens (model A008, EN 932-5, EN 1097-5, ASTM C127) • Laboratory oven • Extra shelf for ovens • Heating plates • Hot-air dryer • 3 kg scales • 4 mm sieve	• Water content: W in % • Density in kg/m³ • Absorption in %
		• Grain size (granulometric analysis by sieve)	 Picture 9.2. Electric Sieve Shaker (model A060-01)  Picture 9.3 Stainless Steel Sieves	• % of material that passes through each specific mm sieve • Maximum diameter • % of fines

[21] Beratest AG, Control Instruments for Civil Engineering, 2011, Switzerland.

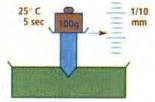
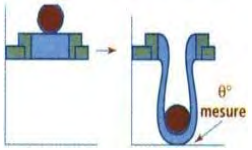
			(model A031-A034, EN 932-2)  Picture 9.4 Brushes (model V179 - V179-06) • Oven • Gas stove • 15 kg scales • Sampler • Electric sieve shaker • Brushes • Stainless steel sieves	
		• Atterberg limit	 Picture 9.5. Manual Casagrande Apparatus (model S170-01, NF P 94.051/BS 1377/ASTM D4318)  Picture 9.6. Casagrande Apparatus Accessories (model S173-01 - S173-06, NF P 94.051/BS 1377/ASTM D4318) • Oven • 400 g scales • Complete Casagrande Apparatus • Complete accessories (cup, grooving apparatus, etc.) • Marble plate	• Liquidity limit: Wl • Plasticity limit: Wp • Plasticity index: Ip = Wl - Wp

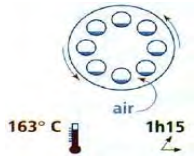
		• Methylene blue value (measurement of the quantity and activity of the clayey content)	 Picture 9.7. Methylene Blue Testing Apparatus (model S157-KIT 1, EN 933-9, NF P 94-068) The complete kit comprises: • Agitator with stand and blades, Ø 70 mm, 400-700 rpm, 230 V • Support for agitator • 50 ml x 0.1 ml burette with base plate and stand S157-07 • 200x150x80 mm tray • Ø 90 mm filter paper (pack of 100) • Ø 8 x 300 mm length glass rod • 3000 ml plastic beaker • 100 g of methylene blue • 500 g of kaolinite	• Blue value of the soils: VBS without unit, % of active clays and inert fine clays
		• Normal and modified Proctor (determination of the compacting characteristics of a soil)	 Picture 9.8. Proctor Molds and Rammers (NF P 94-0930 • Oven • 30 kg scales • 400 g scales • Normal Proctor mold • CBR mold • Proctor rammer • Mixing tray •	• Proctor optimum water content: Wopt in % • Maximum dry density

		• CBR (CBR index after immersion, immediate CBR index)	  Picture 9.9. CBR Presses and Mold (NF P 94-078) • Oven • 35 kg scales • 400 g scales • Proctor rammer • Complete Proctor mold with extra load, swelling tray, comparator • Immersion tray • CBR press • 30 kN force washer • 60 kN force washer • Cadence meter (if the press is manual)	• Immediate CBR index: CBR 0j (0 days) • CBR index after immersion: CBR 4j (four days) • Swelling: GI in % • Soil bearing capacity
		• Los Angeles test (resistance to fragmentation by shock)	  Picture 9.10. Los Angeles Abrasion Machine (NF P 18-573, EN 1097-2, EN 12697-17, EN 12697-43, ASTM C 131) • Los Angeles machine • Ball • Oven • 15 kg scales • 1.6 mm sieve	Los Angeles coefficient: LA in % (abrasion coefficient)
		• Los Angeles coefficient: LA in % (abrasion coefficient)	 	Micro-Deval coefficient in presence of water: MDE in %

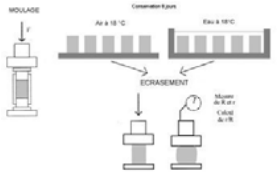
			Picture 9.11 Micro-Deval Abrasion Machine (EN 1097-1, NF P 18-572) • Micro-Deval machine • Steel balls • Oven • 15 kg scales • 1.6 mm sieve	
		• Organic matter content, chemical analysis (chlorides, clay, silt, dust, magnesium, calcium carbonate content)	 Picture 9.12. Chloride/Sulfate Test Papers (model A019)  Picture 9.13. Portable pH Meter/Thermometer (model V217, ASTM D 1067) • Chloride test paper • Sulfate test paper, range 200-1600 mg/l, set of 100 sheets • Reaction metal container with cover • Thermal and atmospheric analysis set • Dietrich Frühling calcimeter • Portable pH meter/thermometer • Bottles • Hellige charter with five glass references	• % organic matter • pH of the water
		• Flattening (flattening coefficient of gravel)	 Picture 9.14. Grate Series (NF P 18 - 561)	Flattening coefficient: A in %

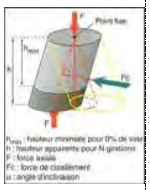
			• Oven • Gas stove • 15 kg scales • Sieve series from 8 µm to 80 mm • 2.5-20 mm opening grate series	
		• Sand equivalent (determination of the purity of the sand, sand equivalent at 10% fines	 Picture 9.15. Electric Agitator (model S160N, EN 933-8/NF XP 18-597/NF XP 18-598)  Picture 9.16. Complete Set of Equipment for Sand Equivalent (model S158-20 Kit, EN 933-8/NF XP 18-597/NF XP 18-598) • Electric agitator The complete kit comprises: • 5 graduated Plexiglas measurement cylinders (100 and 380 mm) • 2 rubber plugs for the cylinders • 500 mm graduated stainless steel rule • Wide-neck plastic funnel • 200 ml measurement container • 5 l plastic canister • Washing tube with cock and	Sand equivalent: ES in % of sand and fines

			siphon assembly, EN/ASTM • Counterweight support with sand level rod • Steel sieve, Ø 200 mm, 2.00 mm mesh • 1000 ml concentrated stock solution • Digital chronometer • Stand for securing siphon assembly Carrying case (55x25x40 cm, 18 kg)	
		• Adhesiveness Test (granulates for surfacing or coatings): passive adhesion test with bitumen and adhesion test with emulsion, T 66-018	• Oven • Beaker • Distilled water	% adhesion of the granulates + additives
02	**Acceptance of the bitumen**	• Flash point	 Picture 9.17. Cleveland Apparatus (EN ISO 2592, T 60-118) • Cleveland apparatus • Thermometer	Flash point in °C
		• Penetration at 25 ° C (needle penetration)	 Picture 9.18. Bitumen penetrometer (EN 1426-T 66-004) • Thermostatic bath • Oven • Bitumen penetrometer	Depth of penetration in 1/10 mm (classification of the bitumens)
		• Softening point (determination of the softening point by ring and ball (R&B) method)		Ring and ball temperature in °C

			Picture 9.19. Ring and Ball Apparatus (EN 1427, T 66-008 • Thermostatic bath • Oven • Ring and ball apparatus • Thermometer • Heating plate	
		• Determination of relative density (determination of relative density by the pycnometer method)	 Picture 9.20 Vacuum Pycnometer (model B067N, EN 12697-5, 13108) • Oven • Thermostatic bath • 400 g scales • Pycnometer • Distilled water Necessary accessories: • Electromagnetic sieve shaker, variable vibration intensity, timer • Plastic ring for fixing the pycnometer on the sieve shaker • Vacuum pump • Plastic tube	Relative density
		• RTFOT (resistance to hardening)	 Picture 9.21 RTFOT Test (NF EN 12607-1) • Test carried out by CST • Magny les Hameaux	• Weight variation in % • Residual penetration in % • Rise of softening point in °C • Softening point in °C

03	**Emulsions quality control**	• Water content (determination of water content)	 Picture 9.22 Dean Stark Apparatus (NF EN 1428, T 66-023) • Dean Stark apparatus • 400g scales • Toluene	Ratio of amount recovered to initial amount in %
		• Homogeneity (homogeneity test by screening)	 Picture 9.23 Sieves (NF EN 1429, T 66-016) • 3 kg scales • Oven • 160 µm sieve • 500 µm sieve	Proportion of particles > 0.5 mm and between 0.16 and 0.5 mm for each 100 g of emulsion
		• pH (determination of the pH of the bitumen emulsions)	 Picture 9.24 pH Meter • pH meter	pH
		• Breaking Index (determination of the breaking index of a cationic emulsion)	• Siliceous Fines Hopper (NF EN 13075-1, T 66-017) • 400 g scales	• Breaking index = 100 x (weight of fines / weight of emulsion) • Storage times

		• Apparent viscosity (determination of Engler apparent viscosity	  Picture 9.25 Viscometer (NF EN 12846, T 66-020) or STV, T 66-005) • Oven • Engler viscometer • Thermometer • Graduated test tube • Chronometer	Viscosity in Engler degrees or flow time in seconds (STV)
04	**Control of Preparation of Surfacing**	• Marshall Test (static test on hydrocarbon mixtures, MARSHALL Test)	 Picture 9.26. Marshall Compression Press (model B042 kit, EN 12697-34, EN 13108, ASTM D1559, BS 598:107, NF P98-251-2) • 15 kg scales • Oven • Marshall rammer • Molds • Marshall • Thermostatic bath • Marshall press • 60 kN force washer • Crushing jaw • Creep meter Software	• Marshall stability in daN • Creep in 1/10 mm • Compactness in %
		• Standard Duriez Test (static test on hydrocarbon mixtures, Standard Duriez Test)	 Picture 9.27 Duriez Test (NF EN 98-251-1)	• Resistance to air: R in Mpa • Resistance to water: r in Mpa • Ratio R/r

			• 15 kg scales • Oven • Mixer • Duriez mold • Thermostatic bath • Climate chamber • Duriez press	
		• Measurement of apparent density by hydrostatic weighing	 Picture 9.28 Scales Equipped With a Hook for Hydrostatic Weighing (NF P 98-250-6) • Scales equipped with a hook for hydrostatic weighing • Paraffin	• Apparent density: MVA in kg/m³
		• If necessary: PCG Test (PCG compacting test) 	 Picture 9.29. PCG Test Apparatus (NF P98-252) • Test carried out by CST, Magny les Hameaux	• Curve of % of compactness according to the number of gyrations n
		• Bitumen dosing by extraction (Kumagawa), Internal Test Method inspired by the LCPC Method	 Picture 9.30 Kumagawa Extractor (model B061 kit, EN 12697-1, LCPC-CNR N.38)	• Binder content: T in parts per hundred

			• Oven • 15 kg scales • Kumagawa apparatus • Solvent • Filter element	
		• Measurement of the specific weight of the surfacing by pycnometer, Internal Test Method	• 3 kg scales • Pycnometer • Solvent	• True density: MVR in kg/m^3
		• Rutting test (Rutting Test, NF P 98-253-1)	 Picture 9.31. Rutting Test Apparatus (NF P 98-253-1) • Test carried out by CST, Magny les Hameaux	• Depth of the rut in mm according to the number of cycles
05	**Cement Acceptance Control**	• Mechanical strength (determination of the mechanical strength)	 Picture 9.32. Press (EN 196-1) • 3 kg scales • Standardized sand • Cement mixer • 4x4x16 mold • 100 kN force washer press • Crushing jaws, 4x4x16, bending and compression	• Bending strength: Rt, Mpa • Compression strength: Rc, MPa
		• Chemical tests	Cf. supplier (EN 196-2)	

		• Setting Time	 Picture 9.33. Vicat Apparatus (EN 196-3) • 3 kg scales • Cement mixer • Vicat apparatus with mold • Test room at 20 °C	• Time to start of setting, td in minutes • Time to end of setting, tf in minutes
		• Fineness (determination of fineness by screening method)	• 400 g scales • 90 µm screen (EN 196-6)	• Fineness R in %
06	**Approval of the constituents of the concrete**	• Grain size • Fineness modulus • Sand equivalent • Blue value • Los Angeles • Density • Flattening • Water content • Purity • Alkali reaction	See above.	See above.
		• Analysis of Batching Water	 Picture 9.34. Batching Water Analysis Kit (XP P 18-303) Batching water analysis kit	• pH • Presence of matter in suspension and organic matter • Cl-, NH4+, SO4-2- and Mg2+ rates
		• Demonstration of organic matter by colorimetry, lye test, Internal Test Method	• Oven • 3 kg scales • Vial • Lye	• Presence or absence of organic matter

		• Compression test	 Picture 9.35 Concrete Press (NF P 18-455) • Holding tank • Sulfur • Surfacing apparatus • 30 kg scales • Concrete press	Compressive strength: Rc in MPa
		• Splitting test	 Picture 9.36. Splitting Test Device (model C101-1, NF P 18-408) • Holding tank • Splitting device • 30 kg scales • Concrete press	Resistance to splitting: Rt in MPa
		• ABRAMS cone slump test	 Picture 9.37. Abrams Cone Kit (model C180-KIT, ASTM C143/NF P 18-305/ P18-451) Abrahams cone	Slump: A in cm
		• Adhesion of the steel • Guaranteed yield strength of the steel	 Picture 9.38. Universal Hydraulic Machine (model H003, EN 1002/ASTM A370)	

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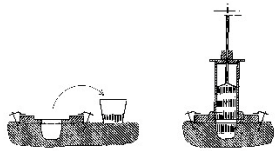
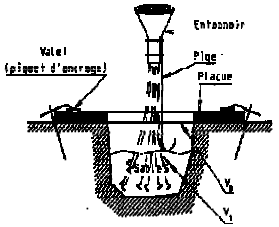
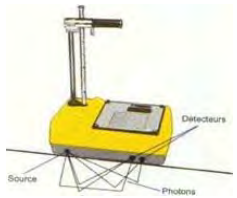
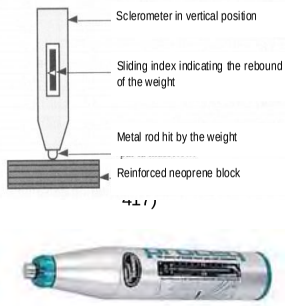
1.2. Testing Equipment at the Work Site (in-Situ)

Table Annexe 2. Equipment of Control (Testing) at the Work Site (*in-situ*)

No.	Task to be accomplished	Type of control/testing	Necessary equipment/supplies	Expression of results
01	**Control of implementation of the earthwork (cutting, filling, subgrade, subbase and base course)**	• Topographical/geometric control	 Picture 9.39. Total Station (model TS15P) • Total Station • Theodolite • Dumpy level • Reflectors • Tapes • 3 m rules • Level rod • Cyclometer • Distance meter	• Altimetric differences • Thicknesses, widths and volumes of earthwork • Surfacing
		• Bearing capacity of the materials in place, deformation modulus (ME)	• Swiss plate of diameter 30 cm (SNV 670317) • Comparators • Truck loaded with over 10 tons • Hydraulic loading device with manometer	Deformation modulus in kg/cm²
		• Bearing capacity of materials in place, modulus with static load on the plate	 Picture 9.40. Hydraulic Loading Device With Manometer (NF P 94-117-1) • Truck loaded with over 10 tons • Plate of diameter 60 cm • Hydraulic loading device	Modulus with static load on the plate: EV2 in MPa

			with manometer • Benkelman beam • Comparator	
		• Density of the materials in place (measurement of the density of the materials put in place using a membrane densitometer)	 Picture 9.41. Membrane Densitometer (NF P 94-061-02) • Membrane densitometer • Membrane • Battery-powered 3 kg scale • Gas stove	• Wet density: γd in kg/m³ • Dry dny: γs in kg/m³
		• Density of the materials in place (measurement of the density of the materials put in place, sand method)	 Picture 9.42. Sand Densitometer (NF P 94-061-03) • Sand densitometer • Fine sand • Battery-powered 3 kg scales • Gas stove	• Wet density: γd in kg/m³ • Dry density: γs in kg/m³
		• Density of the materials in place (measurement of the density of the materials put in place, measurement by direct-transmission gamma densitometer, NF P 98-241-1)	 Picture 9.43 Gamma Densitometer (NF P 98-241-1) Gamma densitometer	• Wet density: γd in kg/m³ • Dry dny: γs in kg/m³ • Water content: W in % (for hydraulic material)
02	**Control of application of surface coatings and**	• Binder dose (determination of the dose of spread binder)	• Plate (NF P 98-275-1) • Foam • Battery-powered 3 kg scales	• Dose of the spread binder: DI in kg/m² • Transverse

	impregnation coats			regularity: r in %
		• Temperature	Thermometer	Laying temperature
		• Granulate dose (measurement of the granulate dose by test using a dosage container	Dosage container (NF P 98-276-1)	Dose of spread granulate: Dg in l/m²
03	**Control of application of the surfacing**	• Topographic	See 01 above.	See 01 above.
		• Checking of the truck mixing and emptying	Visual	
		• Temperature	 Picture 9.44 Digital Thermometer (model V150-V152)  Picture 9.45 Infrared Thermometer (model V160-02, V160-06) Thermometer (in hopper and behind the finishing table)	
		• Compactness (measurement of the density of the materials put in place, measurement by gamma densitometer with direct transmission)	Gamma densitometer (NF P 98-241-1)	• Wet density: γd in kg/m³ • Dry density: γs in kg/m³ • Water content: W in % (for hydraulic materials)
		• Compactness (measurement of the apparent density by hydrostatic weighing)	• Scales equipped with a hook for hydrostatic weighing (NF P 98-250-6) • Paraffin	• Apparent density: MVA in kg/m³
		• Coring	Coring device	See laboratory test.

		• Control of MOT level	 Picture 9.46. Rule for Control of MOT Level (model B099, EN 13036-7)	• Regularity of the covering
		• Regularity of the covering	 Picture 9.47. Benkelman Beam (model B100, B102, AASHTO T256.77) • Benkelman beam or • Lacroix deflectograph or • Falling Weight Deflectometer (FWD)	• Measurement of deformations and deflections of the coverings
04	**Control of application of repair concrete**	Topographic	See 01 above.	See 01 above.
		Compactness	See above.	See above.
		Water-run alignment		
		Checking of conformity of the formwork and reinforcement steel		
		Operation		
		Strength of the concrete (measurement of the surface hardness by bouncing using a sclerometer)	 Picture 9.49. Concrete Sclerometer (model C382-01P) • Sclerometer • Benchmarking anvil	Sclerometric index: Is, to link with Record in MPa

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BIBLIOGRAPHY

1. E. PHANZU E, 2012, Cours de routes, INBTP, Kinshasa, .inédit.
2. Laboratoire Central des Ponts et Chaussées, Catalogue des dégradations de surface des chaussées, Paris, 1998.
3. Magazine spécial de l'Office des Routes, Projet d'aménagement du réseau routier en RDC, Kinshasa, 1999.
4. Office des routes, Département de recherche, Kinshasa, 2016.
5. Office des Voiries et Drainage, Etats généraux.
6. TSHIULA, Cours de routes, UNIKIN, Kinshasa, inédit..
7. Rapport annuel OR exercice 2017.
8. Rapport annuel OVD exercice 2017
9. Ordonnance n° 78-335 du 30 août 1978 modifiant l'Ordonnance n° 71-78 du 26 mars 1971 portant classification du réseau routier.
10. Ordonnance n° 71-078 du 26 mars 1971 portant classification du réseau routier.
11. LCPC, Manuel pour le Renforcement des chaussées souples en Pays tropicaux, Méthodologie d'auscultation des chaussées souples, Mai 1985.
12. E. PHANZU, Cours d'Entretien des Routes, INBTP, Kinshasa, 2015, inédit.
13. Comité National d'Action pour la Sécurité et l'Hygiène dans la Construction (C.N.A.C.), les travaux routiers en sécurité, Bruxelles, 2001.
14. Laboratoire Central des Ponts et Chaussées, Catalogue des dégradations de surface des chaussées, méthode d'essai n°52, mars 1998.
15. E. Phanzu, cours d'entretien des routes, INBTP, inédit, 2018.
16. This method is specific.
17. Services de Ponts et Chaussées, Office de l'entretien : Cahier des charges : revêtements en béton bitumineux, Neuchâtel, mars 2009.
18. Services de Ponts et Chaussées, Op.cit.
19. Office des Voiries et Drainage, Cahier des Prescriptions Techniques, Bureau d'études et de Développement, Travaux de réhabilitation et modernisation du Boulevard Lumumba, Kinshasa, juillet 2009.
20. Office des Voiries et Drainage, Cahier des Prescriptions Techniques, Op cit.
21. Beratest Catalogue, Instruments de Contrôle pour le Génie Civil, Suisse, 2011