

**MINISTRY OF WORKS AND TRANSPORT (MOWT)
THE REPUBLIC OF UGANDA**

**DISTRICT AND URBAN ROADS (DUR)
MAPPING AND ROADS DATABASE PROJECT
IN
THE REPUBLIC OF UGANDA
PROJECT COMPLETION REPORT**

FEBRUARY 2015

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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DISTRICT AND URBAN ROADS (DUR) MAPPING AND ROADS DATABASE PROJECT

PROJECT COMPLETION REPORT

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List of Abbreviations

ADRICS	Annual District Road Inventory and Condition Survey
C/Ps	Counterparts
DANIDA	Danish International Development Agency
DUCs	District Urban Councils
DUCAR	District, Urban and Community Access Roads
DUCARIP	The Ten Year District, Urban and Community Access Road Investment Plan
DUR	District and Urban Roads
GIS	Geographic Information System
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
MC	Municipal Council
MFPEd	Ministry of Finance, Planning and Economic development
M/M	Minutes of Meeting
MoLG	Ministry of Local Government
MoLHUD	Ministry of Land, Housing and Urban Development
MoWT	Ministry of Works and Transport
NDP	National Development Plan
NTMP	National Transport Master Plan
ODA	Official Development Assistance
OJT	On-the-Job training
PDM	Project Design Matrix
PO	Plan of Operation
RAMPS	Rehabilitation and Maintenance Planning System
RSDP3	The Third 10 Year Road Sector Development Program
TC	Town Council
UBOS	Uganda Bureau of Statistics
UGX	Uganda Shilling
UNRA	Uganda National Roads Authority

Chapter 1 OUTLINE OF THE PROJECT

1.1 Background of the Project

Transportation system in the Republic of Uganda (hereinafter referred to as Uganda) is comprised of roads, railways, aviation and shipping. 96.5% of freight traffic and 95.0% of passenger and carriage are carried by road transportation. Road network in Uganda consists of National Roads, District Roads, Urban Roads and Community Access Roads, the major bulk of the road network are called “District, Urban and Community Access Roads (DUCAR)”.

Lack of District and Urban Roads (DUR) database connected with the Geographic Information System (GIS) is an obstacle for preparing road maintenance plan at the present. Concerning the National roads, Uganda National Roads Authority (UNRA) has been developing the database connected with GIS database and manages updating the data which includes data for 10,000km of District roads already upgraded to National roads in 2010.

As for DUR, there is database titled “Rehabilitation and Maintenance Planning System (RAMPS)” developed by Danish International Development Agency (DANIDA) which was distributed to all DUCs in 2004. The number of DUCs was increased from 80 to 112 in July 2010 and currently, 32 DUCs do not own the DUR system. Furthermore, RAMPS system is complicated and only few engineers trained by DANIDA are able to use the system, and MoWT is struggling to manage and update the database. DANIDA collected the location data of roads by GPS1 from 2004 to 2008, but only 70-80% of District roads was covered. Urban and Community Access Roads were not covered.

In addition, Surveys and Mapping Department in the Ministry of Land, Housing and Urban Development (MoLHUD) has the GIS database of road networks for the whole the country, but it needs further information to be added in the database and updated to put it to practical use as a DUR database.

MoWT, which is responsible for policy formation for road development, maintenance and planning, does not have DUR database which includes the basic road information such as the road name, class, distance, location, and condition of the DUR roads. This kind of situation has brought difficulties for DUCs to prepare the appropriate a budget plan for road maintenance and secure the necessary budget, allocation from the Uganda Road Fund (URF) which was established by Government of Uganda (GoU) in 2008 for road maintenance funding.

On the other hand, GoU pointed out that the project outputs such as the road database developed through “Project for Rural Road Network Planning in Northern Uganda (August 2009 - September 2011)” and “Project for Rural Road Network Development in Acholi Sub-Region in Northern Uganda (April 2011 - April 2012)” are effective and useful even though the database is only covering relatively small area of the whole country.

Under above background, MoWT requested Japan International Cooperation Agency (hereinafter referred to as JICA) for the assistance on development of the database including GIS information covering the whole country and its maintenance and management system.

1.2 Summary of the Project

The Project has been conducted based on the PDM Version 4 revised during the 4th JCC on 3rd October 2014. Main points are as below.

1.2.1 Overall Goal of the Project

The overall goal of the Project is to strengthen the maintenance and rehabilitation capacity of the MOWT and local governments concerning district roads and urban roads all over Uganda.

1.2.2 Objective of the Project

The capacity of the MOWT and local governments to grasp conditions and manage district and urban roads will be improved through the efficient operation of the district road database including geographical information and road inventory.

1.2.3 Expected Outputs

- (1) A digital base map of district and urban roads utilizing GIS will be prepared.
- (2) Road inventory data will be collected and the setup for conducting appropriate management will be established based on collaboration between the MOWT and local governments.
- (3) A database of district and urban roads will be constructed and the setup for appropriate maintenance body of the MOWT will be established.

Latest version of Project Design Matrix (PDM) is shown as follows.

Table 1-1 Project Design Matrix (PDM₄)

Project Title: District and Urban Road (DUR) Mapping and Roads Database Project
 Issued Date: 4, November, 2011, 1st Amended Date: 31st March 2012, 2nd Amended Date: 15th July 2012, 3rd Amended Date: 12th February 2014,
 4th Amended Date: 3rd October 2014
 Project Period: April 2012 - March 2015 (three years from the date when the first expert is dispatched)
 Target Areas: Uganda nationwide (District and Urban Roads: DUR)
 Target Group: (Direct) Ministry of Works and Transport, Districts (LC5) and Kampala Capital City Authority;
 (Indirect) Urban Councils (LC4, LC3), other road sector agencies

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
[Overall Goals] MoWT's and DUCs' capacity for DUR rehabilitation and maintenance is strengthened in the whole country.	a. All DUCs prepare timely road maintenance plans with updated data every year. b. MoWT prepares rehabilitation plan for DUR network with updated data every year. c. Allocation of the budgets for DUR by the government is increased.	a. DUCs road work plans and progress reports b. Sector performance reports c. Financial records/reports by the government	National budget and URF's budget for DUR rehabilitation and maintenance are properly secured.
[Project Purpose] MoWT's and DUCs' capacity for ensuring DUR assets is improved through the effective utilization of DUR database including GIS and road inventory data.	a. DUR database is updated by MoWT every year. b. DUCs submit road inventory data to MoWT every year. c. DUR database is utilized for preparing work plan, investment plan, annual report, etc by MoWT and DUCs.	a. DUR database records b. Road inventory data c. MoWT's and DUCs' plans and reports	The responsibilities of MoWT and DUCs for DUR rehabilitation and maintenance do not change.
[Outputs] 1. Digital base map of DUR is prepared using GIS. 2. Road inventory data are collected and managed properly through the collaboration between MoWT and DUCs.	a. Basic digital map of DUR covers 50% of District roads and 50% of Urban Roads in the country. b. More than 50 % of the technical staff at DUR Divisions participates in GIS training. a. Road inventory data cover 25% of DUR network resulting from Pilot Survey and <u>approximately half</u> of the <u>entire</u> network in the end. b. Road inventory formats and manual are approved by MoWT c. At least 1 person from MoWT and 2 persons from DUC participate in site surveys on road inventory.	a. DUR database records b. Attendance sheet of GIS training a. Road inventory data b. Road inventory formats, manual and a letter of approval c. Site survey records	The number of Districts does not change drastically such as the creation of new Districts.
3. DUR database is established and properly maintained by MoWT.	a. DUR database covers 50% of District roads and 50 % of Urban roads in the country. b. DUR database manual is approved by MoWT.	a. DUR database records b. DUR database manual and a letter of approval.	
[Activities] 1. Activities for Output 1-1 Review the existing databases such as HDM4/ROMAP (UNRA), RAMPS (MoWT) and road GIS Database (MoWT, MoLHUD), and identify issues to be improved for DUR database. 1-2 Obtain digital geographical data for the areas which the existing databases do not cover. 1-3 Import necessary data from the existing databases and compile them in Digital base map. 1-4 Produce tentative Digital base map of DUR for each District and compare with a road list prepared by each District (name, ID, classification, length, etc.) to identify the differences 1-5 Correct the discrepancies of data in Digital base map. If necessary, conduct site surveys 1-6 Conduct GIS training on basic skills for MoWT. 2. Activities for Output2 2-1 Review the existing formats and manuals for road inventory on National road and DUR and identify issues to be improved. 2-2 Prepare the formats and manuals for road inventory and condition on DUR. 2-3 Organize a road inventory survey team (at least one person from MoWT and two persons from DUC). 2-4 Conduct road inventory training for MoWT and DUC teams. 2-5 Select pilot Districts and conduct site surveys to prepare road inventory as OJT for MoWT and DUC teams 2-6 Conduct site surveys and prepare road inventory for other Districts 3. Activities for Output3 3-1 Compile the road inventory data from the site surveys and integrate into Digital base map to establish DUR database. 3-2 Prepare a manual on the maintenance of DUR database. 3-3 Conduct DUR database training (skills for update and maintenance) for MoWT and other road sector agencies. 3-4 Discuss how to maintain DUR roads, and formulate DUR database maintenance system at MoWT based on the discussion.	[Inputs] [Japanese side] (1) Dispatch of Experts Team Leader Road Engineer GIS Engineer Road O&M Training (1) Road O&M Training (2) Road Inventory Survey (1) Road Inventory Survey (2) Road Inventory Survey (3) Road Inventory Survey (4) GIS Mapping (2) *1)Provision of Equipment GIS software and hardware Equipment for road inventory such as GPS (3) C/P Training in Japan and/or third country (4) Cost Shared by Japanese side Project Vehicle used by Japanese Experts. Local costs for implementing the Activities. - <i>Travel costs for the C/Ps during 1st Quarter, 2012</i> - <i>Travel costs for the participants of the training during 1st Quarter, 2012</i> * 1: Provision of Equipment will be determined by Japanese Experts and MoWT after the commencement of the Project. [Uganda side] (1) Counterpart personnel (C/P) Project Director Project Manager Project Coordinator Counterparts (2) Facilities and Machinery - Project Office Space at MoWT - Main Office for Japanese Experts and Local Experts. - Vehicle(s) for site surveys (including the cost for fuel and driver) (3) Necessary Data - GPS and GIS data on national roads (UNRA) - GIS data (MoLHUD) (4) Necessary Arrangement - Acquisition of the permission - Enforcement of traffic controls (5) Cost prepared by Uganda side - Tax Exemption for the procurement of equipment - Travel costs for the C/Ps after 1 st Quarter, 2012 - Travel costs for the participants of the trainings after 1 st Quarter, 2012 - Necessary costs for the C/Ps for the data processing works after the Road Inventory Survey	The Project budgets allocation secured by MoWT without any major delay. The C/Ps who participated in trainings available during the Project period. Road classification shall be confirmed by the GoU. Manuals developed by the Project are officially approved without any major delay by MoWT. [Pre-condition] Political stability C/Ps allocation without any major delay	

1.3 Project Area

District roads (22,500 km) and urban roads (5,600 km) over the whole of Uganda.

Pilot Area: 31 districts

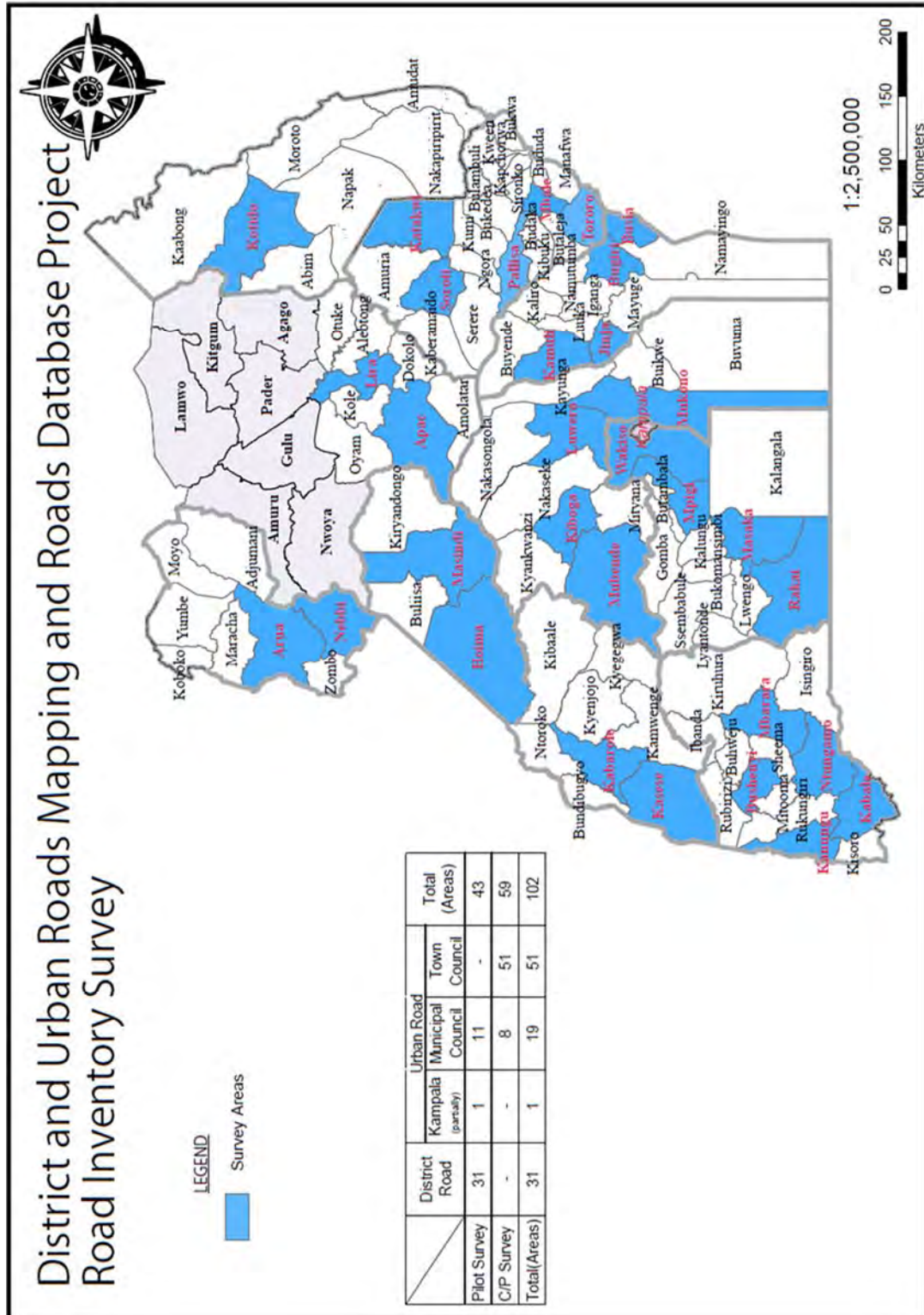


Figure 1-1 Pilot Area

1.4 The counterpart agency of the Project

The counterpart agency is the Ministry of Works and Transport (MOWT) in the Republic of Uganda.

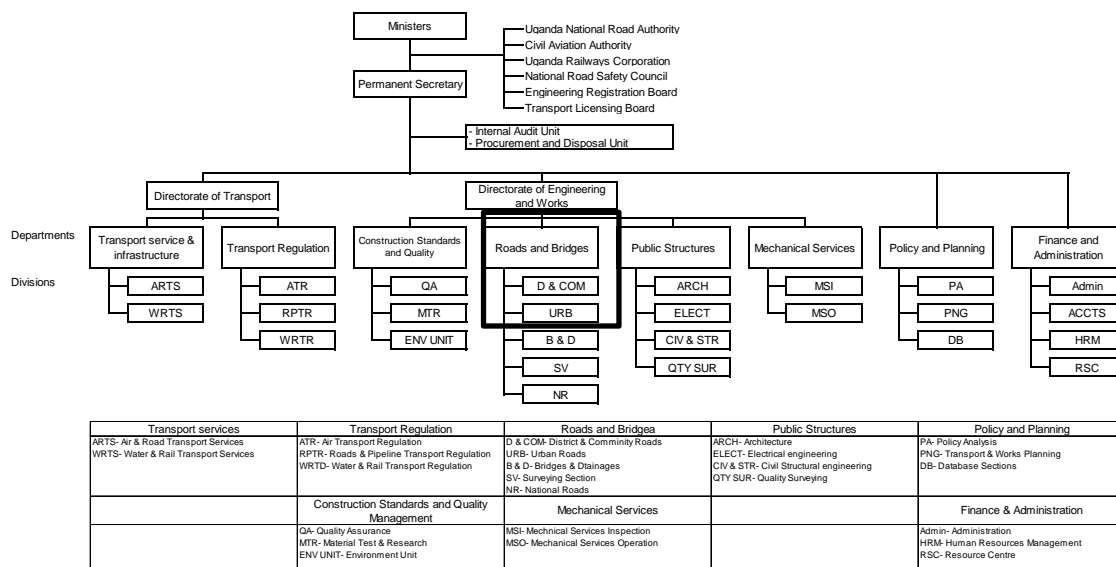


Figure 1-2 Organization Chart of MOWT

1.5 Implementation Structures

The Project implementation structure is shown as follows.

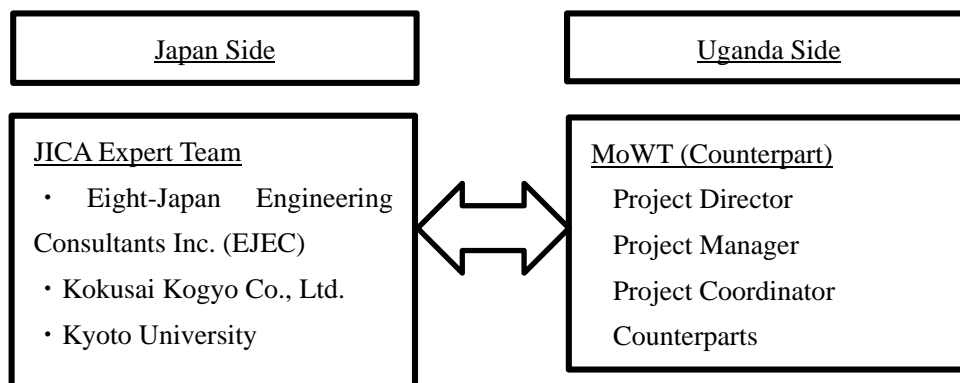


Figure 1-3 Project Implementation Structure

1.6 Project Period

3 years and 2 months from 27th February 2012 to 31st March 2015

Chapter 2 ACHIEVEMENT OF THE PROJECT

2.1 Project Outputs

Major project activities and project outputs are shown as follows.

2.1.1 Trainings

Following trainings have been conducted on the Project. MoWT and DUCs' engineers participated in these trainings.

Table 2-1 List of Trainings

Phase	Trainings	Period	Participates
(1) Road Inventory Survey Training			
1 st & 2 nd Phase	Road Inventory Survey (Pilot Survey)	(1 st Phase) August 2012 to July 2013	14 MoWT engineers, 117 District engineers, 54 Municipal engineers
		(2 nd Phase) January to May 2014	6 MoWT engineers, 32 District engineers, 75 Municipal engineers
2 nd Phase	Road Inventory Survey (C/P initiative Survey by 5 trained MoWT engineers)	(2 nd Phase) June to December 2014	18 Municipal Engineers, 75 Town Council engineers
(2) GIS Training			
1 st Phase	GIS Basic Training	July 17 to 27, 2012 (8days)	10 MoWT engineers
	GIS Advanced Training(1)	July 31 to August 17, 2012 (8days)	11 MoWT engineers
	GIS Advanced Training(2)	April 2 to 5, 2013 (5days)	9 MoWT engineers, 3 KCCA engineers
2 nd Phase	GIS data processing training	December 16, 2013	5 MoWT engineers
	Preparation of Road Atlas, Quality control, data processing tips	March 4,6,10 2014 (3days)	5 MoWT engineers
	Road Intervention Prioritization analysis	September 30, 2014	5 MoWT engineers
	GIS training to the local consultant engineer of World Bank Project	October 6, 2014	7 Local consultant engineers
(3) Road Database Training			
2 nd Phase	Road Database Training	February 4, 2015	3 MoWT engineers
(4) IRI(VIMS) Training			
1 st Phase	IRI training	August 7 to 10, 2012	3 MoWT engineers, 1 KCCA engineer
2 nd Phase	IRI measurement, data processing and analysis	March 14, 2014	5 MoWT engineers
	IRI measurement by iPhone, motorbike	October 8, 2014	5 MoWT engineers
(5) Pavement maintenance training			
1 st Phase	Road maintenance training	August 29 and September 2, 2012	7 MoWT engineers
	Pavement maintenance seminar	February 8, 2013	12 MoWT engineers, 5 KCCA engineers

2.1.2 Manuals to be produced

Following manuals for road inventory survey, GIS, IRI survey and road database maintenance were produced on the Project.

These manuals were used in the training to C/Ps.

Table 2-2 Manuals

Type of Manuals	Details	Issued
Road Inventory Survey Manual		July 2013
GIS Manual	Preparation of Mission Planning Maps and Data Processing Manual	December 2013
	Preparation of Road and Structure Statistics Manual	December 2013
	Data Processing Tips Manual	October 2014
	Road Intervention Prioritization Analysis Manual	October 2014
VIMS Manual		February 2015
Road Database Manual		February 2015

Road Inventory Manual was approved by MoWT on August 2013. And Road Database Manual was approved on February 2015.

2.2 Project Inputs

2.2.1 Dispatch of Experts

Assignment of Japanese experts for the Project is shown as follows.

Table 2-3 Assignment of Japanese experts in 1st Phase (Total:49.00MM)

Name	Description	Organization	MM
Mr. Tetsuro IZAWA	Team Leader / Road Planning	Eight-Japan Engineering Consultants Inc.	Uganda : 4.67 Japan : 1.00
Mr. Hiroaki TAKAHASHI	Deputy leader / Road Engineer	Eight-Japan Engineering Consultants Inc.	Uganda : 4.83 Japan : 0.00
Mr. Joel CRUZ	GIS engineer	Eight-Japan Engineering Consultants Inc.	Uganda : 4.50 Philippine : 0.00
Dr. Yoshinobu OSHIMA	Road O & M Planning / Training (1)	Kyoto University	Uganda : 0.50 Japan : 1.00
Prof. Eiichi ASANO	Road O & M Planning / Training (2)	Kyoto University	Uganda : 1.00 Japan : 1.50
Mr. Zenichi CHIBA	Road Inventory Survey (1)	Kokusai Kogyo Co., Ltd.	Uganda : 5.00 Japan : 0.00

Mr. Kazuhiro ISHIZUKA	Road Inventory Survey (2)	Kokusai Kogyo Co., Ltd.	Uganda : 7.00 Japan : 1.00
Mr. Mitsutaka ENOMOTO	Road Inventory Survey (3)	Kokusai Kogyo Co., Ltd.	Uganda : 4.00 Japan : 0.00
Mr. Yukihiro SAKAI	Road Inventory Survey(4)	Kokusai Kogyo Co., Ltd.	Uganda : 4.50 Japan : 0.00
Ms. Claire REYS	GIS Mapping	Eight-Japan Engineering Consultants Inc.	Uganda : 1.50 Philippine : 7.00
Total			Uganda : 37.50 Japan : 11.50

Table 2-4 Assignment of Japanese experts in 2nd Phase (Total:32.00MM)

Name	Description	Organization	MM
Mr. Hiroaki TAKAHASHI	Team Leader / Road Planning	Eight-Japan Engineering Consultants Inc.	Uganda : 6.90 Japan : 0.50
Mr. Yasushi OHWAKI	Deputy leader / Road Engineer	Eight-Japan Engineering Consultants Inc.	Uganda : 0.30 Japan : 0.00
Mr. Joel CRUZ	GIS Engineer	Eight-Japan Engineering Consultants Inc.	Uganda : 3.00 Philippine : 0.00
Dr. Yoshinobu OSHIMA	Road O & M Planning / Training (1)	Kyoto University	Uganda : 1.00 Japan : 1.00
Prof. Eiichi ASANO	Road O & M Planning / Training (2)	Kyoto University	Uganda : 0.34 Japan : 0.00
Mr. Kazuhiro ISHIZUKA	Road Inventory Survey (2)	Kokusai Kogyo Co., Ltd.	Uganda : 6.23 Japan : 1.00
Mr. Shozo SHIMODA	Road Inventory Survey (3)	Kokusai Kogyo Co., Ltd.	Uganda : 6.23 Japan : 0.00
Mr. Masashi INOUE	GIS Engineer 2	Eight-Japan Engineering Consultants Inc.	Uganda : 0.00 Japan : 2.00
Ms. Claire REYS	GIS Mapping	Eight-Japan Engineering Consultants Inc.	Uganda : 0.00 Philippine : 2.50
Ms. Gina MILARION	GIS Mapping	Eight-Japan Engineering Consultants Inc.	Uganda : 1.00 Philippine : 0.00
Total			Uganda : 25.00 Japan : 7.00

2.2.2 Provision of equipment

List of equipment is shown as follows.

Table 2-5 List of Equipment

No	Name of equipment	Remarks	Qty	Place of Delivery	Date of Handover
1	Wi-Fi Router Linksys WRT54GL	For Project Office Work	1	MoWT	October 03, 2014
2	Laser Printer Canon image runner 2520	For Project Office Work	1	MoWT	October 03, 2014
3	UPS APC650Va	For Project Office Work	1	MoWT	October 03, 2014
4	Projector Acer X1161P	For Project Office Work	1	MoWT	October 03, 2014
5	Arc GIS Arc View	For GIS data processing work	5	MoWT	October 03, 2014
6	AutoCAD Map 2012	For GIS data processing work	5	MoWT	October 03, 2014
7	iPhone 4s	For road inventory survey (for IRI survey)	4	MoWT	October 03, 2014
8	Handy GPS Garmin eTrex 20	For road inventory survey	30	MoWT	October 03, 2014
9	Digital Camera with GPS Nikon Cool Pix AW100	For road inventory survey	30	MoWT	October 03, 2014
10	Laptop PC HP Probook 4530s	For GIS data processing work	12	MoWT	October 03, 2014
11	Inkjet Color Printer HP office jet 7500A	For Project Office Work	1	MoWT	October 03, 2014
12	VIMS system DC-204R Controller with Ba-104 (Battery pack) Acceleration transducer: ARH-20A /Tokyo Sokki Kenkyujo Co., Ltd.	For road inventory survey	1	MoWT	October 03, 2014
13	Laser measurement equipment Bosch GLM 50	For road inventory survey	1	MoWT	October 03, 2014
14	VIMS software JIP Techno-Science Co.,Ltd.	For road inventory survey	1	MoWT	October 03, 2014
15	Drive recorder Blackvue DR500GW-HD	For road inventory survey	4	MoWT	October 03, 2014
16	External Hard Disk Drive Western Digital 1TB	For road inventory survey (for data backup for drive recorder)	4	MoWT	October 03, 2014

2.2.3 Expenses

(1) Expenses provided by Japan side

Project expenses of each phase by Japan side is shown as follows.

Table 2-6 Expenses for Project Operation / Japan Side

Expenses for Project Operation (1st Phase) (USD)

No.	Description	Amount
1	Local Employment Cost	25,500USD
2	Transport Cost	123,100USD
3	Temporary Project Office rental Cost before preparation of the office in MoWT (3months)	4,680USD
1 st Phase Total (USD)		153,280USD

Expenses for Project Operation (1st Phase) (UGX)

No.	Description	Amount
1	Local Employment Cost(1st Phase C/P allowance for Survey)	1,504,000UGX
2	Training Cost	4,928,000UGX
1st Phase Total (USD)		6,432,000UGX

Expenses for Project Operation (2nd Phase) (USD)

No.	Item	Amount
1	Local Employment Cost	33,700USD
2	Transport Cost	53,500USD
2 nd Phase Total (USD)		87,200USD

Summary of Expenses for Project Operation

No.	Description	Amount
1.	Local Employment Cost	
1.1	Local Employment Cost Total(USD)	59,200USD
1.1.1	Local Employment Cost(1 st Phase: Local staff)	25,500USD
1.1.2	Local Employment Cost(2nd Phase Local staff)	33,700USD
1.2	Local Employment Cost Total(UGX)	1,504,000UGX
1.2.1	Local Employment Cost(1st Phase C/P allowance for Survey)	1,504,000UGX
2.	Transport Cost	
2.1	Transport Cost Total	176,600USD
2.1.1	Transport Cost(1 st Phase)	123,100USD
2.1.2	Transport Cost(2nd Phase)	53,500USD
3.	Training Cost	
3.1	Training Cost	4,928,000UGX
4.	Other Cost	
4.1	Temporary Project Office rental Cost before preparation of the office in MoWT (3months)	4,680USD
Total Amount (USD)		240,480USD
Total Amount (UGX)		6,432,000UGX

(2) Local Operation Costs / Uganda Side

Local operation costs by Uganda side is shown as follows. Major cost items are training allowance, travel allowance and fuel cost for road inventory survey.

Table 2-7 Local Operation Costs / Uganda Side

Achievement of Inputs (Local Operation Costs / Uganda Side)

(Unit: UGX)

Items	1st Phase					2nd Phase					
	Qtr1. 2012-12	Qtr2. 2012-13	Qtr3. 2012-13	Qtr4. 2012-13	Qtr1. 2013-14	Qtr2. 2013-14	Qtr3. 2013-14	Qtr4. 2013-14	Qtr1. 2014-15	Qtr2. 2014-15	Qtr3. 2014-15(*)
	Jul-Sep 2012	Oct-Dec 2012	Jan-Mar 2013	Apr-Jun 2013	Jul-Sep 2013	Oct-Dec 2013	Jan-Mar 2014	Apr-Jun 2014	Jul-Sep 2014	Oct-Dec 2014	Jan-Mar 2015
Training Allowances for DUCs	-	11,800,000	6,900,000	5,500,000	-	-	4,400,000	4,650,000	5,000,000	4,500,000	-
Travel Allowance for MoWT	-	-	-	-	14,400,000	-	-	-	-	7,920,000	-
Night Allowance for MoWT	-	-	20,450,000	19,320,000	-	-	15,780,000	24,550,000	43,105,000	38,850,000	-
Fuel Cost	-	-	-	-	-	-	18,150,000	13,200,000	24,750,000	25,410,000	-
Other Cost	-	-	-	-	-	-	-	-	-	-	(40,000,000)
Sub-Total	0	11,800,000	27,350,000	24,820,000	14,400,000	0	38,330,000	42,400,000	72,855,000	76,680,000	(40,000,000)
Total					78,370,000						270,265,000

Note:(*)

Other Cost of Qtr3. 2014-15 is 40,000,000UGX for the preparation of 3 sets of the duplication of the Road Atlas/Road database created by the project. This costs will be prepared by end of March.

2.3 Project Implementation Schedule

The Project Activities were carried out on the whole in accordance with Plan of Operation (PO). The details are shown as follows.

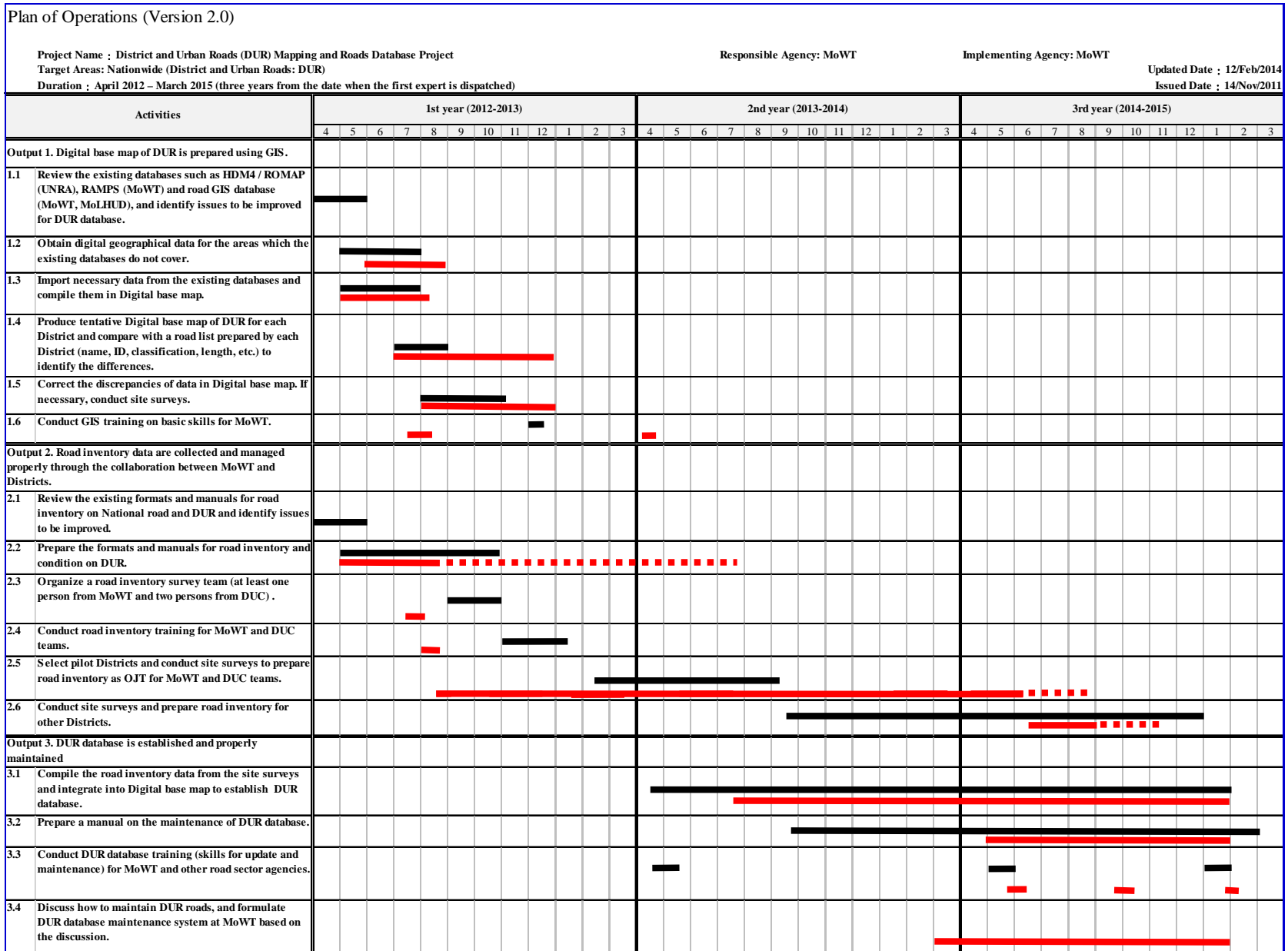


Figure 2-1 Plan of Operation

2.4 Project Design Matrix of the Project

PDM version (signed during the detailed planning survey, 2011) was revised on 31st March 2012 as necessary in order to monitor the Project effectively. Then, PDM version 1 was revised on 15th July 2012. There was a revision again on 12th February 2014 and 3rd October 2014, and since then the Project has been implemented based on the PDM version 4. Details are shown in the table below.

Table 2-8 Change of PDM

Parts revised on PDM					
	PDM Version 1 31 st March 2012	PDM Version 2 15 th July 2012	PDM Version 3 12 th Feb 2014	PDM Version 4 3 rd Oct 2014	Type of changes
<Output>					
1-a	/	Basic digital map of DUR covers XX% of District roads and XX % of Urban roads in the country.	Basic digital map of DUR covers 50% of District roads and 50% of Urban Roads in the country.	/	Modified
1-b	/	More than XX % of the technical staff at DCR and UR Divisions participate in GIS training.	More than 50 % of the technical staff at DUR Divisions participates in GIS training.	/	Modified
2-a	Basic digital map of DUR covers XX% of District roads and XX % of Urban roads in the country.	Road inventory data cover 25% of DUR network resulting from Pilot Survey and 50% of the network in the end.	/	Road inventory data cover 25% of DUR network resulting from Pilot Survey and <u>approximately half</u> of the <u>entire</u> network in the end.	Modified
3-a	DUR database covers XX% of District roads and XX % of Urban roads in the country.	DUR database covers 50% of District roads and 50 % of Urban roads in the country.	/	/	Modified
<Activities>					
3-4	/	/	Discuss how to maintain DUR roads, and formulate DUR database maintenance system at MoWT based on the discussion.	/	Added
<Inputs>					
(4)	/	Travel costs for the C/Ps during 1st Quarter, 2012	/	/	Added
(4)	/	Travel costs for the participants of the trainings during 1st Quarter, 2012	/	/	Added
(7)	/	Including Telephone Lines, Air Conditioner, Internet Access and Secretary. Vehicle(s) for site surveys	/	/	Deleted
(10)	/	Travel costs for the C/Ps after 1st Quarter, 2012	/	/	Added
(10)	/	Travel costs for the participants of the trainings after 1st Quarter, 2012	/	/	Added
(15)	/	/	Necessary costs for the C/Ps for the data processing works after the Road Inventory Survey	/	Added

Chapter 3 PROJECT ACTIVITIES

3.1 Summary of Project Activities

3.1.1 Joint Coordination Committee (JCC)

Joint Coordination Committee (JCC) Meetings were held for 4 times in 1st Phase and for 5 times in 2nd Phase. Date and main topic for the meetings are listed as follows.

Table 3-1 Histories of JCC Meeting

			Date	Meeting Topic
JCC meeting	1 st Phase	1 st	11 May, 2012 (Fri)	Explanation of Draft Work Plan
		2 nd	23 July, 2012 (Mon)	Approval for Work Plan
		3 rd	29 January, 2013 (Tue)	Progress Report for Project Activities done
		4 th	29 August, 2013 (Thu)	Progress Report for 1 st Phase
	2 nd Phase	1 st	03 December, 2013 (Tue)	Explanation of Draft Work Plan
		2 nd	12 February, 2014 (Wed)	Approval for Work Plan
		3 rd	June 12, 2014 (Thu)	Progress Report for Project Activities done
		4 th	October 3, 2015 (Thu)	Project Progress Report and Evaluation Report by Terminal Evaluation Mission
		5 th	February 6, 2015 (Fri)	Report for Completion of the Project Activities done

The Minutes of the Meeting are attached in Annex respectively.

3.1.2 Technical Working Group (TWG) Meeting

Technical Working Group (TWG) meetings were held for 2 times in 2nd Phase. Date and main topic for the meeting are listed as follows.

Table 3-2 Histories of TWG Meeting

			Date	Meeting Topic
TWG Meeting	2 nd Phase	1 st	28 February, 2015 (Fri)	Presentation of Output(Draft)
		2 nd	30 May, 2015 (Fri)	Confirmation and Approval of Outputs and Analysis

3.1.3 Training in Japan

Training in Japan was conducted in 1st and 2nd Phase respectively.

Summary of training in Japan is shown as follows.

Table 3-3 Summary of Training in Japan

Phase	1 st Phase	2 nd Phase
Period	July 24 to August 9, 2013	October 21 to 30, 2014
Trainee	<ul style="list-style-type: none"> • Mr. Okullu Yorobwam(MOWT) • Mr. Baguma Alex Njuma(MOWT) • Mr. Ssozi Vincent(MOWT) • Mr. Victor. J Banga(MOWT) • Mr. Kisitu Timothy(MOWT) 	<ul style="list-style-type: none"> • Eng. Robert Rwanga (MOWT) • Eng. Alex Onen (MOWT) • Dr. Mbadwe John (MOWT) • Mr. Kisitu Timothy (MOWT) • Mr. Muhwezi Bernard Justus (UBOS)
Objective	<ul style="list-style-type: none"> ● Comprehend the importance of Asset Management through lectures and observation of Road Inventory Database by local government, ● Learn the methods of data collection for indexes of road assessment and its evaluation methods through Japan's case, ● Acquire the basic knowledge of pavement management for road operation and maintenance 	
Place of Trainings	<ul style="list-style-type: none"> • Kobe City Council • Sakai City Council • Kyoto University • Meisei Construction Co., Ltd. • Hanshin Expressway Engineering Co., Ltd. • Setsunan University • Toyo Tecx Co., Ltd. 	<ul style="list-style-type: none"> • Ministry of Land, Infrastructure, Transport and Tourism • Saitama Prefectural Office • Kyoto University • Hanshin Expressway Co., Ltd. • Kobe City Council • Kokusai Kogyo Co., Ltd.

Source : JICA Expert Team

The trainees got the following outputs through the training in Japan.

- The trainees understood that data collection, update and maintenance of road database were important for the proper maintenance and secureness of road maintenance budget
- The trainees understood periodic road surface condition survey and rehabilitation were important for the prevention of increase of road maintenance cost.
- The trainees were interested in contractor performance monitoring based on the scoring system which later is reflected in the evaluation process of the contractor and shared with other entities in Kenya
- To understand that VIMS system is utilized as the measurement method in Kenya and other developing countries. To understand that there were no big differences between VIMS system and other IRI measurement systems.
- To understand the importance of proper trial mix and temperature control for keeping the pavement quality through the pavement training
- To understand the importance of safety control and quality control for the road maintenance works

Following action plans were presented by the trainee through the training in Japan.

Table 3-4 Proposed Action Plan prepared in 1st Phase Training in Japan

	Issue	Action	Milestone
S1	Lack of immediate data for budgeting and planning purposes (eg road condition).	Assign more officers on the project.	Immediate
		Develop an effective mechanism to facilitating district engineers.	Immediate
		Increase budget allocation for updating and processing road data.	By quarter one of FY 2014/15
		Undertake data collection in sampled districts	Immediate
S2	Data quality assurance of the road inventory data collected.	Formulate data quality assurance guidelines.	Guidelines formulated by end of FY 2013/14
		Capacity building for district and urban council engineers	Train 132 district and MC engineers by Sept 2014
S3	Lack of adequate verification method for road condition survey data.	Adoption of objective systems such as VIMS(vehicle intelligent monitoring system) for determining road condition	Procure 50 units of VIMS by December 2014. Apply for equipment procurement from JICA
S4	Lack of annual road inventory and condition survey data in districts and urban councils	Enact a legal framework specifying roles of key actors	By quarter two of 2014/15
S5	Road inventory to cover the entire country	Fast track procurement process for the remaining 50% of DUR network	Finalize procurement of consultant by December 2014
S6	Maintenance of the road inventory database	Outsource credible firm for system maintenance.	Finalize ToRs by December 2014
		Apply for JICA volunteers	Immediate
		Create a unit to update road inventory data.	Immediate
		Fast track procurement of GPS for district engineers	Finalize procurement of consultant by December 2014

Source : C/P

Table 3-5 Proposed Action Plan prepared in 2nd Phase Training in Japan

SN	ISSUES	ACTION	MILESTONES
J1	Lack of Planning for maintenance at the time of commissioning	Include Maintenance budget and plan at commissioning of all projects	July 2015
J2	To maintain established road database periodically	To secure necessary budget for road inventory survey, training etc To procure necessary survey equipment to DUCs engineers	July 2015 July 2015
		To assign MoWT engineers for maintenance of road database To conduct the training to DUCs & MoWT engineers for road inventory survey continuously To update road database periodically	Immediately Annually Annually
J3	Utilisation of the road database	To utilize the established road database to prepare the budget for road works To provide necessary information to DUCs for making work plans and budget plans	Annually Annually
J4	Level of Detail of information collected during the road inventory surveys	Improve on the level of detail	July 2015
J5	Lack of objective estimation tool of road condition assessment	Use of DRIMS as an object estimation	Procure 12 units by end of 2015
J6	Delayed intervention to pothole fixing	Advocate for the use of cold mix for repairs	Immediate
J7	Poor Archives management	Reactivation of Archive/ Library	Immediate
J8	Lack of integrated transport master plan	Initiating the process of improving the current national development plan	Immediate
J9	Poor performance of contractors.	Introducing contractor performance scoring system	Immediate
J10	Weak monitoring and enforcement of right of way	Continue the installation of permanent and visible boundary markers on National, District and Community access roads	Immediately

Source: The C/P

3.2 Achievement of the Outputs

Achievement of each output are shown as follows,

3.2.1 Achievement for Output 1

Table 3-6 Achievement of Output 1

Output 1: Digital base map of DUR is prepared using GIS [Achieved]														
Basic digital map of DUR covers 50% of District roads and 50% of Urban Roads in the country. [Achieved]	<p>The digital base map of DUR was prepared by the end of 2012.</p> <p>After the commencement of the Project, data related to the digital base map in the existing DUR database was obtained from relevant agencies such as Uganda Bureau of Statistics (UBOS), MoLHUD, RAMPS/DANIDA. In addition data from JICA related projects were collected.</p>													
More than 50 % of the technical staff at DUCAR Divisions participates in GIS training. [Achieved]	<p>A total of 19, comprising 10 technical staff from District and Community Access Roads Division and 9 technical staff from Urban Road Division, were originally targeted for the GIS training in 1st Phase.</p> <p>GIS training was conducted 3 times in 1st Phase for technical staff at DUR Divisions during the Project and there were 33 participants in the training in total. As mentioned in the table below, the percentage of attendance in each training is more than 50%.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Items Name of training</th> <th style="width: 30%;">Date (No of training days)</th> <th style="width: 40%;">Number of actual / expected participants (% of attendance)</th> </tr> </thead> <tbody> <tr> <td>Basic training course (1)</td> <td>17th to 27th July 2012 (8 days)</td> <td>10/19 (53%)*1</td> </tr> <tr> <td>Advanced training course (1)</td> <td>31st July to 17th August 2012 (8 days)</td> <td>11/19 (58%)*1</td> </tr> <tr> <td>Advanced training course (2)</td> <td>2nd to 5th April 2013 (5 days)</td> <td>12/19 (63%)*1</td> </tr> </tbody> </table> <p>*1: Rounded off to the second decimal place</p>		Items Name of training	Date (No of training days)	Number of actual / expected participants (% of attendance)	Basic training course (1)	17 th to 27 th July 2012 (8 days)	10/19 (53%)*1	Advanced training course (1)	31 st July to 17 th August 2012 (8 days)	11/19 (58%)*1	Advanced training course (2)	2 nd to 5 th April 2013 (5 days)	12/19 (63%)*1
Items Name of training	Date (No of training days)	Number of actual / expected participants (% of attendance)												
Basic training course (1)	17 th to 27 th July 2012 (8 days)	10/19 (53%)*1												
Advanced training course (1)	31 st July to 17 th August 2012 (8 days)	11/19 (58%)*1												
Advanced training course (2)	2 nd to 5 th April 2013 (5 days)	12/19 (63%)*1												

3.2.2 Achievement of Output 2

Table 3-7 Achievement of Output 2

Output 2: Road inventory data are collected and managed properly through the collaboration between MoWT and DUCs. [Achieved]	
Road inventory data cover 25% of DUR	The road inventory data is covering 41% of DUR network resulting from Pilot Survey and is 51% of the network in the end.

network resulting from Pilot Survey and 50% of the network in the end. [Achieved]	Items Type of Surveys	Survey completed	Length covered with Road inventory	Ratio (Length)
	Pilot Survey and Survey of Acholi project	38 Districts	12,963km	41% (14,325km)
		11 MCs	1,362km	
	Survey with C/Ps' initiative	8 MC 51 TC	3,469km	10% (3,469km)
Total			51% (17,794km)	
Road inventory formats and manual are approved by MoWT [Achieved]	Draft of the format of the road inventory was prepared based on the format developed by Annual District Road Inventory and Condition Survey (ADRICS) through the discussion between C/Ps and experts. It was finalized by the road inventory expert in August 2012 and approved by MoWT in August 2013.			
At least 1 person from MoWT and 2 persons from DUC participate in site surveys on road inventory. [Achieved]	According to the experts and results of the review of the project report, there were 2 participants from DUCs in the office meeting on the 1st day, but some DUCs couldn't afford to let both 2 engineers participate continuously in the pilot road inventory survey conducted from the 2nd day due to other work commitments. In such a case, the survey participant was expected to share the experience and skills with the other engineer who was absent.			

3.2.3 Achievement of Output 3

Table 3-8 Achievement of Outputs 3

Output 3: DUR database is established and properly maintained by MoWT. [Achieved]	
DUR database covers 50% of District roads and 50 % of Urban roads in the country. [Achieved]	The road inventory data in 38 Districts and 60 Urban council (19 MC and 51 TC) was collected and have been input into the database. DUR database is covering 48% (12,963km/26,875km) of District Roads and 61% (4,832km/7,831km) of Urban Roads. The database has been developed by January 2015.
DUR database manual is approved by MoWT. [Achieved]	The DUR database manual has been prepared with the collaboration of experts and C/Ps and completed in January 2015. DUR database manual was approved in 11 February 2015 by MoWT.

3.3 Project Activities

3.3.1 Activities 1-1: Review of Existing Database

1-1 Review the existing databases such as HDM4/ROMAP (UNRA), RAMPS (MoWT) and road GIS Database (MoWT, MoLHUD), and identify issues to be improved for DUR database.

The following existing databases have been collected and reviewed.

Table 3-9 Collected and Reviewed Data

Category	Description	Coverage	Source	Year
Administrative Boundary	National	Uganda	UBOS/UNOCHA	N.A.
	Region	Uganda	UBOS/UNOCHA	N.A.
	Sub-region	Uganda	UBOS/UNOCHA	N.A.
	District Centers	Uganda	UBOS/UNOCHA	N.A.
	County	Uganda	UBOS/UNOCHA	N.A.
	Sub-county	Uganda	UBOS/UNOCHA	N.A.
	Parish	Uganda	UBOS/UNOCHA	N.A.
Natural Condition	Village	Uganda	UBOS/UNOCHA	N.A.
	Rivers	Uganda	MoLHUD	N.A.
	Lakes	Uganda	MoLHUD	N.A.
	Lakes	Uganda	FAO	1993
	Contours	Uganda	UNOCHA	2005
Socio Economic	Geological Maps	Uganda	MoEMD	N.A.
	Population	Uganda	UBOS	2011(2002)
Transportation/Road Network	Poverty	Uganda	UBOS	2011
	Road Network	Uganda	MoLHUD	N.A.
	Road Network	Uganda	FAO	N.A.
	Road Network	Uganda	RAMPS	2009.
	Road Network	Kampala	KCCA	N.A.
	Road Network	Kampala (1:2,500)	Ugandan Consultant	1995
Transportation/ Others	National Road Network	Uganda	UNRA	2012
	Railway Lines	Uganda	MoLHUD	N.A.
Public Infrastructure	School	Uganda	NUDC/UNOCHA	N.A.
	Health Facilities	Uganda	NUDC/UNOCHA	N.A.
Land Condition	Land Cover	Uganda	MoLHUD	1992
	Land Cover	Uganda	FAO/AFRICOVER	1993
	Land Cover	Uganda	NBMA	N.A
	Land Cover	Uganda	NUDC/UNOCHA	2005
	Land Use	Kampala	KCCA	N.A
	National Parks/ Protected Area	Uganda	MoLHUD	N.A
Disaster Management	Hazard Maps-Flood	Uganda	NUDC	N.A.
	Fault Map	Uganda	MoEMD	N.A.
Topographic Map	1:2,500	Kampala	KCCA	1995
	1:50,000	Uganda	FAO	N.A.

Source: The Consultant

In terms of area-wide coverage, no database covers Karamoja region, sufficiently and the RAMPS has not covered the urban road network in general.

Since no update was carried out in RAMPS, the RAMPS still includes some National Road Network which were upgraded from District Roads in 2010.

UNRA carries out national road network inventory survey including the upgraded network and its results were processed in ArcGIS.

DUR network length was estimated by district from available RAMPS data removing of the upgraded network which can be known from the above UNRA survey results. The result is shown as follows.

Table 3-10 Estimated DUR Network Length

	District Name	Length (km)				District Name	Length (km)		
		District Roads	Urban Roads	Total Per District			District Roads	Urban Roads	Total Per District
1	ABIM	38.46	18.95	57.42	57	KITGUM	219.67	228.20	447.87
2	ADJUMANI	293.20	4.10	297.30	58	KOBOKO	108.56	27.35	135.91
3	AGAGO	230.83		230.83	59	KOLE	146.96	5.00	151.96
4	ALEBTONG	143.12		143.12	60	KOTIDO	115.01	28.80	143.81
5	AMOLATAR	145.45		145.45	61	KUMI	187.58	42.57	230.15
6	AMUDAT	131.66	6.02	137.68	62	KWEEN	63.52	27.00	90.52
7	AMURIA	558.34	24.60	582.94	63	KYANKWANZI	279.03	143.10	422.13
8	AMURU	102.24	11.82	114.06	64	KYEGEGWA	138.18	105.00	243.18
9	APAC	286.42	45.37	331.79	65	KYENJOJO	302.90	248.98	551.88
10	ARUA	440.90	78.50	519.40	66	LAMWO	237.85	10.83	248.68
11	BUDAKA	105.21		105.21	67	LIRA	227.27	87.50	314.77
12	BUDUDA	80.10		80.10	68	LUUKA	192.02	54.60	246.62
13	BUGIRI	362.97		362.97	69	LUWERO	401.48	199.01	600.50
14	BUIKWE	251.09	26.00	277.09	70	LWENGO	232.90	85.90	318.80
15	BUKEDEA	237.85		237.85	71	LYANTONDE	146.50	32.20	178.70
16	BUKOMANSIMBI	161.34	91.60	252.94	72	MANAFWA	314.75	84.73	399.48
17	BUKWO	58.05	38.01	96.06	73	MARACHA	297.25	69.50	366.75
18	BULAMBULI	104.98	48.23	153.21	74	MASAKA	271.95	82.92	354.87
19	BULIISA	51.96	15.84	67.80	75	MASINDI	433.15	246.28	679.43
20	BUNDIBUGYO	142.44	76.00	218.44	76	MAYUGE	264.87		264.87
21	BUSHENYI	232.71	182.10	414.81	77	MBALE	184.46	92.85	277.31
22	BUSIA	7.12		7.12	78	MBARARA	322.49	108.05	430.53
23	BUTALEJA	96.00	119.20	215.20	79	MITOOMA	226.03	54.00	280.03
24	BUTAMBALA	144.22	61.60	205.82	80	MITYANA	364.77	123.90	488.67
25	BUVUMA	33.11	75.80	108.91	81	MOROTO	158.74		158.74
26	BUYENDE	251.29	217.76	469.05	82	MOYO	221.64		221.64
27	DOKOLO	7.08		7.08	83	MPIGI	282.23	6.45	288.68
28	GOMBA	155.20	80.18	235.38	84	MUBENDE	550.03		550.03
29	GULU	405.75	122.21	527.96	85	MUKONO	484.17		484.17
30	HOIMA	731.10	647.40	1,378.50	86	NAKAPIRIPIRIT	136.16	3.50	139.66
31	IBANDA	263.08	280.00	543.08	87	NAKASEKE	217.25	107.02	324.27
32	IGANGA	285.84	93.11	378.95	88	NAKASONGOLA	692.83	57.72	750.55
33	ISINGIRO	400.82	176.50	577.32	89	NAMIYANGO	125.89	73.30	199.19
34	JINJA	264.20	176.50	440.70	90	NAMUTUMBA	187.86	264.98	452.84
35	KAABONG	148.49	144.07	292.56	91	NAPAK	152.12	6.90	159.02
36	KABALE	661.02		661.02	92	NEBBI	296.21	109.23	405.44
37	KABAROLE	282.84	143.82	426.66	93	NGORA	128.57	69.61	198.18
38	KABERAMAIDO	144.80	106.17	250.97	94	NSIKA	180.49		180.49
39	KALANGALA	118.83	25.80	144.63	95	NTOROKO	94.08	15.50	109.58
40	KALIRO	159.64	16.21	175.85	96	NTUNGAMO	569.90	397.29	967.19
41	KALUNGU	154.65	106.05	260.70	97	NWOYA	170.10	22.60	192.70
42	KAMULI	391.10	26.23	417.33	98	OTUKE	73.27	92.00	165.27
43	KAMWENGE	114.21		114.21	99	OYAM	173.79	58.15	231.94
44	KANUNGU	215.33		215.33	100	PADER	334.51		334.51
45	KAPCHORWA	105.67	18.00	123.67	101	PALLISA	229.65		229.65
46	KASESE	466.70	175.94	642.64	102	RAKAI	366.32		366.32
47	KATAKWI	192.17	34.09	226.26	103	RUKUNGIRI	289.69	147.30	436.99
48	KATERERE	91.88		91.88	104	SERERE	203.41		203.41
49	KAYUNGA	350.31		350.31	105	SIRONKO	175.50	79.93	255.43
50	KIBAALE	503.09		503.09	106	SOROTI	123.83	78.83	202.66
51	KIBINGO	246.86		246.86	107	SSEMBABULE	349.84	43.96	393.80
52	KIBOGA	240.20	45.95	286.15	108	TORORO	357.61	87.90	445.51
53	KIBUKU	92.16		92.16	109	WAKISO	526.50		526.50
54	KIRUHURA	374.28	95.60	469.88	110	YUMBE	262.26	18.46	280.72
55	KIRYANDONGO	259.63	122.80	382.43	111	ZOMBO	236.12	81.91	318.03
56	KISORO	327.50	41.71	369.21		Grand Total	26,875.17	7,830.64	34,705.80

Source: The Consultant

Estimated length is more than that stated in the TOR of the Project. However, the actual road network length is expected to be more than the estimation since the urban road network in major cities like Kampala and Entebbe is considered as not being fully covered.

3.3.2 Activities 1-2 to 1-5

1-2 Obtain digital geographical data for the areas which the existing databases do not cover.
1-3 Import necessary data from the existing databases and compile them in Digital base map.
1-4 Produce tentative Digital base map of DUR for each District and compare with a road list prepared by each District (name, ID, classification, length, etc.) to identify the differences
1-5 Correct the discrepancies of data in Digital base map. If necessary, conduct site surveys

Preparation of Digital Base Map

The Consultant has decided to use the existing RAMPS data as a base map since the data is still reliable and useful compared to others. The existing RAMPS data has been developed into the ArcGIS.

As discussed, the data coverage of the Karamoja and urban area seemed to be insufficient, the Consultant requested JICA to procure satellite images of the missing areas according to the statement in the TOR.

Since the Project focuses on the District Road Network which is considered to have more than, , 3m in width, high resolution of the satellite image is not required to capture road alignment, therefore, the Consultant proposed 2.5m of minimum resolution (performance) of the satellite image.

The Consultant has investigated and compared available satellite images which satisfy the minimum resolution requirement and the results are tabulated as follows.

Table 3-11 Comparison of Satellite Image Performances

	ALOS	SPOT	FORMOSAT-2
Date Lunched	2006	2002	2003
Satellite Operator	JAXA, Japan	Spot Image, France	NSPO, Taiwan
Image Resolution	PRISM ¹ 2.5m, AVNIR-2 ² 10m	2.5/5m Pan, 10 / 20m Multispectral	2m Pan, 8m Multispectral
Min Revisit	1-2 days	2-3 days	1 day
Scene Size	PRISM 35x35km or 35x70km , AVNIR 70x70km	60x60km	24 x 24 km
Processing Level	Level 1B2 ³ (Georeferenced)	Level 2A (Georeferenced)	Level 2A (Georeferenced)

¹:Pan (Monochrome): To capture geographical features including altitude

² Multispectral(Color): To capture land use and land cover

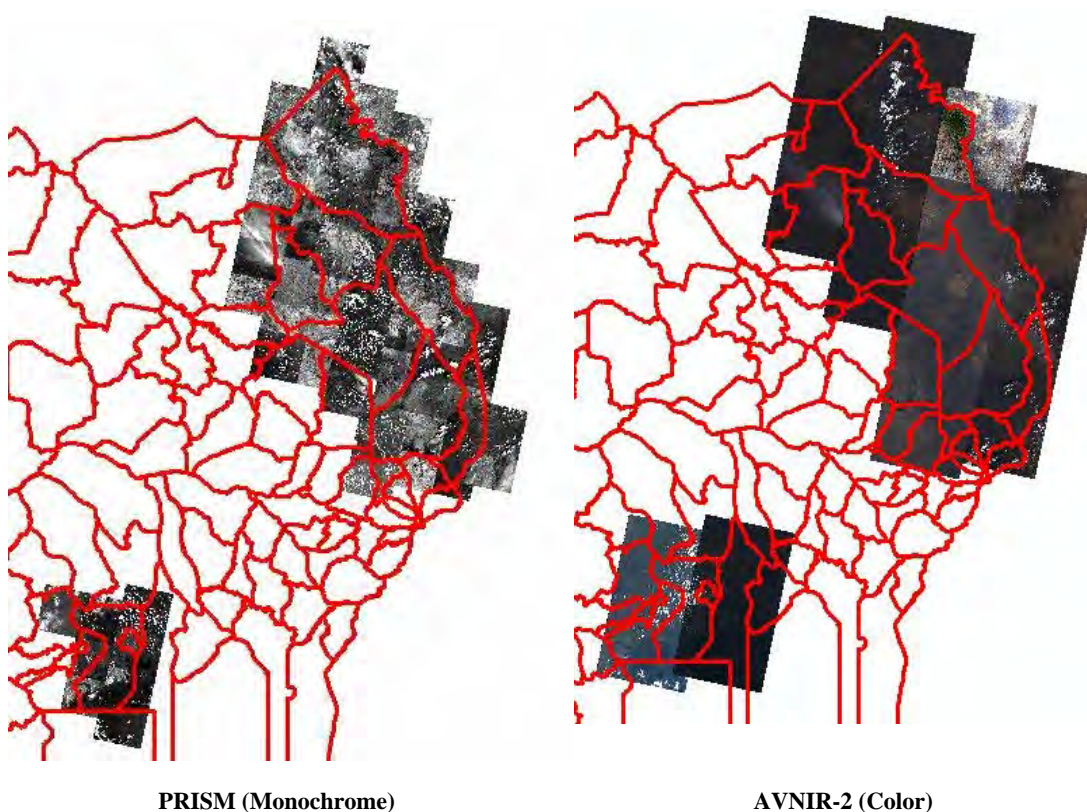
³ Level Definition of PRISM Standard Data Products

Level	Definition
1A	Uncompressed, reconstructed digital counts appended with radiometric calibration and geometric correction coefficients (appended but not applied) Individual files for forward, nadir and backward looking data

Indicative Price	PRISM: 42.9 JPY/sq.km, ALOS: 10.7 JPY/sq.km. ⁴	JPY 150.0 per sq. km ⁵	434.0 JPY per sq. km. ⁶
Evaluation	A	C	B

Source: The Consultant

The Consultant concluded the ALOS as a recommendable image because of financial advantage and data lunched date (most recent) compared to others and JICA has procured the ALOS satellite images for the missing areas in different arrangement of the Project.



Source: The Consultant

Figure 3-1 Procured Satellite Images

The Consultant has borrowed the procured satellite images from JICA in order for them to be processed into the GIS base map and the processing has been completed.

The Consultant has concluded the Road Network in Uganda as the result of the data collection and

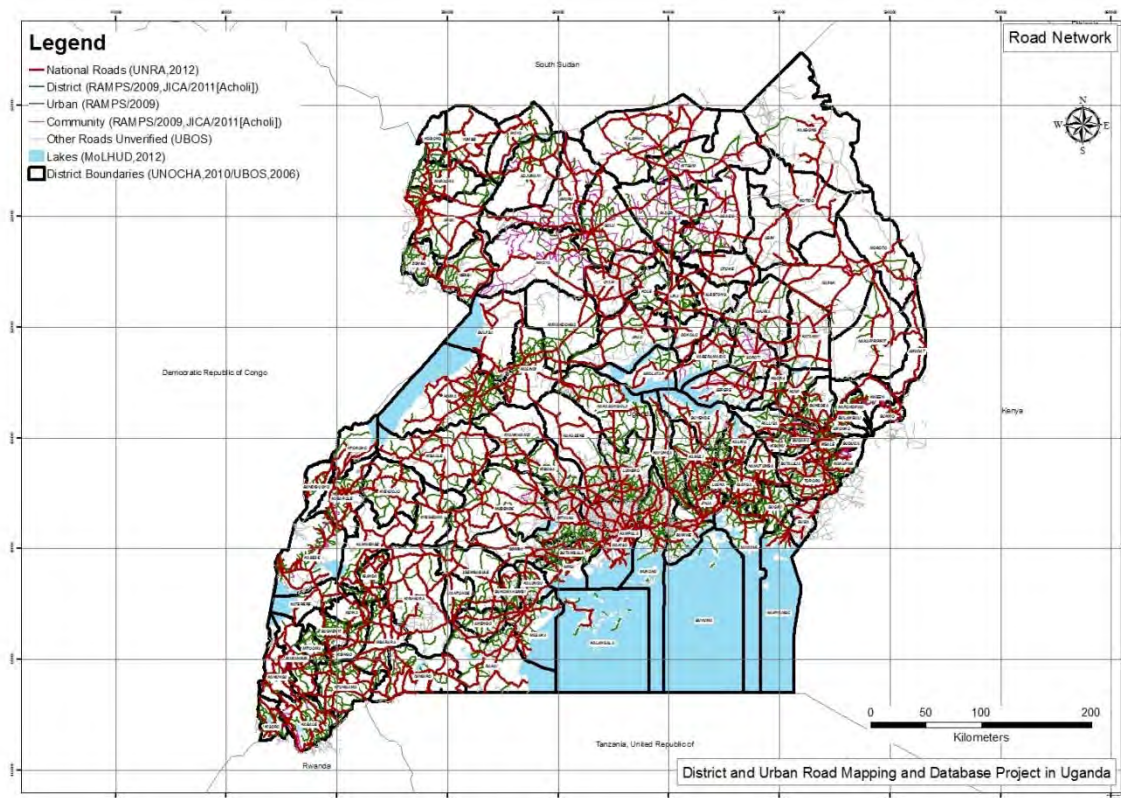
1B1	Radiometrically calibrated data at sensor input
1B2	Geometrically corrected data
	Option
	G: Systematically Geo-coded R: Systematically Geo-referenced Option G or R is alternative

⁴ http://www.alos-restec.jp/pdf/ALOSdata_price_america_oceania_ver6_3_CS3.pdf

⁵ http://www.fugro-npa.com/downloads/spot-pricelist_000

⁶ http://www.fugro-npa.com/downloads/FORMOSAT2PriceList_000.pdf

they are developed into ArcGIS as shown as follows.



Source: The Consultant

Figure 3-2 Road Network in Uganda

3.3.3 Activities 1-6

1-6 Conduct GIS training on basic skills for MoWT.

Following GIS trainings have been conducted by the Project.

Table 3-12 List of GIS Trainings

Phase	Name of training	Date (No of training days)	Number of participants
Phase 1	Basic training course (1)	17 to 27 July 2012 (8 days)	10 MoWT engineers
	Advanced training course (1)	31 July to 17 August 2012 (8 days)	11 MoWT engineers
	Advanced training course (2)	2 to 5 April 2013 (5 days)	9 MoWT engineers 3 KCCA engineers

DUR Database by use of GIS is one of the major outputs of our project and its operation skill needs to be acquired by the engineers.

Since the technical transfer trainings for the GIS operation have been conducted in previous JICA's

Acholi Master Plan Project, the training in this project will be an advanced program to the trainees who experienced the previous training and basic operation training will also be given to the engineers who were not trained during the Acholi Master Plan Project.

Table 3-13 GIS Training Schedule in July & August

Sun	Mon	Tue	Wed	Thu.	Fri	Sat
15	16	17 B Prog. day 1	18 B Prog. day 2	19 B Prog. day 3	20 B Prog. day 4	21
22	23	24 B Prog. day 1	25 B Prog. day 2	26 B Prog. day 3	27 B Prog. day 4	28
29	30	31 A Prog. day 1	1 A Prog. day 2	2 A Prog. day 3	3 A Prog. day 4	4
5	6	7	8	9	10	11
12	13	14 A Prog. day 1	15 A Prog. day 2	16 A Prog. day 3	17 A Prog. day 4	18

Note: B Prog.: Basic Training Program, A Prog.: Advanced Training Program

Source: The Consultant

Prior to the Training, a capacity assessment by use of questionnaires was given to the trainees (MoWT Engineers). The questionnaire asked about experiences of participation in other GIS trainings and utilization of GPS, CAD and GIS.

No one has participated in other GIS training and a few engineers had experience in using GPS and its skill has been identified as poor by themselves.

Basic training program had the following sub-program is as shown as follows.

Table 3-14 GIS Basic Training Program Contents

PART 1 Road Survey Techniques Using GPS

S/N	Contents	Note
1	Self-introduction	Day 1 (am)
2	Assessment of Participant Technical Capability	Day 1 (am)
	Objectives of Road Survey	Day 1 (am)
	Terminology	Day 1 (am)
	Road Survey Forms Form 1 : Waypoint Recording Sheet Form 2 : Road Section Condition Assessment Form Form 3 : Structure Recording Sheet	Day 1 (am)
	Sequence of the Road Survey	Day 1 (am)
	GPS Basics	Day 1 (am/pm)
	Basic Operations on the GPS needed for Road Survey	Day 1 (pm)
	Downloading of tracks & waypoints from GPS	Day 2 (am)
	Conducting GPS Road Survey Mission Planning Make a Plan of Roads to be Surveyed Check the Equipment Prepare Road Survey Form Determine Road Alignment Recommended Survey Sequence Conduct the actual survey	Day 2 (pm)
	Conducting Road Structure Survey Mission Planning Make a Plan of Roads to be Surveyed Check the Equipment Prepare Road Survey Form Determine Road Alignment Recommended Survey Sequence Conduct the actual survey	Day 2 (pm)
	GPS Field Exercises	Day 3/4

PART 2 Road Data Processing Techniques Using GIS

S/N	Contents	Note
	Introduction	Day 5 (am)
	GIS Database Developed for DUR Mapping of Uganda	Day 5 (am)
	Overall process of Road Database Development	Day 5 (pm)
	GIS Concepts	Day 6
	Practical Exercises on Road Data Processing Techniques Using GIS	Day 7/8

Source: The Consultant

The Program contained a field survey in order for the trainees to learn principles of the Road Inventory Survey and basic operation of the GPS. The Pilot road section used was Kigo road near Kampala.

Trainees were generally well-motivated to participate in the training and no one was absent during the program.

Further to the Basic Training, the Advance Training was conducted. Most of the trainees were the engineers who participated in the Basic program and it was because of aggressive request by the engineers.

The Advanced program, started from 1st of August, 2012, had the following curriculums as shown as follows.

Table 3-15 GIS Advance Training Program Contents

PART 1 Road Survey Techniques Using GPS

S/N	Contents	Note
1	Self introduction	Day 1 (am)
2	Assessment of Participant Technical Capability	Day 1 (am)
	Objectives of Road Survey	Day 1 (am)
	Terminology	Day 1 (am)
	Road Survey Forms Form 1 : Waypoint Recording Sheet Form 2 : Road Section Condition Assessment Form Form 3 : Structure Recording Sheet	Day 1 (am)
	Sequence of the Road Survey	Day 1 (am)
	GPS Basics	Day 1 (am)
	Basic Operations on the GPS needed for Road Survey	Day 1 (pm)
	Downloading of tracks & waypoints from GPS	Day 2 (am)
	Conducting GPS Road Survey Mission Planning Make a Plan of Roads to be Surveyed Check the Equipment Prepare Road Survey Form Determine Road Alignment Recommended Survey Sequence Conduct the actual survey	Day 2 (pm)
	Conducting Road Structure Survey Mission Planning Make a Plan of Roads to be Surveyed Check the Equipment Prepare Road Survey Form Determine Road Alignment Recommended Survey Sequence Conduct the actual survey	Day 2 (pm)
	GPS Field Exercises	Day 3

PART 2 Road Data Processing Techniques Using GIS

S/N	Contents	Note
	Introduction	Day 4 (am)
	GIS Database Developed for DUR Mapping of Uganda	Day 4 (am)
	Overall process of Road Database Development	Day 4 (am)
	GIS Concepts	Day 4 (pm)
	Practical Exercises on Road Data Processing Techniques Using GIS	Day 5

PART 3 Road Data Processing Techniques Using GIS - Advanced Topics

S/N	Contents	Note
	Introduction	Day 6 (am)
	Road Roughness Measuring Techniques Using Accelerometer	Day 6 (am/pm)
	GIS Skills - Data Buildup of Map Data - Data Digitizing - Converting CADD Data to GIS	Day 7 (am)
	GIS Skills - Data Buildup of Tabular Data - Using Excel as Database	Day 7 (pm)
	GIS Skills - Thematic Mapping	Day 7 (pm)
	GIS Skills - Analysis Techniques - Road Alignment Selection - Hazard Mapping - Land Suitability Analysis - 3D Analysis - DEM Creation - Profile Generation - Slope Analysis - 3D Mapping	Day 8

Source: The Consultant

Trainees were still well-motivated for the Advanced training. However, the trainees still seemed to need review of the skill obtained from the program since they needed some assistance in operation of GIS and CAD during the training.



Photo 3-1 A Scene of Briefing for Program Contents for Basic Training by Joel Cruz (in charge of GIS training)



Photo 3-2 A Scene of Presentation by Trainee.



Photo 3-3 A Scene of Field Training at Kigo Road in Basic Training with Joel Cruz



Photo 3-4 A Scene of Basic Training Completion Ceremony with Joel Cruz and Claire Reyes (in charge of GIS Mapping)

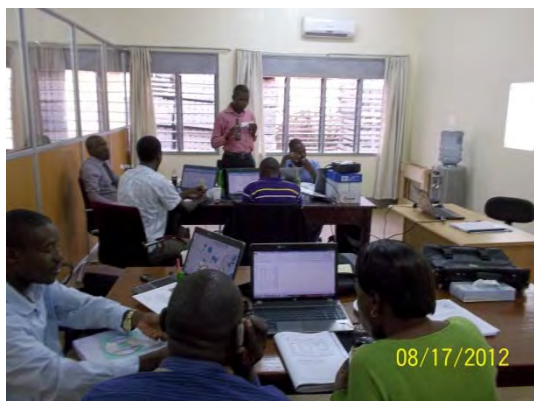


Photo 3-5 A Scene of Self Studying in Advance Training



Photo 3-6 A Scene of Presentation for Result of Data Processing by Trainee



Photo 3-7 A Scene of Advance Training Completion Ceremony (Giving Completion Certificate)



Photo 3-8 A Scene of Advance Training Completion Ceremony

Data processing training was carried out between 2nd and 5th April, 2013. This training consisted of 2 trainees from KCCA in addition to those from MoWT. As a result, data processing for the Pilot Survey is being carried out by the C/P after this training.

Table 3-16 Data Processing Training in April, 2013

Sun	Mon	Tue	Wed	Thur.	Fri	Sat
	1	2 Lecture	3 Lecture	4 Lecture	5 Lecture	6

Source: The Consultant

Training Programme

PART 1 Introduction

S/N	Contents	Note
1	Self introduction	[Day 1]
2	Assessment of Participant Technical Capability	[Day 1]
-	Objectives of Road Survey	[Day 1]

PART 2 Road Data Processing technical Using GIS

S/N	Contents	Note
	GIS Database Developed for DUR Mapping of Uganda	[Day 1]
	Overall Process of Road Database Development	[Day 1]
-	Road Data Processing Technique Using GIS <ul style="list-style-type: none"> - Road processing concepts - GIS Concepts (Essentials) - OJT on Road Data Processing (Target : Soroti & Kotido) <ul style="list-style-type: none"> - Preparing the Workstation - Setting the Road Processing Environment - Folder Structure - Preparation of Mission Planning Maps - Road Data Processing using Actual Data <ul style="list-style-type: none"> - Pre-processing Steps <ul style="list-style-type: none"> - Reformatting Road Condition Excel Files - Preparing the Road Tracks - Creating the Base Road GIS Database <ul style="list-style-type: none"> - Creating the Road Condition GIS Database - Merging All Roads in each District (Base Road DB, Road Condition DB) - Production of Road Condition Maps for each District - Merging All Roads in Uganda (Base Road DB, Road Condition DB) - Production of Road Condition Maps for each District 	[Day 2-4]

Source: The Consultant



Photo 3-9 A Scene of Explanation of Training Contents by Joel Cruz, GIS Engineer(2nd April 2013)



Photo 3-10 Trainees (2nd April 2013)



Photo 3-11 A Scene of Presentation by a Trainees(2nd April 2013)



Photo 3-12 A Scene of Training (2nd April 2013)



Photo 3-13 A Scene of Training (2nd April 2013)



Photo 3-14 A Scene at Completion of Training (5nd April 2013)

3.3.4 Activities 2-1

2-1 Review the existing formats and manuals for road inventory on National road and DUR and identify issues to be improved.

Road field information and its regular updates are very necessary in Road O&M planning. As part of the District Road Manual, Ministry of Works, Housing and Communications introduced ADRICS which explained the survey methodology with road inventory format. However, it seems like it is not being effectively used in O&M planning by districts. In previous JICA's Acholi Master Plan Study an improved survey approach with survey formats was introduced in consideration of effective use of GPS and its operation sequences. The approach has also been confirmed as applicable with the C/P in Acholi Sub-region.

The approach of the Road Inventory Survey (Pilot Survey) is to develop the experiences from the Acholi Regional Road Master Plan and to improve survey methodology including field data compilation.

Target skills to be obtained from the pilot survey were as follows,

- 1) Always be able to identify one's position in the field
- 2) Survey can be performed based on a common assessment and survey criteria.
- 3) The obtained survey findings can be systematically arranged and reviewed.

According to preliminary investigation in the districts, the following facts have been identified,

- 1) The road inventory survey is being carried out but not regularly,
- 2) In many districts there are tabulated road inventory but no maps with them,
- 3) Few survey equipment such as GPS and vehicles have been provided,
- 4) Insufficient budget is arranged for survey cost including fuel even if there is equipment,
- 5) Custom made road inventory in Excel are being used instead of the RAMPS in most of the districts
- 6) Personnel are available to attend short duration training like for a week and engineers are, generally, interested in the training such as for the GPS operation in particular.

The original form in the Manual of the ADRICS has many items to be surveyed and recorded which seems to result in lesser efficiency during the field survey work since it included unnecessary items in the Road O&M planning. The improved points given by the Acholi Regional Road Master Plan was to apply absolute survey items as sufficient to establish Road O&M planning. This approach continued in development of the form in this project.

Road Inventory Survey Manual applied to the Acholi Regional Road Master Plan has been developed in the Project and the development has been made by the Consultant because of time constraint. However, the status of the development was draft and further development and finalizing are expected to be made by the C/P by end of the Project.

3.3.5 Activities 2-2

2-2 Prepare the formats and manuals for road inventory and condition on DUR.

Since the developed Manual was expected to be used as text to district engineer in the pilot survey, the development was made taking into account sequence of the field survey and for easy understanding by the district engineer.

Minor amendments have been made to the Manual as a result of the field surveys and formats and manual for road inventory were finalized on July 2013.

3.3.6 Activities 2-3

2-3 Organize a road inventory survey team (at least one person from MoWT and two persons from DUC).

C/P assigned MoWT engineers to each region (Noethern, Eastern, Western and Central region) and arranged the DUCs engineers to participate in the road inventory survey.

3.3.7 Activities 2-4

2-4 Conduct road inventory training for MoWT and DUC teams.

The Consultant has given the training to the MoWT engineers who were expected to be the trainers to the district engineers in the pilot survey. The number of trained engineers was nine and the following program was given in the training.

Day 1: Trainings for operation of survey equipment,

Day 2: Lecture for road inventory field survey method,

Day 3: Trail field survey

Day 4: Reviewing and improvement on the Survey Manual

3.3.8 Activities 2-5

2-5 Select pilot Districts and conduct site surveys to prepare road inventory as OJT for MoWT and DUC teams

The road inventory survey as pilot survey areas have been selected by JICA expert team and approved by the joint coordination committee in 1st phase.

- 1) To select District and Urban Councils
- 2) Accessibility to site
- 3) Easy to get the good effect after the survey
- 4) Major regional point
- 5) To consider the survey coverage of each region
- 6) To exclude the districts where road inventory survey were conducted by JICA Acholi Project

Selected areas for the pilot survey are 31 districts for districts roads and 12 municipal councils for urban roads. List of selected districts and urban council for the pilot survey is shown as below.

Table 3-17 List of Districts and Urban Councils for Pilot Survey

Urban Road Network				Districts Road Network			
No	City//Municipal	Region	Expected Length (km)	No.	District	Region	Expected Length (km)
1	Kampala	Central	1,166.00	1	Wakiso	Central	526.50
2	Entebbe	Central	120.00	2	Mpigi	Central	282.23
3	Mukono	Central	N.A	3	Kiboga	Central	240.20
4	Mbale	Eastern	108.96	4	Luwero	Central	401.48
5	Jinja	Eastern	124.40	5	Mukono	Central	484.17
6	Sorti	Eastern	78.33	6	Mubende	Central	550.03
7	Gulu	Northern	122.21	7	Masaka	Central	271.95
8	Arua	Northern	78.50	8	Rakai	Central	366.32
9	Lira	Northern	89.51	9	Jinja	Eastern	254.20
10	Kabale	Western	86.50	10	Bugiri	Eastern	362.97
11	Mbarara	Western	108.05	11	Busia	Eastern	7.12
12	Fort Portal	Western	111.23	12	Tororo	Eastern	357.61
	Total		2,193.69	13	Mbale	Eastern	184.46
				14	Pallisa	Eastern	229.65
				15	Kamuli	Eastern	391.10
				16	Sori	Eastern	123.83
				17	Katakwi	Eastern	192.17
				18	Arua	Northern	440.90
				19	Nebbi	Northern	296.21
				20	Lira	Northern	227.27
				21	Apac	Northern	286.42
				22	Kotido	Northern	115.01
				23	Masindi	Western	433.15
				24	Hoima	Western	731.10
				25	Kabarole	Western	282.84
				26	Kasese	Western	466.70
				27	Mbarara	Western	322.49
				28	Bushenyi	Western	232.71
				29	Kabale	Western	466.70
				30	Ntungamo	Western	569.90
				31	Kanungu	Western	154.65
					Total		10,456.33

Resource : Project Progress Report-2 (1st Phase) submitted on September 2013

(2) Pilot Survey

The pilot survey was started from August 2012 in 1st phase and completed on the end of May 2014 in 2nd phase.

The pilot survey was carried out 4 times in 1st phase and 2 times in 2nd phase.

Survey schedule for Pilot Area is shown as below.

Table 3-18 Survey Schedule for the Pilot Survey in 1st Phase

Survey in 1st Phase (from August 2012 to July 2013)									
1 st Survey (August 2012)									
2 nd Survey (from October to December 2012)									
3 rd Survey (from January to March 2013)									
4 th Survey (from May to July 2013)									
	Survey duration	Survey days	Team 1	Survey duration	Survey days	Team 2	Survey duration	Survey days	Team 3
1 st Survey	Aug13-Aug22,2012	10	Sorti (Completed)	Aug13-Au22,2012	10	Mpigi (Completed)			
	Aug23-Aug31,2012	9	Katakwi (Not Completed)	Aug23-Aug31,2012	9	Luwero (Completed)			
2 nd Survey	Oct21-Oct31,2012	10	Arua (Not Completed)	Oct21-Oct31,2012	11	Mukono (Not Completed)	Oct21-Oct30,2012	10	Jinja (Not Completed)
	Nov01-Nov09,2012	9	Arua (Urban) (Completed)	Nov01-Nov09,2012	9	Mukono(Urban) (Not Completed)	Oct31-Nov09,2012	10	Jinja(Urban) (Not Completed)
	Nov12-Nov23,2012	10	Nebbi (Not Completed)	Nov12-Nov20,2012	9	Kiboga (Completed)	Nov12-Nov21,2012	9	Kamuli (Completed)
	Nov26-Dec04,2012	9	Gulu(Urban) (Not Completed)	Nov21-Nov30,2013	10	Wakiso (Not Completed)	Nov22-Dec03,2012	12	Bugiri (Completed)
	Dec06-Dec10,2012	9	Kotido (Completed)	Dec03-Dec12,2012	10	Entebbe(Urban) (Completed)	Dec04-Dec12,2012	9	Busia (Completed)
3 rd Survey	Jan17-Jan28,2013	12	Tororo (Not Completed)	Jan17-Jan28,2013	12	Masaka (Completed)			
	Jan29-Feb08,2013	11	Pallisa (Not Completed)	Jan29-Feb07,2013	10	Rakai (Not Completed)			
	Feb11-Feb28,2013	18	Kampala(Urban) (Not Completed)	Feb10-Feb19,2013	10	Mbarara (Completed)			
	Mar03-Mar13,2013	11	Lira(Urban) (Completed)	Feb20-Mar02,2013	11	Mbarara(Urban) (Completed)			
	Mar14-Mar23,2013	12	Lira (Completed)	Mar04-Mar14,2013	11	Ntungamo (Completed)			
4 th Survey				Mar15-Mar26,2013	12	Kabale(Urban) (Completed)			
	May12-May21,2013	10	Hojima (Not Completed)	May12-May22,2013	11	Kabale (Not Completed)			
	May22-May31,2013	9	Mubende (Not Completed)	May23-May31,2013	9	Kanungu (Not Completed)			
	Jun02-Jun10,2013	9	Soroti(Urban) (Completed)	Jun03-Jun13,2013	11	Kabarole (Completed)			
	Jun11-Jun19,2013	9	Mbale(Urban) (Completed)	June14-Jun27,2013	14	Fort Portal(Urban) (Completed)			
	June20-June28,2013	7	Mbale (Completed)	June30-Jul08,2013	9	Apac (Not Completed)			
	Jun30-Jul08,2013	9	Bushenyi (Completed)	Jul09-Jul17,2013	9	Masindi (Not Completed)			
Jul09-Jul17, 2013	8	Kasese (Not Completed)							

Note: shaded area: not completed area in 1st Phase

Source: The Consultant

Table 3-19 Survey Schedule for the Pilot Survey in 2nd Phase

Team 1 (Completed 8 Districts and 1 MC)

Team 1	Survey Duration	Survey Days	District / Urban Council	Estimated length (km)	Survey length in 1 st Phase(km)	Survey length in 2 nd Phase(km)	Total Survey length(km)
1 st Survey (from Jan to March 2014)	Jan.19-Jan.22, 2014	3	Apac District	366.4	283.1	96.6	379.7
	Jan.23-Jan.25, 2014	1	Paliisa District	360.0	321.5	32.4	353.9
	Jan.27-Jan.29, 2014	2	Rakai District	519.1	455.4	45.7	501.1
	Feb.2-Feb.8, 2014	5	Masindi District	357.9	177.0	153.8	330.8
	Feb.13-Feb.21, 2014	8	Hoima District	731.1	244.1	336.0	536.7
	Feb.22-Feb.27, 2014	5	Hoima MC(*)	606.1	-----	69.6	69.6
	Mar.4-Mar.13, 2014	6	Mubende District	550.0	341.4	237.2	614.6
2 nd Survey (April to May)	Apr.24-Apr.30, 2014	5	Mukono District	501.8	176.6	307.2	483.8
	May 22-May 24, 2014	3	Mukono District	501.8	176.6	307.2	483.8
	May 01-May06, 2014	3	Mukono Urban	151.5	87.4	81.1	168.5
	May 13-May20, 2014	6	Wakiso District	534.6	363.9	148.4	512.3

Team 2 (Completed 8 Districts and 2 MCs)

Team 2	Survey Duration	Survey Days	District / Urban Council	Estimated length (km)	Survey length in 1 st Phase(km)	Survey length in 2 nd Phase(km)	Total Survey length(km)
1 st Survey (Jan to March 2014)	Jan.19-Jan.22, 2014	2	Gulu MC	179.0	100.4	6.7	107.1
	Jan.23-Jan.24, 2014	1	Katakwi District	243.8	208.3	35.0	243.3
	Jan.29-Feb.10, 2014	12	Kabale District	661.0	297.0	237.1	534.1
	Feb.11-Feb.14, 2014	2	Kanungu District	215.3	202.0	59.5	261.5
	Feb.17-Feb.25	7	Kasese District	386.9	155.0	135.4	290.4
	Mar.4-Mar.13, 2014	7	Tororo District	486.4	235.2	286.0	521.2
	Apr.24-Apr.26, 2014	1	Nebbi District	378.6	362.7	16.7	379.4
2 nd Survey (April to May)	Apr.27-May10, 2014	10	Arua District	638.6	193.5	431.9	625.4
	May 13, 2014	1	Jinja District	264.2	130.1	10.3	140.4
	May 16, 2014	1	Jinja MC	133.2	115.0	13.4	128.4

Source: The Consultant

The total surveyed District Road length in Pilot Survey had reached 11,239km after completion of the pilot survey. After adding the surveyed District Road length in Pilot Survey and JICA Acholi Project, total length of district roads had reached 12,963km out of 26,875km of total estimated District road network. This achievement was equivalent to 48.2% of the district road network as well as almost 50% of the target.

Total length of urban roads had reached 1,362km out of 7,831km of total estimated urban road network. This achievement was equivalent to 17.4% of the urban road network.

Road inventory survey for urban roads within Kampala had been partially completed. During the JCC meeting, C/Ps offered to change the survey areas from Kampala to other urban councils. Main reasons are (1) KCCA can prepare own road database by themselves. (2) Other urban councils have some difficulties such as limitation of capacity for conducting road inventory survey by themselves.

Table 3-20 Summary of Road Inventory Survey for Pilot Survey

District Roads							Urban Roads							
No.	District	Region	Completed on 1 st Phase	Completed on 2 nd Phase	Survey Length(km)			No.	Urban Council	Completed on 1 st Phase	Completed on 2 nd Phase	Survey Length(km)		
					1 st Phase	2 nd Phase	Total					1 st Phase	2 nd Phase	Total
D-1	Apac	Northern	X	Completed	283.1	96.6	379.7							
D-2	Arua	Northern	X	Completed	193.5	431.9	625.4	U-1	Arua MC	Completed			50.7	50.7
D-3	Bugiri	Eastern	Completed		355.3		355.3							
D-4	Busia	Eastern	Completed		357.9		357.9							
D-5	Bushenyi	Western	Completed		306.5		306.5							
D-6	Hoima	Western	X	Completed	244.2	292.6	536.8	U-2	Gulu MC	X	Completed		100.4	6.7 107.1
D-7	Jinja	Eastern	X	Completed	130.1	10.3	140.4	U-3	Jinja MC	X	Completed		115.0	13.4 128.4
D-8	Kabale	Western	X	Completed	297.0	237.1	534.1	U-4	Kabale MC	Completed			74.6	74.6
D-9	Kabarole	Western	Completed		236.8		236.8	U-5	Fort Portal MC	Completed			107.5	107.5
D-10	Kamuli	Eastern	Completed		401.1		401.1							
D-11	Kanungu	Western	X	Completed	202.0	59.5	261.5							
D-12	Kasese	Western	X	Completed	155.0	135.4	290.4							
D-13	Katakwi	Eastern	X	Completed	208.3	35.0	243.3							
D-14	Kiboga	Central	Completed		345.9		345.9							
D-15	Kotido	Northern	Completed		105.1		105.1							
D-16	Lira	Northern	Completed		400.0		400.0	U-6	Lira MC	Completed			145.2	145.2
D-17	Luwero	Central	Completed		333.4		333.4							
D-18	Masaka	Central	Completed		295.7		295.7							
D-19	Masindi	Western	X	Completed	177.0	153.8	330.8							
D-20	Mbale	Eastern	Completed		234.0		234.0	U-7	Mbale MC	Completed			94.3	94.3
D-21	Mbarara	Western	Completed		430.1		430.1	U-8	Mbarara MC	Completed			115.7	115.7
D-22	Mpigi	Central	Completed		201.0		201.0							
D-23	Mubende	Central	X	Completed	341.4	273.2	614.6							
D-24	Mukono	Central	X	Completed	176.6	307.2	483.8	U-9	Mukono MC	X	Completed		87.4	81.1 168.5
D-25	Nebbi	Northern	X	Completed	362.7	16.7	379.4							
D-26	Ntungamo	Western	Completed		433.1		433.1							
D-27	Pallisa	Eastern	X	Completed	321.5	32.6	354.2							
D-28	Rakai	Central	X	Completed	455.4	45.8	501.2							
D-29	Soroti	Eastern	Completed		94.6		94.6	U-10	Soroti MC	Completed			98.2	98.2
D-30	Tororo	Eastern	X	Completed	235.2	286.0	521.2							
D-31	Wakiso	Central	X	Completed	363.9	148.4	512.3	U-11	Entebbe MC	Completed			125.8	125.8
								U-12	Kampala	X	Δ		146.2	146.2
District Roads			Total		8,677.2	2,562.0	11,239.3	Urban Roads			Total	1,260.9	101.2	1,362.1

Source: The Consultant

Table 3-21 Road Inventory for JICA Acholi Project

District Roads				Urban Roads				
No.	District	Region	Survey Length(km)	No.	MC / TC	Region	Survey Length(km)	
1	AGAGO	Northern	239.4					
2	AMURU	Northern	101.3					
3	GULU	Northern	409.0					
4	KITGUM	Northern	223.7					
5	LAMWO	Northern	241.8					
6	NWOYA	Northern	170.1					
7	PADER	Northern	338.3					
District Roads			Total	Urban Roads			total	0.0

Source: The Consultant

Table 3-22 Summary of Road Inventory Survey

	District Roads	Urban Roads
Survey Length for Pilot survey	11,239km	1,362km
Survey Length for JICA Acholi Project	1,724km	0km
Total Length	12,963km (48.2%)	1,362km (17.4%)
Target	50% of estimated total length of district roads 26,875km	50% of estimated total length of urban roads 7,831km
Remarks	Almost achieved	Survey by C/P has been carried out to achieve 50% as a target for urban roads.

Source: The Consultant

3.3.9 Activities 2-6

2-6 Conduct site surveys and prepare road inventory for other Districts

(1) Survey by C/P

Road inventory survey as pilot survey with JICA experts was completed by the end of May 2014. After completion of pilot survey, survey by C/P has been started.

During the pilot survey, JICA experts had gone to the site with C/Ps and instructed them in making the survey plan and implementation of the survey at the site. However, all activities for the survey by C/P, such as the preparation of the survey, making the survey schedule, survey instruction to the engineers in Local Governments, to organize the survey results, etc. have been done with C/P initiative. JICA experts advised CPs, if CPs had some issues for the survey.

During the C/P initiative survey, C/P offered to execute additional survey to complete all urban council roads under 31 districts as Pilot Survey.

C/Ps could complete initial survey and additional survey by December 2014.

Team No.1 (4MC, 12TC: completed)

District	Survey period	Survey days	Survey Road	Expected length(km)	Survey length in 1 st phase(km)	Survey length in 2 nd Phase(km)	Total length(km)
Wakiso	May 29, 30, 2014	2	Kakiri TC	86.0	---	33.6	33.6
Wakiso	Jun.4 – Jun.12, 2014	8	Kira TC	275.0	---	176.0	176.0
Masaka	Jul 14-Jul 18, 2014	5	Masaka MC	311.0	---	138.5	138.5
Kamuli	Aug01-Aug02, 2014	2	Kamuli TC	40.1	----	32.62	32.62
Bugiri	Aug04-Aug05, 2014	2	Bugiri TC	47.8	----	40.94	40.94
Busia	Aug06-Aug07,2014	2	Busia MC	68.6	----	37.73	37.73
Tororo	Aug08-Aug09, 2014	2	Malaba TC	35.2	----	31.41	31.41
Tororo	Aug12-Aug16, 2014	5	Tororo MC	165.4	----	106.74	106.74
Tororo	Aug18-Aug19, 2014	2	Nagongera TC	61.5	----	27.73	27.73
Wakiso	Aug27-Aug29, 2014	3	Kira TC	275.0	----	51.1	227.1
Wakiso	Sep01-Se09, 2014	4	Kira TC	275.0	----	35.96	263.1
Mpigi	Sep11-Sep15, 2014	4	Mpigi TC	226.8	----	179.93	179.93
Luwero	Oct06-Oct07, 2014	2	Bombo TC	48.5	----	38.5	38.5
Luwero	Oct16-Oct17, 2014	2	Wobulenzi TC	60.1	----	47.1	47.1
Kiboga	Nov12, 2014	1	Bukomero TC	50.1	----	31.93	31.93

Kiboga	Nov14, 2014	1	Kiboga TC	37.1	-----	49.68	49.68
Mubende	Nov22-Nov23, 2014	2	Mubende TC	52.1	-----	64.76	64.76
Masindi	Nov24-Dec07, 2014	5	Masindi MC	334.7	-----	222.76	222.76

Team 2 (3MC,24TC: completed)

District	Survey period	Survey days	Survey Road	Expected length(km)	Survey length in 1 st phase(km)	Survey length in 2 nd Phase(km)	Total length(km)
Jinja	May 15 & 21, 2014	2	Bugembe TC	43.6	-----	29.9	29.9
Jinja	May 19-May 20, 2014	2	Buwenge TC	61.8	-----	34.2	34.2
Jinja	May 22-May 23, 2014	2	Kakira TC	44.1	-----	43.6	43.6
Wakiso	May 27 – Jun.02, 2014	6	Wakiso TC	125.9	-----	79.0	79.0
Wakiso	Jun.5 – Jun9, 2014	3	Nansana TC	39.2	-----	43.0	43.0
Wakiso	Jun.13-Jun.14, 2014	2	Namayumba TC	70.8	-----	54.9	54.9
Wakiso	Jun 20-Jun 25, 2014	3	Masulita TC	67.4	---	44.5	44.5
Kabale	Jul 10,2014	1	Hamurwa TC	26.0	----	17.3	17.3
Kabale	Jul12 – Jul14, 2014	2	Katuna TC	38.1	----	22.5	22.5
Kabale	Jul15 – Jul16, 2014	2	Muhanga TC	77.6	----	29.5	29.5
Ntungamo	Jul22 – Jul24, 2014	3	Ntungamo MC	86.4	----	67.4	67.4
Ntungamo	Jul18 – Jul18, 2014	1	Rwashameire TC	31.3	----	20.9	20.9
Ntungamo	Jul17 – Jul17, 2014	1	Rubare TC	28.8	----	30.0	30.0
Ntungamo	Jul21 – Jul21, 2014	1	Kitwe TC	34.1	----	22.2	22.2
Bushenyi	Aug04-Aug09, 2014	6	Ishaka-Bushenyi MC	181.2	----	140.4	140.4
Kanungu	Aug11-Aug13, 2014	3	Kihihi TC	93.3	----	72.6	72.6
Kanungu	Aug13, 2014	1	Kambuga TC	40.9	-----	16.5	16.5
Kanungu	Aug15-Aug16, 2014	2	Butogota TC	53.4	-----	30.4	30.4
Kanungu	Aug18-Aug20, 2014	3	Kanungu TC	69.0	-----	42.9	42.9
Luwero	Sep09-Sep11, 2014	3	Luwero TC	96.7	----	92.8	92.8
Kasese	Oct21, 2014	1	Hima TC	36.5	----	23.5	23.5
Kasese	Oct22-Oct23, 2014	2	Kasese M.C	178.5	----	62.2	62.2
Kasese	Oct24, 2014	1	Katwe-Kabatoro TC	29.4	----	21.3	21.3
Kasese	Oct27-Oct29, 2014	3	Mpondwe-	98.9	----	134.7	134.7

			Lubiriha TC				
Rakai	Nov26, 2014	1	Rakai TC	56.3	----	45.44	45.44
Rakai	Nov27, 2014	1	Kalisizo TC	55.4	----	31.57	31.57
Rakai	Nov28, 2014	1	Kyotera TC	55.5	----	32.10	32.10

Team 3(1MC,15TC: completed)

District	Survey period	Survey days	Survey Road	Expected length(km)	Survey length in 1 st phase(km)	Survey length in 2 nd Phase(km)	Total length(km)
Hoima	Jul 10 – Jul 29, 2014	13	Hoima MC	537.2	-----	355.7	355.7
Hoima	Jul 24 – Jul 25 2014	2	Kigorobya TC	40.6	-----	28.1	28.1
Kabarole	Aug04-Aug05, 2014	2	Karago TC	29.5	-----	26.0	26.0
Kabarole	Aug06, 2014	1	Kijura TC	80.5	-----	42.4	42.4
Kabarole	Aug07-Aug08, 2014	2	Kibiito TC	40.7	-----	37.5	37.5
Kabarole	Aug11, 2014	1	Kiko TC	22.1	-----	32.4	32.4
Kabarole	Aug12-Aug13, 2014	2	Rwimi TC	64.8	-----	38.7	38.7
Kabarole	Aug14-Aug15, 2014	2	Rubona TC	53.7	-----	21.6	21.6
Nebbi	Oct22-Oct23, 2014	2	Nebbi TC	405.9	-----	57.6	57.6
Nebbi	Oct24, 2014	1	Pakwach TC	35.1	-----	19.4	19.4
Apac	Oct27, 2014	1	Apac TC	41.8	-----	30.6	30.6
Apac	Oct28, 2014	1	Aduku TC	13.7	-----	13.0	13.0
Paliisa	Nov05-Nov06, 2014	2	Paliisa TC	51.8	-----	63.9	63.9
Mbale	Nov10, 2014	1	Nakaloke TC	17.9	-----	40.54	40.54
Kotido	Nov11, 2014	1	Kotido TC	27.9	-----	15.73	15.73
Katakwi	Nov12, 2014	1	Katakwi TC	44.7	-----	21.53	21.53

Final total length for road inventory survey was 17,794km which was 51.3% of expected total length of district and urban roads. Finally, survey coverage is reached over the target 50%.

Table 3-23 Road Inventory Survey Coverage

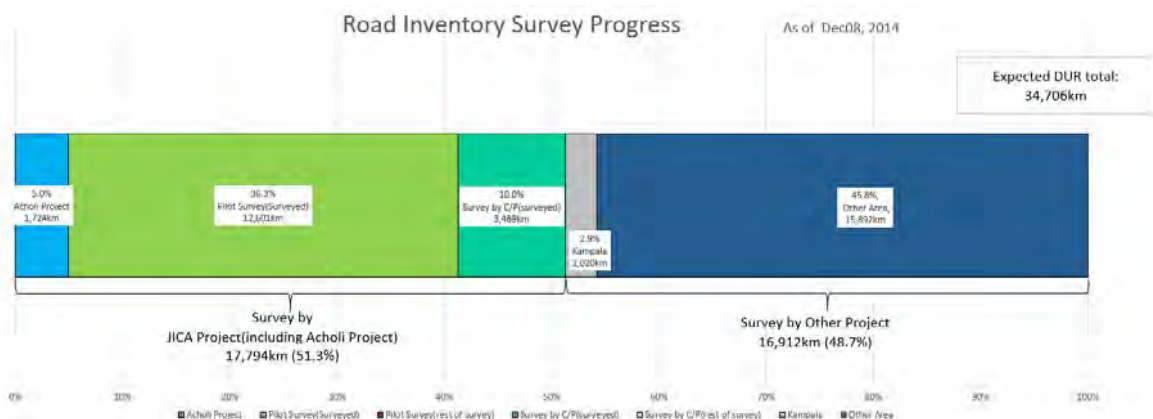
	District Road	Urban Road	Total
Estimated Total length (*1)	26,875km	7,831km	34,706km
Pilot Survey + JICA Acholi Project			
Survey Completed in 1 st Phase	8,677km 15 districts	1,261km 8 MCs	9,938km 23 areas
Survey Completed in 2 nd Phase (Jan to May 2014)	2,562km 16 districts	101km 3 MCs	2,663km 19 areas
Total Length Surveyed (Pilot Survey)	11,239km 31 districts	1,362km 11 MCs	12,601km 42 areas
JICA Acholi Project	1,724km 7 districts	—	1,724km 7 areas
Pilot Survey + Acholi Project	12,963km 48.2%	1,362km 17.4%	14,325km 41.3%
C/P initiative Survey			
Initial Survey	—	2,527km(6MC,34TC)	2,527km(6MC,34TC)
Additional Survey	—	942km(2MC,17TC)	942km(2MC,17TC)
Total Survey Length (C/P Survey)	—	3,469km 8MCs, 51TCs 44.3%	3,469km 8MCs, 51TCs 44.3%
Total Survey Length of the Project			
JICA Length of JICA Project	12,963km 48.2%	4,832km 61.7%	17,794km 51.3%

Note) MC : Municipal Council, TC : Town Council

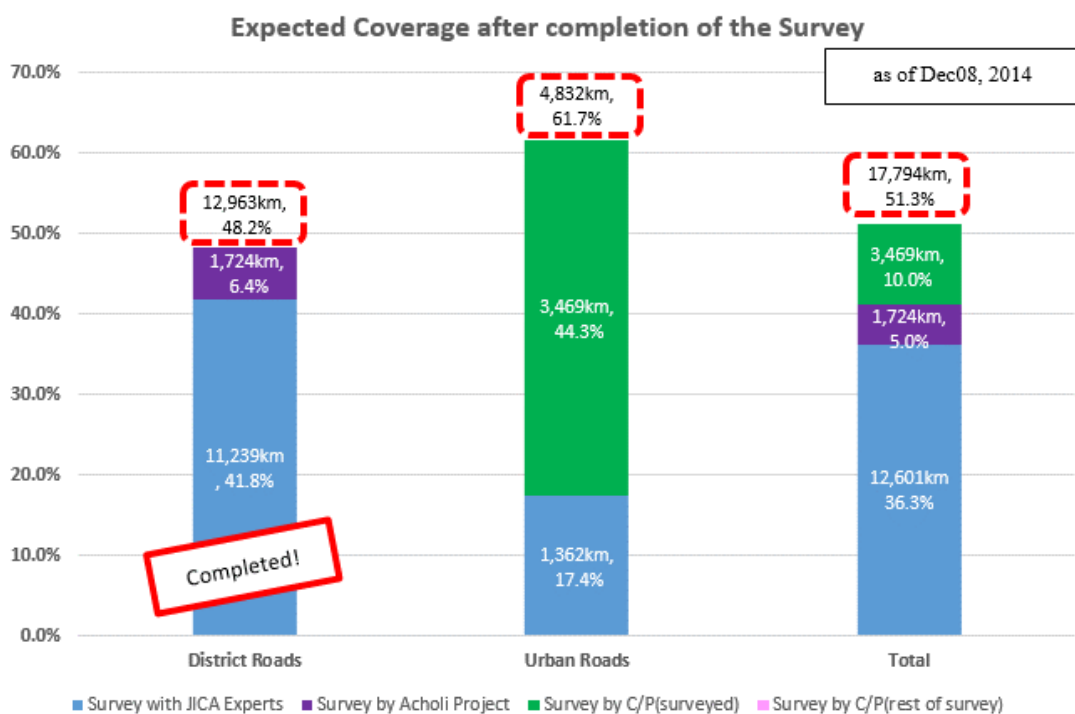
(*1): Total length for district roads and urban roads were estimated by the Consultant Experts on 1st Phase Project.

(*2): Expected survey length and coverage ratio

Source: The Consultant



Source: The Consultant



Source: The Consultant

Figure 3-4 Coverage of Road Inventory Survey

(2) World Bank Project

JICA road database project covers around 50% of the estimated total length of DUR in Uganda.

The JICA project collected road inventory data for approximately 50% of the DUR network in Uganda. A review of the district and urban network has been carried out and a list generated of roads which have not been surveyed in the JICA survey has been released by World Bank. Local consultant was awarded the World Bank Project. Contents of the Project is shown as follows.

- Road condition survey; rest of DUR which JICA project surveyed , all community access roads in the 111 districts of Uganda
- Traffic survey

World Bank project follows same system as JICA project. JICA project shared the information such as manuals for road inventory survey and GIS for data processing with local consultant of World Bank Project.

As of January 2015, road inventory survey by World Bank Project is on-going by local consultant. World Bank Project has completed the field surveys of Koboko, Maracha, Gulu, Yumbe, Moyo, Nwoya, Amuru, Oyam, Lira, Pader, Kumi, Palisa, Ngora. Of the districts surveyed so far, Kayunga, Koboko and Gulu are the districts that have been completely processed. The other districts surveyed are undergoing pre-processing by the local consultant. Total length of daily survey progress is around 450km which average daily survey length per team is around 37km/day/team. 12 teams are dispatched to the field survey.

At an average of 445 km per day, the eight groups will finish Northern Uganda in the next two months which will be in end of February and the four groups will finish Eastern Uganda in June after Six months. If the eight groups are deployed in the Western Region they will most likely take four months, finishing at the same time with the group in Eastern Uganda. Then all the twelve should be deployed in the central region to finish within two months which will be in August. All field survey as data collection will be completed by September 2015.

The Project had been conducted by 2 or 3 teams, however, World Bank Project has been conducted by 12 teams. Survey progress of World Bank Project is faster than the Project because of the difference of no. of dispatched survey teams.

Local consultant pointed out some problems which were faced during the course of the project.

- a) Mechanical breakdown of cars because of bad roads

- b) Faulty operation of the data collection tablets including their screens breaking and losing sensitivity.

3.3.10 Activities 3-1

3-1 Compile the road inventory data from the site surveys and integrate into Digital base map to establish DUR database.

(1) GIS Data Process Training

Technical transfer activities consisted of reinforcement training on data processing and conducting quality control checks of the road and structure database being developed in the Project. The following table summarizes the trainings held in 2nd Phase. Several small informal discussions were also held between JICA expert team and C/P in the Project office as needed in order to clarify data processing and GIS analysis works.

Table 3-24 Table of Trainings

Date	Title	Objective	Participants	Outputs	Notes
12/16/2013	<ul style="list-style-type: none"> Data Processing Training and Debugging 	Reinforcement training to C/P and JICA local staff in Data processing of survey data collected in 43 Districts and Urban Areas	<ul style="list-style-type: none"> Mr. Kisitu Timothy, Mr. Okullu Yorobwam, Mr. Baguma Alex Njuma, Mr. Kintu Joel Munabangog JICA local Staff 	<ul style="list-style-type: none"> Updated GIS Processing Manual 	It was suggested by C/P to include Graphs in addition to maps and tables as outputs of data processing .
3/4/2014 3/6/2014 3/10/2014	<ul style="list-style-type: none"> Preparation of Road Atlas Quality Control and Troubleshooting Training 	Training was provided on how to conduct quality control checks on the database being developed.	<ul style="list-style-type: none"> Mr. Timothy Kisitu Mr. Baguma Alex Mr. Banga Victor Mr. Okullu Yorobwam Mr. Bagyenda Drake JICA Local Staff 	<ul style="list-style-type: none"> Manual on Preparation of Road Atlas QC Checklist DUR Processing Tips Manual 	MoWT appointed 4 C/P engineers to conduct data processing
9/30/2014	<ul style="list-style-type: none"> Road Intervention Prioritization Training 	Training was provided on how to make road intervention prioritization by using the road database.	<ul style="list-style-type: none"> Mr. Timothy Kisitu Mr. Baguma Alex Mr. Banga Victor Mr. Okullu Yorobwam Mr. Leppi Bosco JICA Local Staff 	<ul style="list-style-type: none"> Road intervention prioritization manual 	MoWT appointed 5 C/P engineers to conduct road intervention prioritization

10/6/2014	<ul style="list-style-type: none"> • GIS training to Local Consultant Engineers of World Bank Project 	Information sharing of GIS manuals being developed	<ul style="list-style-type: none"> • Local consultant (7engineers) 	<ul style="list-style-type: none"> • GIS manuals 	
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(2) Data Processing and GIS Analysis Works

After completion of field survey works, compiling the road inventory data from the field surveys and integration into digital base map was conducted by C/Ps.

The road inventory data in 38 districts and 60 urban council (19 MC and 51 TC) was collected and have been input into the database. DUR database is covering 48% (12,963km/26,875km) of District Roads and 61% (4,832km/7,831km) of Urban Roads. The database has been developed by January 2015.

3.3.11 Activities 3-2

3-2 Prepare a manual on the maintenance of DUR database.

Road Database Manual was developed with the collaboration of JICA experts and C/Ps by January. This manual was approved by MoWT on February 11, 2015.

Main contents of this manual are shown as follows;

- Contents of the DUR database
- DUR database maintenance and update
 - ✓ Required structure for data management team
 - ✓ Required computer network system
 - ✓ Maintenance and update of digital base map
 - ✓ Maintenance and update of road inventory database
- DUR database application

3.3.12 Activities 3-3

3-3 Conduct DUR database training (skills for update and maintenance) for MoWT and other road sector agencies.

After preparation of DUR database manual, DUR database training was conducted to C/Ps on February 04, 2015.

Table 3-25 Table of Trainings

Date	Title	Objective	Participants	Outputs	Notes
2/4/2015	<ul style="list-style-type: none"> Road Database training 	Training was provided on how to maintain and how to use the established road database	<ul style="list-style-type: none"> Mr. Timothy Kisitu Mr. Baguma Alex Mr. Leppi Bosco 	<ul style="list-style-type: none"> Road Database Manual 	MoWT appointed 3 C/P engineers to understand road database maintenance

3.3.13 Activities 3-4

3-4 Discuss how to maintain DUR roads, and formulate DUR database maintenance system at MoWT based on the discussion.

JICA expert team and C/Ps discussed to maintain DUR roads and formulate DUR database maintenance system at MoWT.

Major actions and annual work cycle for making road maintenance/rehabilitation plan including budget plan by each organization are shown as following table.

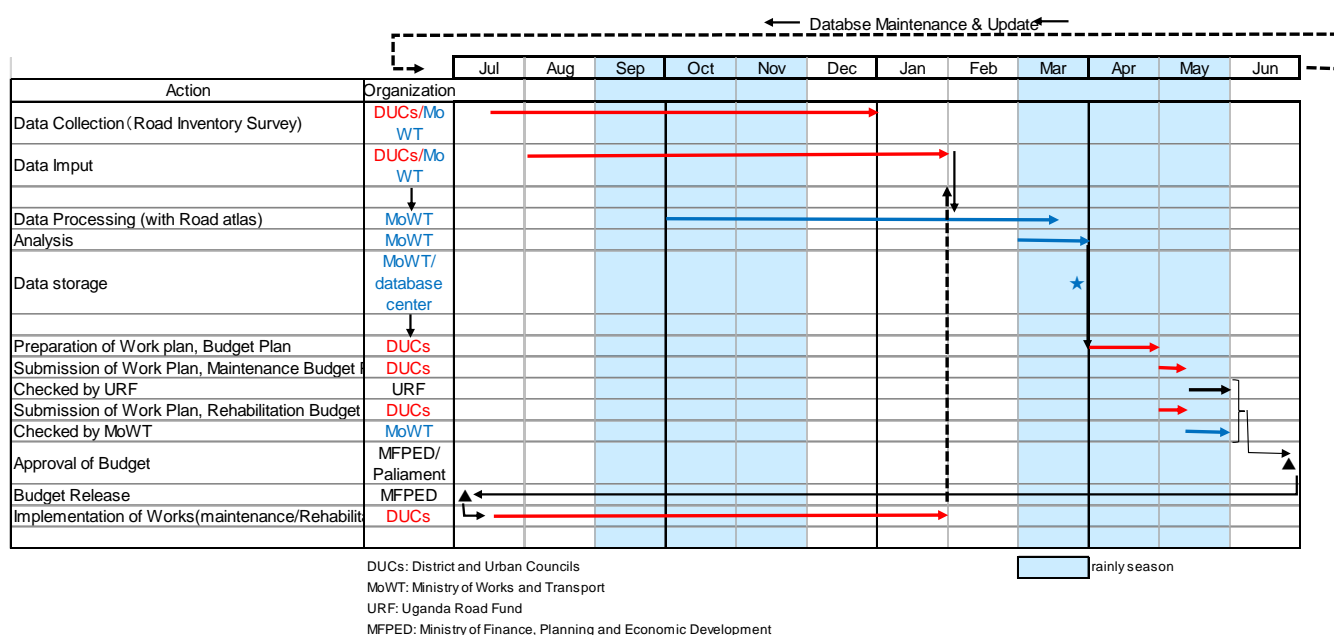


Figure 3-6 Work Flow for the Preparation of Maintenance/Rehabilitation Plan & Budget

Data management team will be established in MoWT for the maintenance, update and analysis of road database.

The DUR Database shall be maintained by the “Database Management Team” composed of members

of the MOWT District and Community Access Roads (DCAR) Division and Urban Roads Division who have undergone training under the District and Urban Roads Mapping and Database Project by JICA. Data Management Team Personnel is shown as follows;

Table 3-26 Data Management Team Personnel

Designation	Function	Number	Assignment
Team Leader	Oversees the maintenance and update of the DUR database	1	Full-time assignment
Field Survey Managers	Oversee field survey work by Districts and Urban Councils Performs random checks to ensure quality of data coming from the DUCs	4, one for each regions - Northern - Western - Eastern - Central	Full-Time assignment during conduct of field surveys
Road Inventory Analyst	Perform data processing and analysis of road inventory data	4	Full-Time assignment during conduct of field surveys
Encoders	Perform data encoding/editing tasks	4	As needed
Field Surveyors	Perform surveys of selected DUC's Provide field survey support to DUC's Provide Road Survey Training to DUC's	4	As needed
Network Administrator	Ensures that Files servers are maintained in good working order	1	As needed

Outputs of road database are road atlas and road/structure intervention prioritization analysis. Road/Structure intervention analysis

One of the most important use of the DUR Database is in prioritization analysis of road and structure intervention works. The procedures on how to conduct this analysis can be found in the manual prepared by the JICA Expert Team called "Road Intervention Prioritization Manual". The following shows the outputs that can be derived by conducting this analysis using the DUR Database.

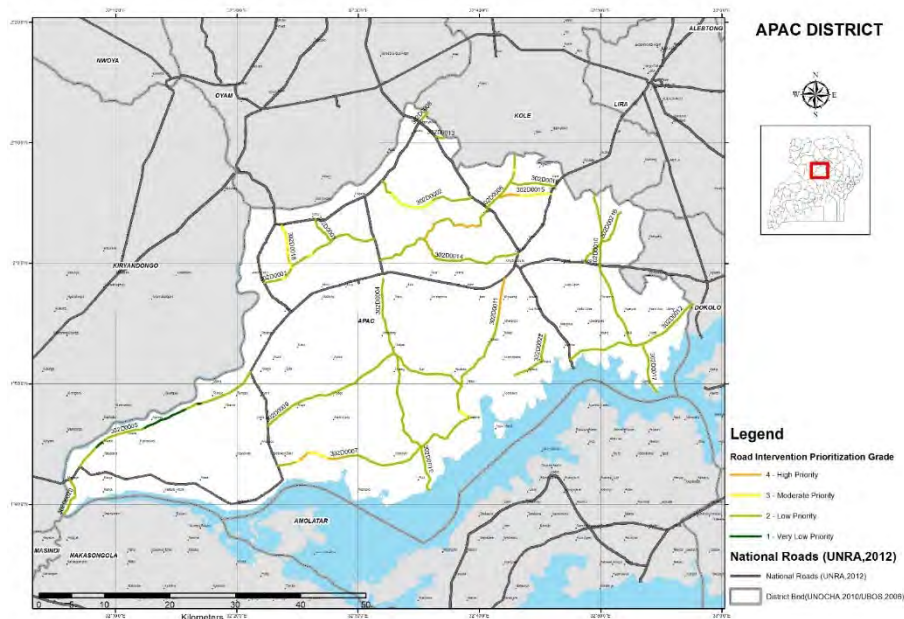


Figure 3-7 Road Intervention Prioritization Map

Table 3-27 Road Intervention Prioritization Table

Road Code	Road Name	Ranking (Km)				Total Length
		Very Low Priority	Low Priority	Moderate Priority	High Priority	
302D0001	Alw oroceng_Aw iri	0.00	12.03	1.68	0.00	13.71
302D0002	Aninola_Ongica_Olumunu	0.00	8.84	7.77	0.00	16.61
302D0003	Amonoloco_Aw iri_Adir	0.00	11.53	0.00	0.00	11.53
302D0004	ApacTC-Arido	0.00	24.84	0.00	0.00	24.84
302D0005	Alenga-Kungu	8.36	22.82	0.00	0.00	31.18
302D0006	Apac_Atar_Balabdr	0.00	25.36	0.21	7.55	33.11
302D0007	Akokoro-Alido	0.00	25.96	3.44	4.43	33.83
302D0008	TEBOKE-AYER BORDER	0.00	1.50	0.00	0.00	1.50
302D0009	AWLA-OLELPEK	0.00	22.97	0.00	0.00	22.97
302D0010	Akalo_Abongomola-NambiesoRd	0.00	24.52	0.00	0.00	24.52
302D0011	Aboko-Arido-Chaw enty S/c Hqtrs	0.00	18.69	2.50	6.00	27.18
302D0012	NAMBIESO-AGWATTA	0.00	22.20	0.00	0.00	22.20
302D0013	TEBOKE-BALA BORDER	0.00	1.60	0.00	0.00	1.60
302D0014	Aboko-Arido-Chaw enty S/c Hqtrs	0.00	13.80	0.00	0.00	13.80
	Aduku_Apiire_Atar	0.00	3.23	0.00	0.00	3.23
302D0015	AGUICWIRI-INOMO	0.00	0.00	5.01	3.24	8.25
302D0016	AYITO-AKOREMOR	0.00	6.97	0.00	0.00	6.97
302D0017	AYABI-OGWIL	0.00	8.09	0.00	0.00	8.09
302D0018	Apete-Kilidani	0.00	0.00	6.33	1.01	7.34
302D0019	Akalo_Olelpek-AbeiRd	0.00	23.13	0.00	0.00	23.13
302D0020	WAITUMBA-JUBLEE	0.00	6.19	0.00	0.00	6.19
302D0021A	ABONGOMOLA TC-ABWONG-AMAC BORDER A	0.00	4.02	0.00	0.00	4.02
302D0021B	ABONGOMOLA TC-ABWONG-AMAC BORDER B	0.00	6.09	0.00	0.00	6.09
302D0022	AYAT-ANWANGI	0.00	9.01	0.00	0.00	9.01
Grand Total		8.36	303.39	26.93	22.23	360.90

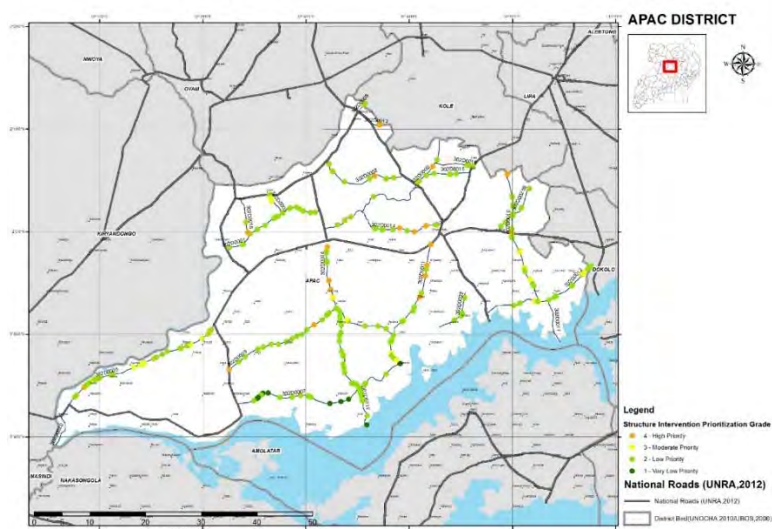


Figure 3-8 Structure Intervention Prioritization

Table 3-28 Structure Intervention Prioritization Table

Road Code	Road Name	Very Low Priority	Low Priority	Moderate Priority	High Priority	Total Structures
302D0001	Alw oroceng_Aw iri_Rd		15		2	17
302D0002	Aninlol_Ongica_Olumunu		12		2	15
302D0003	Armonoloco_Aw ir_Adir		14		2	16
302D0004	APACTC_ARIDO		13		6	25
302D0005	Alenga_KunguRoad		41		13	59
302D0006	Apac_Atar_Balabdr		6			4
302D0007	Akokoro-Aldo	13	32			45
302D0008	TEBOKE-ALER BORDER		4		2	6
302D0009	AWILA-OLELEK		3		1	4
	AWILA-OLELEK		19		1	20
302D0010	Akalo_Abongomola-NambiesoRoad		84	13	12	109
302D0011	ABOKO-CHAWENTE		19	3	7	29
302D0012	NAMBIESO-AGWATTA		28	4		32
302D0013	TEBOKE-BALA BORDER				3	3
302D0014	ADuku_Apire_AtarRd		21		9	30
302D0015	AGUICWIRI-INOMO		7			7
302D0016	AYITO-AKOREMOR		7			7
302D0018	Apele-Kiditai_Rd		2		3	1
302D0019	Olelpek-AbeiRd	1	31			32
302D0021A	ABONGOMOLA TC-ABWONG-AMAC BORDER A		7			7
302D0021B	ABONGOMOLA TC-ABWONG-AMAC BORDER B		10			10
302D0022	AYAT-ANWANGI		7			7
Grand Total		14	384	48	52	498

Estimating Costs of Road Intervention Works

Once the road and structure prioritization tables have prepared for the district or urban council, the tables can then be used to estimate costs of intervention works. The following are the steps needed to prepare cost estimates of road and structure intervention works:

Tables of cost rates must first be prepared for road and structure intervention works

a. Road Intervention Works

Table 3-29 Road Intervention Works

Grade	Priority	Cost/Km (UGX/Km)	Workdays/Km/Team (Days/KM/Team)
5	Very High Priority	50,000,000	5
4	High Priority	40,000,000	4
3	Moderate Priority	30,000,000	3
2	Low Priority	20,000,000	2
1	Very Low Priority	10,000,000	1

b. Structure Intervention Works

Table 3-30 Structure Intervention Works

Grade	Priority	Cost/Structure (UGX/Structure)	Workdays/Structure/Team (Days/Structre/Team)
5	Very High Priority	350,000	5
4	High Priority	300,000	4
3	Moderate Priority	250,000	3
2	Low Priority	150,000	2
1	Very Low Priority	50,000	1

Link road and structure prioritization tables to their corresponding cost rate tables then calculate costs of intervention works for each road

Table 3-31 Road Intervention Costs

Road Code	Road Name	Ranking (Km)												Total Length (KM)	Total Cost
		Very Low Priority (KM)	Grade	Cost/Km (UGX/Km)	Low Priority (KM)	Grade	Cost/Km (UGX/Km)	Moderate Priority (KM)	Grade	Cost/Km (UGX/Km)	High Priority (KM)	Grade	Cost/Km (UGX/Km)		
302D0001	Alw oroceng_Awiri	0.00	1	10,000,000	12.03	2	20,000,000	1.68	3	30,000,000	0.00	4	40,000,000	13.71	290,980,000
302D0002	Aninlal_Ongica_Olumunu	0.00	1	10,000,000	8.84	2	20,000,000	7.77	3	30,000,000	0.00	4	40,000,000	16.61	409,810,000
302D0003	Amonoloco_Awiri_Adir	0.00	1	10,000,000	11.53	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	11.53	230,600,000
302D0004	ApacTC-Arido	0.00	1	10,000,000	24.84	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	24.84	496,800,000
302D0005	Alenga-Kungu	8.36	1	10,000,000	22.82	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	31.18	540,020,000
302D0006	Apac_Atar_Balabdr	0.00	1	10,000,000	25.36	2	20,000,000	0.21	3	30,000,000	7.55	4	40,000,000	33.11	815,250,000
302D0007	Akokoro-Arido	0.00	1	10,000,000	25.96	2	20,000,000	3.44	3	30,000,000	4.43	4	40,000,000	33.83	799,620,000
302D0008	TEBOKE-AYER BORDER	0.00	1	10,000,000	1.50	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	1.50	30,000,000
302D0009	AWILA-OLLPBK	0.00	1	10,000,000	22.97	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	22.97	459,400,000
302D0010	Akalo_Abongomola-NambiesoRd	0.00	1	10,000,000	24.52	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	24.52	490,460,000
302D0011	Aboko-Arido-Chawenty S/c Httrs	0.00	1	10,000,000	18.69	2	20,000,000	2.50	3	30,000,000	6.00	4	40,000,000	27.18	688,630,000
302D0012	NAMBIESO-AGWATTA	0.00	1	10,000,000	22.20	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	22.20	444,000,000
302D0013	TEBOKE-BALA BORDER	0.00	1	10,000,000	1.60	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	1.60	32,000,000
302D0014	Aboko-Arido-Chawenty S/c Httrs	0.00	1	10,000,000	13.80	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	13.80	276,020,000
	Aduku_Apire_Atar	0.00	1	10,000,000	3.23	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	3.23	64,600,000
302D0015	AJUCWIRI-INOMI	0.00	1	10,000,000	0.00	2	20,000,000	5.01	3	30,000,000	3.24	4	40,000,000	8.25	279,900,000
302D0016	AYITO-AKOREMOR	0.00	1	10,000,000	6.97	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	6.97	139,400,000
302D0017	AYABI-OGWIL	0.00	1	10,000,000	8.09	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	8.09	161,800,000
302D0018	Apele-Kidansi	0.00	1	10,000,000	0.00	2	20,000,000	6.33	3	30,000,000	1.01	4	40,000,000	7.34	230,100,000
302D0019	Akalo_Olpepk-AbesRd	0.00	1	10,000,000	23.13	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	23.13	462,660,000
302D0020	WATUMBA-JUBLEE	0.00	1	10,000,000	6.19	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	6.19	123,800,000
	ABONGOMOLA TC-ABWONG-AMAC BORDER A	0.00	1	10,000,000	4.02	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	4.02	80,400,000
302D0021A	ABONGOMOLA TC-ABWONG-AMAC BORDER B	0.00	1	10,000,000	6.09	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	6.09	121,800,000
302D0022	AYAT-ANWANGI	0.00	1	10,000,000	9.01	2	20,000,000	0.00	3	30,000,000	0.00	4	40,000,000	9.01	180,200,000
Grand Total		8.36			303.39			26.93			22.23		360.90	7,848,250,000	

Road database developed by the Project is useful information for making road maintenance plan and budget. And also JICA project developed user friendly road database systems like off the shelf program which is a commonly used software such as excel, arc GIS and so on which can be used easily by most people.

3.3.14 Other Activities

3.3.14.1 IRI Training

(1) IRI training

In RAMPS and HDM4, the IRI (International Roughness Index) that indicates roughness is adopted. In conventional IRI measurement, special measuring devices were required and survey costs were expensive, and this proved a bottleneck in road surveying.

In UNRA, ROMDAS has been used for IRI survey; however no device has been arranged by MoWT and District whereas IRI needs to be surveyed in the RAMPS. The IRI, although it is a numerical index, is decided by physical observation by engineers.

So as IRI be surveyed under the standard measurement method, the survey device is necessary.

As explained, VIMS is most reasonable device which can be applicable to road administration agency that has budget constrain. The objective of this training was to extend device and give training of how to use it.

The Consultant proposed that VIMS is applied to tarmac pavement roads only because tarmac roads need a more serious numerical index than that of the murrum roads in judgment of road condition.

In order to know the applicability of the VIMS, the Consultant conducted a preliminary IRI survey in Kampala by himself. The result of the survey is shown as follows.



Note: 0 < Green < 7, 7 < Yellow < 10, 10 < Red, White Error
Source: The Consultant

Figure 3-9 Preliminary IRI Survey in Kampala

The survey was conducted in day time, week day. There was traffic congestion in the City and the heaviest was at Kira road.

As shown in above figure, error (white) tended to occur continuously on the congested road. As WIMS requires constant cruising speed by the survey vehicle, which should be more than 30km/hr, and it was confirmed that the road section with heavy congestion shall not be surveyed. The proper survey plan shall be established taking into account traffic condition.

It was also noticed that the driver of the survey vehicle tended to avoid potholes which results in incorrect survey result. Proper direction and monitoring by the driver while driving is also needed during the survey.

Trainings were given to the C/P according to schedule as shown as follows.

Table 3-32 IRI Collection Training Schedule in August

Sun	Mon	Tue	Wed	Thu.	Fri	Sat
5	6	7	8	9	10	11
		Lecture & Demonstration	System Set-up & Calibration	Field Data Collection	Data Compilation	

Source: The Consultant

The lecture included not only the IRI but also Road O&M principals. Since VIMS has been applied to Kenya National Highway Authority (KeNHA), the experiences in Kenya have also been explained.



Source: The Consultant

Figure 3-10 Power Point Presentation explaining an Experience in Kenya

The lecture was opened to not only MoWT engineers but also UNRA and KCCA engineers.

One of the comments by UNRA was adding more function on the VIMS like waypoint positioning for road facility since the ROMDAS has it and more functions.

Another comment by UNRA was that the ROMDAS has been extended by World Bank; UNRA needs to apply the ROMDAS while the financial support is given to UNRA by the Bank.

After the lecture, the demonstration of installation of the device, method of calibration and field survey were carried out.

It was slightly difficult to find an appropriate trial road section for the calibration as the calibration required around 1 km of a section which allows the survey vehicle to run with some constant speeds like 30, 50, 80 and 100km/hr. This was especially difficult to do with higher speeds. Some improvement of calibration method was expected and requested from the system developer.

Application of data processing needed some improvement as well since there was minor error that resulted because of differences of PCs specification (64 bit or 32 bit).

There were five trainees for the program who generally understood basic operation of the VIMS and requested the Consultant to provide an internet forum so as to know any updates of the device and exchange information/opinion with KeNHA and other road agencies where VIMS is applied.



Photo 3-15 Scene of Lecture by Dr. Oshima (in charge of the Training), Kyoto Univ.



Photo 3-16 Scene 1 of Demonstration of Installation of VIMS



Photo 3-17 Scene 2 of Demonstration of Installation of VIMS



Photo 3-18 Scene of Demonstration of Calibration

During the VIMS operation, two calibration processes were necessary at beginning: one was a hump calibration which compensated for the difference between different vehicles, and the other one was a speed calibration with which moderate speed change could be accepted. As for the hump calibration, only a small area such as car parking area was needed. On the other hand, for the speed calibration, the measurement vehicle should pass over the same path approximately 1km in length at different speeds, which is often difficult to carry out in the developing countries. In addition, traffic in the city areas was often heavy and the vehicle had to stop or move quite slowly due to traffic jams. In this case, the IRI could not possible be calculated by conventional VIMS system because the minimum speed required in the conventional VIMS is 30km/h.

To eliminate the process of speed calibration, a new calibration method is proposed and verified. In the new calibration method, numerical simulations are conducted instead of speed calibration by an actual vehicle. In this method, the numerical model, QC model, obtained by hump calibration process is applied to the simulation where the QC model passes several times with different speeds.

Another solution that VIMS mounted on motor cycles has been tested aiming address IRI measurement in heavy traffic areas in order to resolve the issues regarding speed constrains with existing system. Figure 3-11 shows the motorbikes which have been tested for the trial measurement. As a result, it was found that acceleration of front-axle has relatively high repeatability compared to any other position. This phenomenon could also be found in other bikes. Thus for IRI measurement, the acceleration of front-axle can be applied. In the future, an algorithm to obtain IRI from the RMS of obtained acceleration will be developed.



Source: The Consultant

Figure 3-11 Motorbikes used for Trail Measurements

So as to simplify the measurement process by VIMS, a new system of VIMS using I-Phone has been developed by VIMS association (Research group for VIMS). In this system, angular velocity is applied in IRI measurement. Because the angular velocity is almost identical regardless of position, IRI can be easily measured by the I-Phone without any consideration of position or angle of the phone. Especially the responses at the frequencies less than 8Hz have high repeatability and new system was proposed using angular velocity with less than 8Hz.

VIMS (Vehicle Intelligent Monitoring System) which was developed in Japan as reasonable IRI measuring device was introduced to C/P in 1st Phase Project for improvement of the survey efficiency.

(1) Issues on VIMS in developing countries

- 1) VIMS (Vehicle Intelligent Measurement System) is the system to calculate IRI using the acceleration acquired by a simple sensor and GPS installed on a general vehicle. The results of VIMS can be exported as text files and also mapped by Google earth without any post processing. VIMS basically consists of a measurement system and an analysis system, which can be independently operated.
- 2) Technical issues on VIMS are mainly a) Simplification of speed calibration, b) Enhancement of estimation accuracy for rough roads, and c) Capability of IRI estimation at low speed of a measurement vehicle.
- 3) In the speed calibration, the measurement vehicle should pass over an identical path over 1km at different speeds, which is often difficult to carry out in the developing countries. Now a new calibration method using numerical simulations has been proposed and verified. Additionally it has been clarified that IRI estimation accuracy decreases at significantly low

speed as well as in rough road, and several approaches have been proposed and tried to resolve these issues.

(2) Software update

The VIMS used in Uganda has been introduced in the first period and it was developed on the basis of the prototype developed for Kenya. After that, several improvements and modifications have been done in the analysis software and measurement software as well. Thus in the second period, the modification of analysis software customized for Uganda was done and a new measurement software was introduced. Mainly the points of modification are:

- 1) Modification of an output format suitable to the Ugandan database
- 2) Improvement of an algorithm to estimate IRI

Note that the obtained data in the first period were revised because the old data were obtained by the prototype system. Note also that the revision was made also in the measurement software so that the number of potholes can be recorded.

(3) Output data format

To incorporate the IRI information into the existing data base, the output format was modified. CSV files and kml files for Google Earth are produced as output files in VIMS. As shown in Fig.5-22, IRI results, latitude and longitude etc. at every 100 section are recorded in the CSV file. As shown in Fig.3-12, IRI results over 100m can be recognized as lines with colors corresponding to its grade. Note that IRI values also can be confirmed in the map by adding a specific file.

date	FROM	TO	Kampala IRI	SPEED	VALID	GRADE	S_LAT	S_LON	E_LAT	E_LON	LANE	TYPE	A1	A2	A3
0	100	200	5.06	27.05	0	N	0.334853	32.61913	0.33546	32.61982	1	0	2	0	0
100	200	300	4.18	40.63	1	F	0.33546	32.61982	0.33606	32.62052	1	0	0	0	0
200	300	400	3.44	49.19	1	F	0.33606	32.62052	0.33667	32.62124	1	0	0	0	0
300	400	500	3.29	53.19	1	F	0.33667	32.62124	0.33705	32.62205	1	0	0	0	0
400	500	600	3.59	53.29	1	F	0.33705	32.62205	0.33738	32.62289	1	0	0	0	0
500	600	700	3.65	52.73	1	F	0.33738	32.62289	0.33770	32.62373	1	0	0	0	0
600	700	800	3.07	50.23	1	F	0.33770	32.62373	0.33802	32.62457	1	0	0	2	0
700	800	900	3.02	52.84	1	F	0.33802	32.62457	0.33835	32.62542	1	0	0	0	0
800	900	1000	3.72	55.42	1	F	0.33835	32.62542	0.33867	32.62626	1	0	0	0	0
900	1000	1100	3.24	54.56	1	F	0.33867	32.62626	0.33899	32.6271	1	0	0	0	0
1000	1100	1200	3.3	50.81	1	F	0.33899	32.6271	0.33930	32.62794	1	0	0	0	0
1100	1200	1300	3.69	48.66	1	F	0.33930	32.62794	0.33962	32.6288	1	0	0	0	0
1200	1300	1400	2.79	49.21	1	G	0.33962	32.6288	0.33995	32.62963	1	0	0	0	2
1300	1400	1500	4.58	50.32	1	F	0.33995	32.62963	0.34028	32.63048	1	0	0	0	0
1400	1500	1600	2.36	49.99	1	G	0.34028	32.63048	0.34059	32.63132	1	0	0	0	0
1500	1600	1700	3.81	48.06	1	F	0.34059	32.63132	0.34092	32.63217	1	0	0	20	0
1600	1700	1800	2.93	43.98	1	G	0.34092	32.63217	0.34124	32.63301	1	0	0	0	0
1700	1800	1900	3.72	38.37	1	F	0.34124	32.63301	0.34157	32.63384	1	0	0	0	0
1800	1900		2.76	43.17	1	G	0.34157	32.63384	0.34189	32.63469	1	0	0	0	0

Figure 3-12 Example of CSV file

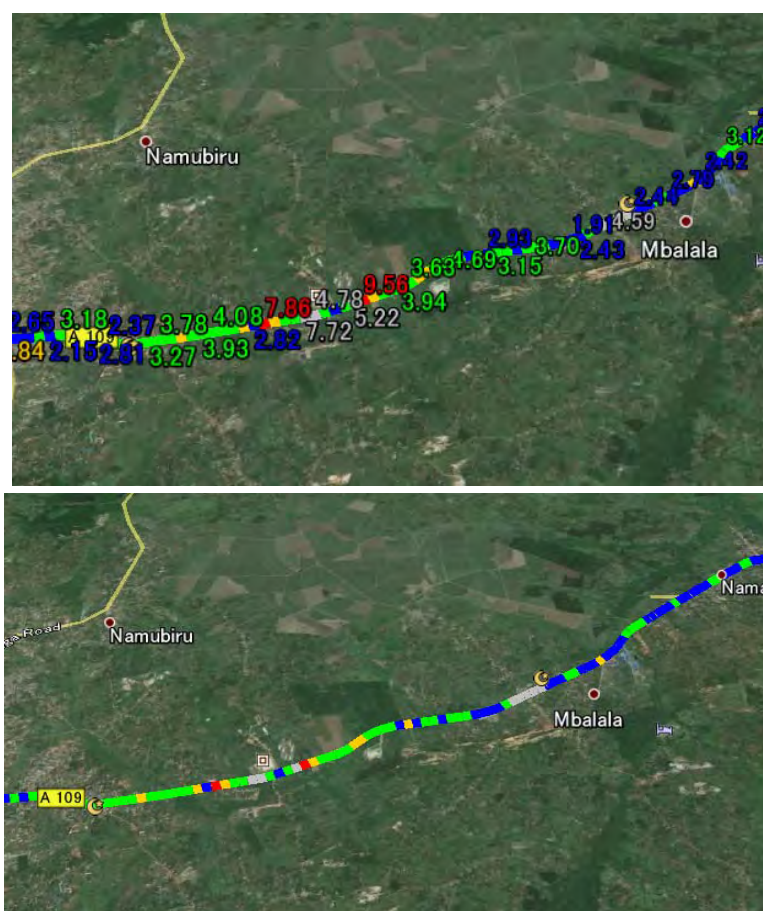


Figure 3-13 IRI mapping by Google Earth

IRI Data base obtained in the first period are arranged according to its section and street as a layer structure. Thus in the output format of VIMS, the output files are also produced according to its street so that data sheet can be created for every street. The manual was also revised.

(4) Guidance for trainees

In 2nd Phase of the Project, VIMS was reviewed once again because the inexperienced persons joined the lecture. The procedures of VIMS measurement and analysis were confirmed in the lecture. In the lecture, the trainees were taught how to create the data sheet using the obtained data by VIMS.



Figure 3-14 IRI training on March 2014

(5) Evaluation

In order to evaluate the ability to perform VIMS measurement by the counterpart, hearing was done with a main staff who has been trained in the Project on February 3, 2015. The questions concerning the physical requirements (hardware), analysis (computing), and operation were asked and the assessed person mostly answered the fundamental questions. It can be said that the assessed person is able to perform the VIMS measurement if he has a manual. Due to the lack of experience in practical operation of VIMS, however, he can earn the matured skill after he operates the VIMS in practice.

Thus continuous support may be still needed for further development.

3.3.14.2 Pavement Inventory Survey Training

(1) Pavement Inventory Survey Training

Pavement maintenance is one of the major components for Road O&M work and its condition greatly deals with service level of the road. Further to the IRI collection training, detailed pavement inventory survey training has been planned which would include lectures on pavement defects type, pavement deterioration mechanism, counter measures and field surveys. In this training program, tarmac road maintenance issues would be focused on.

Focusing on pavement structural resistance against deterioration, the complex causes of the defect need to be analyzed by data collection and work experiences from field. That is expected to be an answer of how to plan pavement maintenance. This is a general theme for effective Road O&M.

Prior to the Training, road condition survey on the major road network in Uganda had been carried out by the Consultant so as to obtain traffic characteristics and defect types on pavements.

During the survey, an attention was given to identify issues which would be incorporated in the Training.

Further to the survey, the capacity assessment by questionnaire to the C/P was carried out. The questionnaires were in connection with pavement and soil tests.

From the result, it was known that the C/P understood theory and methodology of the tests; however, few C/P had tests experience, physically as it is commonly being seen in other East African countries.

Trainings were given to the C/P according to schedule as shown as follows.

Table 3-33 Pavement Inventory Survey Training Schedule August and September, 2012

Sun	Mon	Tue	Wed	Thu.	Fri	Sat
26	27	28	29	30	31	1
			Lecture day 1	Lecture day 2	Lecture day 3	
2	3	4	5	6	7	8
	Field Training					

Source: The Consultant

In the field training, pavement defects like potholes, rutting and cracking was physically inspected in Kampala.



Photo 3-19 A Scene of Lecture for Pavement Defect



Photo 3-20 A Scene of Workshop for Pavement Defect Analysis



Photo 3-21 A Scene of Pavement Inspection



Photo 3-22 A Scene of Wrap-up Meeting for Pavement Inspection

(2) Investigation at pavement maintenance work sites and material testing laboratories
So as to consider the programme of the lectures for the Training in Japan scheduled on August, 2013, the Consultant for Pavement Maintenance (Prof. Asano) carried out investigations at pavement maintenance work sites and material testing laboratories in Kampala.

As a result of the investigation on work sites, it was found that no proper quality control exercises and inappropriate workman ship were in place.

During investigation of testing laboratories, interviews were carried out and inquires made regarding availabilities of testing instruments (inventory) and knowhow of testing method. The results are shown as follows.

Table 3-34 Results of Laboratory Investigation

Date of Investigation	Name of Laboratory	Interviewees	Observations
4 th Feb. '13	MoWT Centra Labo.	Eng. Okello (Chief Materials Engineer/Assistant Commissioner)	Testing instruments are not well organized and maintained. There are asphalt testing instruments, however they seem not to be regularly used.
6 th Feb. '13	Teclab www.techlabuganda +256 772 405 374	Eng. Kibuuka (Technical Director)	There is a modern boring machine which can drill down to significant depth. The offices as well as laboratory are well organized which gives an impression that proper quality assurance for tests are in places Asphalt testing instruments are also available; however they seem not to be regularly used.
6 th Feb. '13	Makerere Univ. www.Cedat.mak.ac.ug +256 772 605 495	Dr. Bagampadde (Dean)	Improper maintenance of testing instruments was observed. Minimum testing instruments are even not available for bituminous materials which result in inability of proper tastings.
7 th Feb. '13	SMAT +256 772 605 495	Eng. Kisitu(Technical manager)	Despite having small scale laboratory, necessary testing instruments for bituminous materials are available and they are well organized and placed properly. It should be noted that testing environments such as temperature and dust control are well organized which shows high consciousness of proper testing quality at laboratory.

Source: The Consultant

Taking into account the observations, a seminar of pavement maintenance was held on 8th February, 2013.



Photo 3-23 A Scene of Investigation at Maintenance Work Site



Photo 3-24 MoWT Central Laboratory. Kireka



Photo 3-25 Boring Machine owned by Teclab



Photo 3-26 Laboratory of Makerere University



Photo 3-27 Laboratory owned by SMAT



Photo 3-28 Seminar for Pavement Maintenance

(3) Technical seminar

Technical seminar for the evaluation of C/Ps was held on January 31, 2015 to 3C/Ps at Project office.

C/Ps There were some comments from C/P through the discussion in seminar.

C/Ps have gotten to be able to conduct the survey based on the evaluation and survey criteria and to organize the results systematically and review the outputs by themselves. Technology transfer of the skills for the solution of the problems to be faced though some projects is required for the C/Ps.



Figure 3-15 Seminar on January 31, 2015

Chapter 4 RECOMMENDATIONS AND LESSONS LEARNED ON THE PROJECT IMPLEMENTATION AND MANAGEMENT

4.1 Issues concerning implementation and management of the Project

(1) Issue of C/P arrangement

At the beginning of the Project, MoWT C/Ps participated in the training for road inventory survey and GIS data processing with their expectation and interest to the Project.

On the other hand, there were some problems which influenced the Project progress since MoWT had some difficulties to participate in the Project for their own business i.e. reshuffling of the staff.

Almost all nominated engineers from MoWT were well-qualified with a generally sincerely work attitude. Unfortunately, there were few engineers who lacked cooperation, judgment and leadership as basic aptitude for the Project.

Persons in charge of the Project should have not only the knowledge of the operation of equipment but also management capacity for the Project.

(2) Issue of C/Ps responsibilities

During the pilot survey for the road inventory survey, the survey vehicles of JICA expert team were used with JICA experts. Originally, survey by C/Ps initiatives had been determined to be conducted by their own vehicles including fuel with their drives as C/Ps responsibility. However, at the beginning of C/Ps survey, there was delay for the necessary arrangement of their own vehicles for the C/Ps initiative survey so that C/P team had to continue to use the JICA expert's vehicles for their survey for approx.2 months after the Pilot survey.

C/Ps would conduct their survey smoothly after preparation of necessary arrangement for usage of their own vehicles.

The main cause of the delay for the vehicle arrangement with MoWT seemed to be internal issues for the arrangement of necessary costs. Improvement of internal systems for the preparation of necessary budget is strongly desired.

4.2 Measures taken by the project to promote the performance and implementation process

(1) Nomination of engineers for assignment preferentially to the Project

At the beginning of the Project, JICA expert team requested MoWT to nominate many engineers who could participate in the trainings. However, C/Ps determined the dispatched engineers to the road

inventory survey within 1 month in consideration of their own business and security at the site. As the result, there were some of districts or urban areas where the surveys were not completed because of limitation of survey period. JICA expert team requested C/Ps to assign the engineers to the Project for the smooth implementation of the project activities.

MoWT agreed that 4 engineers (1 project coordinator/leader, 3 engineers) were assigned to the Project. After setup of this team, the road inventory survey and data processing were executed smoothly.

The 4 assigned engineers had motivation and an incentive to participate in the Project. They had positive attitude to the improvement of survey method, operational efficiency, coordination with DUCs, mission planning and so on, for the smoothly implementation from the experiences learnt through the pilot survey and other trainings.

(2) Training to Local Consultant of World Bank Project

JICA expert team invited local consultant of World Bank Project to the trainings and information sharing of developed manuals on the Project to keep same level of established database. Word Bank project by local consultant has been continued by year 2017. After the Project, there are no supports by JICA experts, however, it expects that same quality of the survey and outputs will be kept by the local consultant under the control by the project coordinator.

(3) Practical training in the training course

During the pilot survey of road inventory survey, C/Ps could understand how to use GPS equipment and how to evaluate the road surface and structure conditions at the site under the guidance of JICA experts.

Furthermore, road inventory survey manual had been updated to reflect their queries when they met some issues at the site. C/Ps capacities as the appropriate explanation of survey method to DUSs engineers and the management of the survey have been improved through the pilot survey.

Regarding GIS training, at the first step, basic training was conducted to C/Ps. After the basic GIS training, C/Ps were continuously trained by several type of trainings such as theory of GIS and analysis method, through the data processing work after the road inventory survey. These trainings were very practical and useful for C/Ps.

(4) Impact on other areas

Through the pilot survey of road inventory survey, there were some interests in participating in the training for the establishment of road database from neighboring districts or urban councils. There were some impacts to other areas and the expectations of establishment of road database in their own areas.

4.3 Issues concerning sustainable development of the project

(1) Further challenges towards effective road maintenance policy

Road maintenance process can be characterized as the cyclic management system (namely PDCA cycle) which consists of sequencing survey (data collecting), analysis, planning for action and execution phases as the core business. It means that not only the enhancement of a single step such as data collecting but subsequent follow up for total system is indispensable for success. So it can be said that further tasks still await MoWT in order to reach the overall goal of the Project.

Therefore the Team recommends MoWT to be encouraged to embrace the institutional framework of cyclic management for exploring the more efficient and effective management process while fully utilizing the fruits of the Project. For this purpose the further activities as listed below are recommended to be addressed after the completion of the Project.

	MoWT	DUCs/LG
To maintain established road database periodically	<ul style="list-style-type: none"> • To secure necessary budget for road inventory survey, training etc. • To procure necessary survey equipment to DUCs engineers • To monitor the road inventory survey by DUCs • To assign MoWT engineers for maintenance of road database • To conduct the training to DUCs & MoWT engineers for road inventory survey continuously • To update road database periodically • To arrange the training for road inventory survey to MoWT & DUCs engineers 	<ul style="list-style-type: none"> • To conduct road inventory survey periodically • Necessary arrangement of survey team • To update road database to MoWT, if there were maintenance or rehabilitation works • To participate the training for road inventory survey
To utilize road database	<ul style="list-style-type: none"> • To utilize established road database which will be prepared by the Project for making work plan, budget plan annually • To provide necessary information to DUCs for making work plan and budget plan 	<ul style="list-style-type: none"> • To utilize established road database which will be prepared by the Project for making work plan, budget plan annually

(2) Continuous road inventory survey and establishment of roads database through World Bank Project

It is necessary to check and monitor the outputs of the World Bank Project for keeping same quality levels as JICA Project by trained C/Ps.

(3) Setup the necessary system in MoWT

Established road database by the Project is one of the tools for making maintenance programs. It is more important to setup the necessary system in MoWT to utilize established road database for proper maintenance by MoWT and DUCs.

(4) Various motivation in DUCs

Road inventory survey was executed by MoWT with DUCs' engineers including road inspectors to complete 50% as the target of district and urban roads in Uganda through the Project.

There are some motivated DUCs which the engineers assigned at full time, on the other hand, there are some DUCs where the engineers could not assign at full time, because of the limitation of the numbers of engineers in their office. And also there are few DUCs which had no motivation to the Survey.

Some DUCs had difficulties for the smooth implementation for the above-mentioned reasons.

Also, there were DUCs where had not enough computer equipment and power, telecommunication problems. During the survey at such kind of DUCs, it was impossible to install the software and provide the survey data.

It is necessary to consider the environment of each DUCs' office such as power/telecommunication conditions for maintenance/update of roads database in future.

C/Ps need to assist DUCs to improve their capacity and their technical knowledge.

(5) Appropriated distribution of Survey equipment for the continuous survey

30 nos. of handy GPSs, 30 nos. of digital cameras with GPS, etc. as required equipment for road inventory survey were provided to C/Ps on the Project. 30 numbers of equipment is not enough for all DUCs, because total number of district in Uganda are 111 and urban councils are 197 except Kampala.

Through the Pilot survey and C/P initiative survey, some of DUCs' engineers requested C/Ps to use continuously after the pilot survey and C/P initiative survey to master survey equipment. However, they could not use continuously, because of the limitation of numbers of survey equipment.

At least 1 GPS and digital camera with GPS are necessary to each DUCs for continuous maintenance

and update for established road database by DUCs engineers after the Project.

(6) Monitoring for the continuous Project implementation

After the Project, monitoring of the activities by DUC and MoWT engineers is necessary for continuous update of established roads database and utilization to making road maintenance plan.

Chapter 5 **ACHIEVEMENT OF THE PROJECT PURPOSE**

Achievement of the project purpose is shown as follows,

Figure 5-1 Achievement of the Project Purpose

Project Purpose : MoWT and DUCs capacity for ensuring DUR assets is improved through effective utilization of DUR database including GIS and road inventory data. [Achieved]	
DUR database is updated by MoWT every year. [Achieved]	The DUR database was completed by January 2015 and approved by MoWT on February 11, 2015.. After the completion of the database, it will be updated and managed by departments of District and Community Access roads and Urban roads in MoWT. The database will be updated when the road inventory survey is conducted every year and road maintenance, development and rehabilitation are implemented.
DUCs submit road inventory data to MoWT every year. [Achieved]	The road inventory survey data completed by DUCs (District Office, Municipal Council (MC) and Town Council (TC)) have been submitted to MoWT thus far and the data submitted is being input into the database by MoWT. It can be said that there is a process developed for submitting inventory data from each DUC to MoWT. When the road inventory survey is conducted every year, the inventory data will be submitted to MoWT.
DUR database is utilized for preparing work plan, investment plan, annual report, etc by MoWT and DUCs. [Achieved]	<p>The DUR database was completed by January 2015, it can be utilized for preparing work plans (road maintenance plans), investment plans (budget plans) and annual report with the initiatives of DUCs.</p> <p>During the technical working group (TWG) meeting, the selection criteria for prioritizing roads to be maintained and rehabilitated were discussed and already approved by the chairman of TWG.</p> <p>List of road/structure intervention prioritization was prepared for each DUC by MoWT, with the supports of experts. The training on how to prioritize roads was provided for MoWT.</p> <p>The prepared lists will be distributed to DUCs and each DUC will create their own maintenance and rehabilitation plans based on the list.</p> <p>The created maintenance list will be submitted from each DUC to URF directly and all DUCs' rehabilitation plans are forwarded to MoWT and then submitted to Ministry of Finance, Planning and Economic Development (MFPED).</p>

Chapter 6 RECOMMENDATION FOR THE ACHIEVEMENT OF THE OVERALL GOAL

Following actions are required for the achievement of the overall goal of the Project.

- [1] Endorsement of the road inventory and database as its standard format

Road inventory survey manual and road database manual prepared by the Project were approved by MoWT. It is necessary for the MoWT to endorse the output of the road inventory survey and database as its standard format to consolidate their efforts and strengthen their capacity for road maintenance.

MoWT should prepare to make the presentation on what MoWT so far has and later make sensitization strategy to the other donors and stakeholders in the sector working group meeting.

- [2] Completion of the road database in Uganda by World Bank Project

World Bank Project will follow the same system formulated by the Project for the preparation of the road database of district and urban roads including the community access road in Uganda completely.

- [3] Periodic maintenance and update of road database, and improvement of road database system

It is necessary to maintain and update of road database by the Project and World Bank Project. Established road database is easy to customize, if it is necessary to add or modify the items of road database.

- [4] To utilize road database for the appropriated road maintenance

DUCs should utilize the road database prepared by the Project for making the road maintenance programme and budget.

- [5] To establish data management team and to secure necessary budget and human resources

Establishment of data management team in MoWT, to secure necessary budget and human resources are required by year 2016 for the maintenance and operation of the road database system.

- [6] Continuous Training

Continuous training to DUCs engineers is required for the improvement of their capacities.

District and Urban Roads (DUR) Mapping
and Roads Database Project
in
the Republic of Uganda

Project Completion Report

Annex

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Annex 1. Project Design Matrix (PDM), Ver.1 to 4

Table Project Design Matrix (PDM₁)

Project Title: District and Urban Road (DUR) Mapping and Roads Database Project
Issued Date: 4/November/2011 **Amended Date:** 31st March 2012
Project Period: April 2012 - March 2015 (three years from the date when the first expert is dispatched)
Target Areas: Uganda nationwide (District and Urban Roads: DUR)
Target Group: (Direct) Ministry of Works and Transport, Districts (LC5) and Kampala Capital City Authority; (Indirect) Urban Councils (LC4, LC3), other road sector agencies

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
[Overall Goals] MoWT and DUCs capacity for DUR rehabilitation and maintenance is strengthened in the whole country.	a. All DUCs prepare timely road maintenance plans with updated data every year. b. MoWT prepares rehabilitation plan for DUR network with updated data every year. c. Allocation of the budgets for DUR by the government is increased.	a. DUCs road work plans and progress reports b. Sector performance reports c. Financial records/reports by the government	National budget and URF budget for DUR rehabilitation and maintenance are properly secured.
[Project Purpose] MoWT and DUCs capacity for ensuring DUR assets is improved through the effective utilization of DUR database including GIS and road inventory data.	a. DUR database is updated by MoWT every year. b. DUCs submit road inventory data to MoWT every year. c. DUR database is utilized for preparing work plan, investment plan, annual report, etc by MoWT and DUCs.	a. DUR database records b. Road inventory data c. MoWT's and DUCs' plans and reports	The responsibilities of MoWT and DUCs for DUR rehabilitation and maintenance do not change.
[Outputs] 1. Digital base map of DUR is prepared using GIS.	a. Basic digital map of DUR covers XX% of District roads and XX % of Urban roads in the country. b. More than XX % of the technical staff at DCR and UR Divisions participate in GIS training.	a. DUR database records b. Attendance sheet of GIS training	The number of Districts does not change drastically such as the creation of new Districts.
2. Road inventory data are collected and managed properly through the collaboration between MoWT and DUCs.	a. Road inventory data cover XX% of District roads and XX % of Urban roads in the country. b. Road inventory formats and manual are approved by MoWT c. At least 1 person from MoWT and 2 persons from DUC participate in site surveys on road inventory.	a. Road inventory data b. Road inventory formats, manual and a letter of approval c. Site survey records	
3. DUR database is established and properly maintained by MoWT.	a. DUR database covers XX% of District roads and XX % of Urban roads in the country. b. DUR database manual is approved by MoWT.	a. DUR database records b. DUR database manual and a letter of approval.	
[Activities] 1. Activities for Output 1-1 Review the existing databases such as HDM4/ROMAP (UNRA), RAMPS (MoWT) and road GIS database (MoWT, MoLHUD), and identify issues to be improved for DUR database. 1-2 Obtain digital geographical data for the areas which the existing databases do not cover 1-3 Import necessary data from the existing databases and compile them in Digital base map. 1-4 Produce tentative Digital base map of DUR for each District and compare with a road list prepared by each District (name, ID, classification, length, etc.) to identify the differences 1-5 Correct the discrepancies of data in Digital base map. If necessary, conduct site surveys 1-6 Conduct GIS training on basic skills for MoWT. 2. Activities for Output2 2-1 Review the existing formats and manuals for road inventory on National road and DUR and identify issues to be improved. 2-2 Prepare the formats and manuals for road inventory and condition on DUR. 2-3 Organize a road inventory survey team (at least one person from MoWT and two persons from DUC). 2-4 Conduct road inventory training for MoWT and DUC teams. 2-5 Select pilot Districts and conduct site surveys to prepare road inventory as OJT for MoWT and DUC teams 2-6 Conduct site surveys and prepare road inventory for other Districts 3. Activities for Output3 3-1 Compile the road inventory data from the site surveys and integrate into Digital base map to establish DUR database. 3-2 Prepare a manual on the maintenance of DUR database. 3-3 Conduct DUR database training (skills for update and maintenance) for MoWT and other road sector agencies.	[Inputs] [Japanese side] (1) Dispatch of Experts Team Leader Road Engineer GIS Engineer Road O&M Training (1) Road O&M Training (2) Road Inventory Survey (1) Road Inventory Survey (2) Road Inventory Survey (3) Road Inventory Survey (4) GIS Mapping (2) *1)Provision of Equipment GIS software and hardware Equipment for road inventory such as GPS (3) C/P Training in Japan and/or third country (4) Cost Shared by Japanese side Project Vehicle used by Japanese Experts Local costs for Implementing the Activities * 1: Provision of Equipment will be determined by Japanese Experts and MoWT after the commencement of the Project.	[Uganda side] (1) Counterpart personnel (C/P) Project Director Project Manager Project Coordinator Counterparts (2) Facilities and Machinery - Project Office Space at MoWT Main Office for Japanese Experts and Local Experts including Telephone Lines, Air Conditioner, Internet Access and Secretary. - Vehicle(s) for site surveys (3) Necessary Data - GPS and GIS data on national roads (UNRA) - GIS data (MoLHUD) (4) Necessary Arrangement - Acquisition of the permission - Enforcement of traffic controls (5) Cost shared by Uganda side - Tax Exemption for the procurement of equipment - Travel costs for the C/Ps - Travel costs for the participants of the trainings	The Project budgets allocation secured by MoWT without any major delay. The C/Ps who participated in trainings available during the Project period. Road classification shall be confirmed by the GoU Manuals developed by the Project are officially approved without any major delay by MoWT. [Pre-condition] Political stability C/Ps allocation without any major delay

Table Project Design Matrix (PDM₂)

Project Title: District and Urban Road (DUR) Mapping and Roads Database Project
 Issued Date: 4, November, 2011, 1st Amended Date: 31st March 2012, 2nd Amended Date: 15th July 2012
 Project Period: April 2012 - March 2015 (three years from the date when the first expert is dispatched)
 Target Areas: Uganda nationwide (District and Urban Roads: DUR)
 Target Group: (Direct) Ministry of Works and Transport, Districts (LC5) and Kampala Capital City Authority; (Indirect) Urban Councils (LC4, LC3), other road sector agencies

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions	
[Overall Goals] MoWT and DUCs capacity for DUR rehabilitation and maintenance is strengthened in the whole country.	a. All DUCs prepare timely road maintenance plans with updated data every year. b. MoWT prepares rehabilitation plan for DUR network with updated data every year. c. Allocation of the budgets for DUR by the government is increased.	a. DUCs road work plans and progress reports b. Sector performance reports c. Financial records/reports by the government	National budget and URF budget for DUR rehabilitation and maintenance are properly secured.	
[Project Purpose] MoWT and DUCs capacity for ensuring DUR assets is improved through the effective utilization of DUR database including GIS and road inventory data.	a. DUR database is updated by Mo WT every year. b. DUCs submit road inventory data to MoWT every year. c. DUR database is utilized for preparing work plan, investment plan, annual report, etc by MoWT and DUCs.	a. DUR database records b. Road inventory data c. MoWT's and DUCs' plans and reports	The responsibilities of MoWT and DUCs for DUR rehabilitation and maintenance do not change.	
[Outputs] 1. Digital base map of DUR is prepared using GIS.	a. Basic digital map of DUR covers XX% of District roads and XX % of Urban roads in the country. b. More than XX % of the technical staff at DCR and UR Divisions participate in GIS training.	a. DUR database records b. Attendance sheet of GIS training	The number of Districts does not change drastically such as the creation of new Districts.	
2. Road inventory data are collected and managed properly through the collaboration between MoWT and DUCs.	a. Road inventory data cover 25% of DUR network resulting from Pilot Survey and 50% of the network in the end. b. Road inventory formats and manual are approved by MoWT c. At least 1 person from Mo WT and 2 persons from DUC participate in site surveys on road inventory.	a. Road inventory data b. Road inventory formats, manual and a letter of approval c. Site survey records		
3. DUR database is established and properly maintained by MoWT.	a. DUR database covers 50% of District roads and 50 % of Urban roads in the country. b. DUR database manual is approved by MoWT.	a. DUR database records b. DUR database manual and a letter of approval.		
[Activities] 1. Activities for Output 1-1 Review the existing databases such as HDM4/ROMAP (UNRA), RAMPS (Mo WT) and road GIS Database (MoWT, MoLHUD), and identify issues to be improved for DUR database. 1-2 Obtain digital geographical data for the areas which the existing databases do not cover 1-3 Import necessary data from the existing databases and compile them in Digital base map. 1-4 Produce tentative Digital base map of DUR for each District and compare with a road list prepared by each District (name, ID, classification, length, etc.) to identify the differences 1-5 Correct the discrepancies of data in Digital base map. If necessary, conduct site surveys 1-6 Conduct GIS training on basic skills for Mo WT. 2. Activities for Output2 2-1 Review the existing formats and manuals for road inventory on National road and DUR and identify issues to be improved. 2-2 Prepare the formats and manuals for road inventory and condition on DUR. 2-3 Organize a road inventory survey team (at least one person from MoWT and two persons from DUC). 2-4 Conduct road inventory training for MoWT and DUC teams. 2-5 Select pilot Districts and conduct site surveys to prepare road inventory as OJT for MoWT and DUC teams 2-6 Conduct site surveys and prepare road inventory for other Districts 3. Activities for Output3 3-1 Compile the road inventory data from the site surveys and integrate into Digital base map to establish DUR database. 3-2 Prepare a manual on the maintenance of DUR database. 3-3 Conduct DUR database training (skills for update and maintenance) for MoWT and other road sector agencies.	[Inputs]	[Japanese side]	[Uganda side]	The Project budgets allocation secured by MoWT without any major delay. The C/Ps who participated in trainings available during the Project period. Road classification shall be confirmed by the GoU Manuals developed by the Project are officially approved without any major delay by MoWT. [Pre-condition] Political stability C/Ps allocation without any major delay
	(l) Dispatch of Experts Team Leader Road Engineer GIS Engineer Road O&M Training (1) Road O&M Training (2) Road Inventory Survey (1) Road Inventory Survey (2) Road Inventory Survey (3) Road Inventory Survey (4) GIS Mapping (2) *1)Provision of Equipment GIS software and hardware Equipment for road inventory such as GPS (3) C/P Training in Japan and/or third country (4) Cost Shared by Japanese side Project Vehicle used by Japanese Experts Local costs for Implementing the Activities - Travel costs for the C/Ps during 1st Quarter, 2012 - Travel costs for the participants of the trainings during 1st Quarter, 2012 * 1: Provision of Equipment will be determined by Japanese Experts and MoWT after the commencement of the Project.	(1) Counterpart personnel (C/P) Project Director Project Manager Project Coordinator Counterparts (2) Facilities and Machinery - Project Office Space at MoWT Main Office for Japanese Experts and Local Experts including Telephone Lines, Air Conditioner, Internet Access and Secretary Vehicle(s) for site surveys (3) Necessary Data - GPS and GIS data on national roads (UNRA) - GIS data (MoLHUD) (4) Necessary Arrangement - Acquisition of the permission - Enforcement of traffic controls Cost shared by Uganda side (5) Tax Exemption for the procurement of equipment - Travel costs for the C/Ps after 1st Quarter, 2012 - Travel costs for the participants of the trainings after 1st Quarter, 2012		

Revised Project Design Matrix (PDM)

Project Design Matrix (PDM₃)

Project Title: District and Urban Road (DUR) Mapping and Roads Database Project

Issued Date: 4, November, 2011, 1st Amended Date: 31st March 2012, 2nd Amended Date: 15th July 2012, 3rd Amended Date: 12th February 2014

Project Period: April 2012 - March 2015 (three years from the date when the first expert is dispatched)

Target Areas: Uganda nationwide (District and Urban Roads: DUR)

Target Group: (Direct) Ministry of Works and Transport, Districts (LC5) and Kampala Capital City Authority;

(Indirect) Urban Councils (LC4, LC3), other road sector agencies

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
[Overall Goals] MoWT and DUCs capacity for DUR rehabilitation and maintenance is strengthened in the whole country.	<ul style="list-style-type: none"> a. All DUCs prepare timely road maintenance plans with updated data every year. b. MoWT prepares rehabilitation plan for DUR network with updated data every year. c. Allocation of the budgets for DUR by the government is increased. 	<ul style="list-style-type: none"> a. DUCs road work plans and progress reports b. Sector performance reports c. Financial records/reports by the government 	National budget and URF budget for DUR rehabilitation and maintenance are properly secured.
[Project Purpose] MoWT and DUCs capacity for ensuring DUR assets is improved through the effective utilization of DUR database including GIS and road inventory data.	<ul style="list-style-type: none"> a. DUR database is updated by MoWT every year. b. DUCs submit road inventory data to MoWT every year. c. DUR database is utilized for preparing work plan, investment plan, annual report, etc by MoWT and DUCs. 	<ul style="list-style-type: none"> a. DUR database records b. Road inventory data c. MoWT's and DUCs' plans and reports 	The responsibilities of MoWT and DUCs for DUR rehabilitation and maintenance do not change.
[Outputs] 1. Digital base map of DUR is prepared using GIS.	<ul style="list-style-type: none"> a. Basic digital map of DUR covers 50% of District roads and 50% of Urban Roads in the country. b. More than 50 % of the technical staff at DUR Divisions participates in GIS training. 	<ul style="list-style-type: none"> a. DUR database records b. Attendance sheet of GIS training 	The number of Districts does not change drastically such as the creation of new Districts.
2. Road inventory data are collected and managed properly through the collaboration between MoWT and DUCs.	<ul style="list-style-type: none"> a. Road inventory data cover 25% of DUR network resulting from Pilot Survey and 50% of the network in the end. b. Road inventory formats and manual are approved by MoWT c. At least 1 person from MoWT and 2 persons from DUC participate in site surveys on road inventory. 	<ul style="list-style-type: none"> a. Road inventory data b. Road inventory formats, manual and a letter of approval c. Site survey records 	
3. DUR database is established and properly maintained by MoWT.	<ul style="list-style-type: none"> a. DUR database covers 50% of District roads and 50 % of Urban roads in the country. b. DUR database manual is approved by MoWT. 	<ul style="list-style-type: none"> a. DUR database records b. DUR database manual and a letter of approval. 	
<p>[Activities]</p> <p>1. Activities for Output</p> <p>1-1 Review the existing databases such as HDM4/ROMAP (UNRA), RAMPS (MoWT) and road GIS Database (MoWT, MoLHUD), and identify issues to be improved for DUR database.</p> <p>1-2 Obtain digital geographical data for the areas which the existing databases do not cover</p> <p>1-3 Import necessary data from the existing databases and compile them in Digital base map.</p> <p>1-4 Produce tentative Digital base map of DUR for each District and compare with a road list prepared by each District (name, ID, classification, length, etc.) to identify the differences</p> <p>1-5 Correct the discrepancies of data in Digital base map. If necessary, conduct site surveys</p> <p>1-6 Conduct GIS training on basic skills for MoWT.</p> <p>2. Activities for Output2</p> <p>2-1 Review the existing formats and manuals for road inventory on National road and DUR and identify issues to be improved.</p> <p>2-2 Prepare the formats and manuals for road inventory and condition on DUR.</p> <p>2-3 Organize a road inventory survey team (at least one person from MoWT and two persons from DUC).</p> <p>2-4 Conduct road inventory training for MoWT and DUC teams.</p> <p>2-5 Select pilot Districts and conduct site surveys to prepare road inventory as OJT for MoWT and DUC teams</p> <p>2-6 Conduct site surveys and prepare road inventory for other Districts</p> <p>3. Activities for Output3</p> <p>3-1 Compile the road inventory data from the site surveys and integrate into Digital base map to establish DUR database.</p> <p>3-2 Prepare a manual on the maintenance of DUR database.</p> <p>3-3 Conduct DUR database training (skills for update and maintenance) for MoWT and other road sector agencies.</p> <p>3-4 Discuss how to maintain DUR roads, and formulate DUR database maintenance system at MoWT based on the discussion.</p>	<p>[Inputs]</p> <p>[Japanese side]</p> <p>(1) Dispatch of Experts Team Leader Road Engineer GIS Engineer Road O&M Training (1) Road O&M Training (2) Road Inventory Survey (1) Road Inventory Survey (2) Road Inventory Survey (3) Road Inventory Survey (4) GIS Mapping</p> <p>(2) *1)Provision of Equipment GIS software and hardware Equipment for road inventory such as GPS</p> <p>(3) C/P Training in Japan and/or third country</p> <p>(4) Cost Shared by Japanese side Project Vehicle used by Japanese Experts. Local costs for implementing the Activities. - Travel costs for the C/Ps during 1st Quarter, 2012 - Travel costs for the participants of the training during 1st Quarter, 2012</p> <p>* 1: Provision of Equipment will be determined by Japanese Experts and MoWT after the commencement of the Project.</p>	<p>[Uganda side]</p> <p>(1) Counterpart personnel (C/P) Project Director Project Manager Project Coordinator Counterparts</p> <p>(2) Facilities and Machinery - Project Office Space at MoWT Main Office for Japanese Experts and Local Experts. - Vehicle(s) for site surveys (including the cost for fuel and driver)</p> <p>(3) Necessary Data - GPS and GIS data on national roads (UNRA) - GIS data (MoLHUD)</p> <p>(4) Necessary Arrangement - Acquisition of the permission - Enforcement of traffic controls</p> <p>(5) Cost prepared by Uganda side - Tax Exemption for the procurement of equipment - Travel costs for the C/Ps after 1st Quarter, 2012 - Travel costs for the participants of the trainings after 1st Quarter, 2012 - Necessary costs for the C/Ps for the data processing works after the Road Inventory Survey</p>	<p>The Project budgets allocation secured by MoWT without any major delay.</p> <p>The C/Ps who participated in trainings available during the Project period.</p> <p>Road classification shall be confirmed by the GoU</p> <p>Manuals developed by the Project are officially approved without any major delay by MoWT.</p> <p>[Pre-condition]</p> <p>Political stability</p> <p>C/Ps allocation without any major delay</p>

Project Design Matrix (PDM₄)

Project Title: District and Urban Road (DUR) Mapping and Roads Database Project

Issued Date: 4, November, 2011, 1st Amended Date: 31st March 2012, 2nd Amended Date: 15th July 2012, 3rd Amended Date: 12th February 2014,
4th Amended Date: 3rd October 2014

Project Period: April 2012 - March 2015 (three years from the date when the first expert is dispatched)

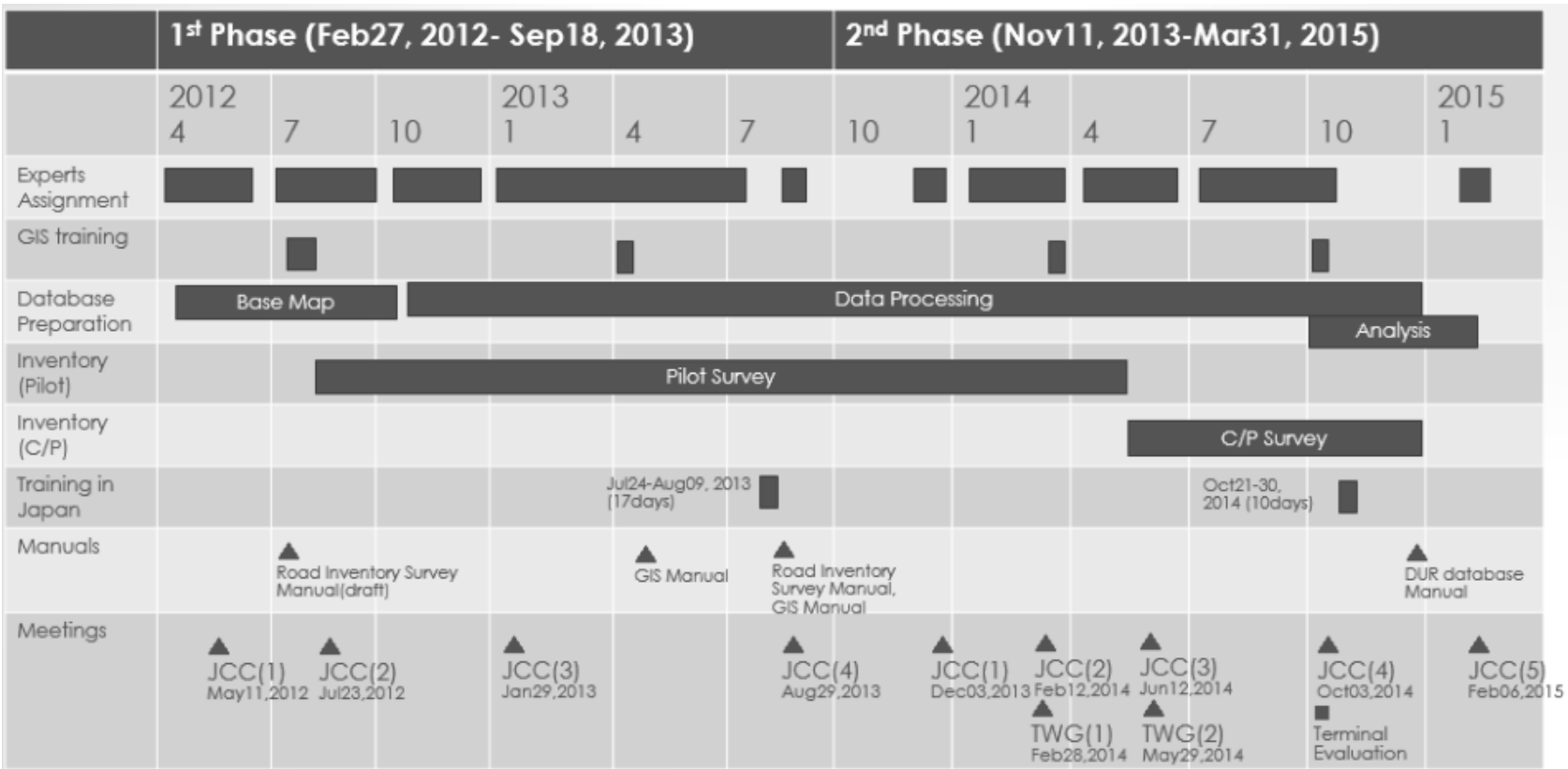
Target Areas: Uganda nationwide (District and Urban Roads: DUR)

Target Group: (Direct) Ministry of Works and Transport, Districts (LC5) and Kampala Capital City Authority;

(Indirect) Urban Councils (LC4, LC3), other road sector agencies

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[Project Purpose] MoWT's and DUCs' capacity for ensuring DUR assets is improved through the effective utilization of DUR database including GIS and road inventory data.	a. DUR database is updated by MoWT every year. b. DUCs submit road inventory data to MoWT every year. c. DUR database is utilized for preparing work plan, investment plan, annual report, etc by MoWT and DUCs.	a. DUR database records b. Road inventory data c. MoWT's and DUCs' plans and reports	The responsibilities of MoWT and DUCs for DUR rehabilitation and maintenance do not change.
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2. Road inventory data are collected and managed properly through the collaboration between MoWT and DUCs.	a. Road inventory data cover 25% of DUR network resulting from Pilot Survey and approximately half of the entire network in the end. b. Road inventory formats and manual are approved by MoWT c. At least 1 person from MoWT and 2 persons from DUC participate in site surveys on road inventory.	a. Road inventory data b. Road inventory formats, manual and a letter of approval c. Site survey records	
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	(1) Dispatch of Experts Team Leader Road Engineer GIS Engineer Road O&M Training (1) Road O&M Training (2) Road Inventory Survey (1) Road Inventory Survey (2) Road Inventory Survey (3) Road Inventory Survey (4) GIS Mapping (2) *1)Provision of Equipment GIS software and hardware Equipment for road inventory such as GPS (3) C/P Training in Japan and/or third country (4) Cost Shared by Japanese side Project Vehicle used by Japanese Experts. Local costs for implementing the Activities. - Travel costs for the C/Ps during 1 st Quarter, 2012 - Travel costs for the participants of the training during 1 st Quarter, 2012 * 1: Provision of Equipment will be determined by Japanese Experts and MoWT after the commencement of the Project.	(1) Counterpart personnel (C/P) Project Director Project Manager Project Coordinator Counterparts (2) Facilities and Machinery - Project Office Space at MoWT Main Office for Japanese Experts and Local Experts. - Vehicle(s) for site surveys (including the cost for fuel and driver) (3) Necessary Data - GPS and GIS data on national roads (UNRA) - GIS data (MoLHUD) (4) Necessary Arrangement - Acquisition of the permission - Enforcement of traffic controls (5) Cost prepared by Uganda side - Tax Exemption for the procurement of equipment - Travel costs for the C/Ps after 1 st Quarter, 2012 - Travel costs for the participants of the trainings after 1 st Quarter, 2012 - Necessary costs for the C/Ps for the data processing works after the Road Inventory Survey	

Annex 2. Work Flow



Plan of Operations (Version 1.0)

Project Name : District and Urban Roads (DUR) Mapping and Roads Database Project
 Target Areas: Nationwide (District and Urban Roads: DUR)
 Duration : April 2012 – March 2015 (three years from the date when the first expert is dispatched)

Responsible Agency: MoWT

Implementing Agency: MoWT

Issued Date : 14/Nov/2011

Activities	1st year (2012-2013)												2nd year (2013-2014)												3rd year (2014-2015)																	
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3						
Output 1. Digital base map of DUR is prepared using GIS.																																										
1.1 Review the existing databases such as HDM4 / ROMAP (UNRA), RAMPS (MoWT) and road GIS database (MoWT, MoLHUD), and identify issues to be improved for DUR database.	█																																									
1.2 Obtain digital geographical data for the areas which the existing databases do not cover.	█			█																																						
1.3 Import necessary data from the existing databases and compile them in Digital base map.	█			█																																						
1.4 Produce tentative Digital base map of DUR for each District and compare with a road list prepared by each District (name, ID, classification, length, etc.) to identify the differences.							█																																			
1.5 Correct the discrepancies of data in Digital base map. If necessary, conduct site surveys.							█																																			
1.6 Conduct GIS training on basic skills for MoWT.												█																														
Output 2. Road inventory data are collected and managed properly through the collaboration between MoWT and Districts.																																										
2.1 Review the existing formats and manuals for road inventory on National road and DUR and identify issues to be improved.	█																																									
2.2 Prepare the formats and manuals for road inventory and condition on DUR.	█			█																																						
2.3 Organize a road inventory survey team (at least one person from MoWT and two persons from DUC) .							█																																			
2.4 Conduct road inventory training for MoWT and DUC teams.												█																														
2.5 Select pilot Districts and conduct site surveys to prepare road inventory as OJT for MoWT and DUC teams.													█																													
2.6 Conduct site surveys and prepare road inventory for other Districts.													█												█																	
Output 3. DUR database is established and properly maintained																																										
3.1 Compile the road inventory data from the site surveys and integrate into Digital base map to establish DUR database.													█												█																	
3.2 Prepare a manual on the maintenance of DUR database.													█												█																	
3.3 Conduct DUR database training (skills for update and maintenance) for MoWT and other road sector agencies.													█												█												█					
Dispatch of JICA Experts																																										
Team Leader (10.0MM)	█			█			█			█			█			█			█			█			█			█			█			█			█			█		
Road Engineer (14.0MM)	█			█			█			█			█			█			█			█			█			█			█			█			█			█		
GIS Specialist (13.0MM)	█			█			█			█			█			█			█			█			█			█			█			█			█			█		
Surveyer-1 (14.0MM)	█			█			█			█			█			█			█			█			█			█			█			█			█			█		
Surveyer-2 (7.0MM)	█			█			█			█			█			█			█			█			█			█			█			█			█			█		
Project Coordinator / Surveyer-3 (13.0MM)	█			█			█			█			█			█			█			█			█			█			█			█			█			█		

Annex 3. Plan of Operations (PO)
 3-1 Plan of Operations (Ver.1.0)

Plan of Operations (Version 2.0)																																				
Project Name : District and Urban Roads (DUR) Mapping and Roads Database Project												Responsible Agency: MoWT												Implementing Agency: MoWT												
Target Areas: Nationwide (District and Urban Roads: DUR)																								Updated Date : 12/Feb/2014												
Duration : April 2012 – March 2015 (three years from the date when the first expert is dispatched)																								Issued Date : 14/Nov/2011												
Activities	1st year (2012-2013)												2nd year (2013-2014)												3rd year (2014-2015)											
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Output 1. Digital base map of DUR is prepared using GIS.																																				
1.1	Review the existing databases such as HDM4 / ROMAP (UNRA), RAMPS (MoWT) and road GIS database (MoWT, MoLHUD), and identify issues to be improved for DUR database.																																			
1.2	Obtain digital geographical data for the areas which the existing databases do not cover.																																			
1.3	Import necessary data from the existing databases and compile them in Digital base map.																																			
1.4	Produce tentative Digital base map of DUR for each District and compare with a road list prepared by each District (name, ID, classification, length, etc.) to identify the differences.																																			
1.5	Correct the discrepancies of data in Digital base map. If necessary, conduct site surveys.																																			
1.6	Conduct GIS training on basic skills for MoWT.																																			
Output 2. Road inventory data are collected and managed properly through the collaboration between MoWT and Districts.																																				
2.1	Review the existing formats and manuals for road inventory on National road and DUR and identify issues to be improved.																																			
2.2	Prepare the formats and manuals for road inventory and condition on DUR.																																			
2.3	Organize a road inventory survey team (at least one person from MoWT and two persons from DUC) .																																			
2.4	Conduct road inventory training for MoWT and DUC teams.																																			
2.5	Select pilot Districts and conduct site surveys to prepare road inventory as OJT for MoWT and DUC teams.																																			
2.6	Conduct site surveys and prepare road inventory for other Districts.																																			
Output 3. DUR database is established and properly maintained																																				
3.1	Compile the road inventory data from the site surveys and integrate into Digital base map to establish DUR database.																																			
3.2	Prepare a manual on the maintenance of DUR database.																																			
3.3	Conduct DUR database training (skills for update and maintenance) for MoWT and other road sector agencies.																																			
3.4	Discuss how to maintain DUR roads, and formulate DUR database maintenance system at MoWT based on the discussion.																																			

(2)2nd Phase (from Nov 2013 to Mar 2015)

Phase II	Designation	Name	YEAR 2013			YEAR 2014												YEAR 2015			Assignment days	Min-Month
			NOV	DEC		IAN	FEB	MAR	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	DEC	IAN	FEB	MAR		
Work in U G A N D A	1	Team Leader Road Planning	[Planned]			[Planned]												163	5.40			
			[Actual]			[Actual]												207	6.90			
	2	Deputy Team Leader Road Engineer	[Planned]			[Planned]												54	1.80			
			[Actual]			[Actual]												6	0.30			
	3	GIS Engineer	[Planned]			[Planned]												90	3.00			
			[Actual]			[Actual]												90	3.00			
	4	Road O&M Planning Training(1)	[Planned]			[Planned]												30	1.00			
			[Actual]			[Actual]												30	1.00			
5	Road O&M Planning Training(2)	[Planned]			[Planned]												10	0.33				
		[Actual]			[Actual]												10	0.33				
6	Road Inventory Survey (2)	[Planned]			[Planned]												187	6.23				
		[Actual]			[Actual]												187	6.23				
	Road Inventory Survey (3)	[Planned]			[Planned]												187	6.23				
		[Actual]			[Actual]												187	6.23				
8	GIS Mapping	Gina Milanon	[Planned]			[Planned]												30	1.00			
			[Actual]			[Actual]												30	1.00			
													Work in Uganda Total (Plan)		750	25.00						
													Work in Uganda Total (Actual)		750	25.00						

Work in Uganda (Planned) E/EC: Eight-Japan Engineering Consultants Inc.
 Work in Uganda (Actual) KK: Kokusai Kogyo Co., Ltd.

4-2 Assignment of Counterpart Personnel (Uganda Side)

C/P List				
No	Name	Name of Title	Organization	Current Status
1	A.O.Mugisa	former Acting Director of Engineering and Works/Engineering in Chief/ Project Director for JICA Project	Ministry of Works and Transport	X (Retired)
2	Rwanga Robert	Acting Director of Engineering and Works/ Project Director for JICA Project /Engineering in Chief(former Assistant Commissioner Urban Roads)	Ministry of Works and Transport	O
3	Kitonsa Stephen	Assistant Comissioner Engineering/ District Community Roads	Ministry of Works and Transport	O
4	Alex Onen	Principal Excutive Engineer/District Community Roads/ Project Manager for JICA Project	Ministry of Works and Transport	O
5	Mbadhwe John	Senior Engineer(Civil)/District Community Roads	Ministry of Works and Transport	O
6	Kisitu Timothy	Senior Engineer(Civil)/District Community Roads/ Project Coordinator for JICA Project	Ministry of Works and Transport	O
7	Kayima Fred	Senior Engineer(Civil)/District Community Roads	Ministry of Works and Transport	O
8	Okullu Yorobwam	Engineer/Civil/ District Community Roads	Ministry of Works and Transport	O
9	Mugavu Martin	Engineer/Civil/ District Community Roads	Ministry of Works and Transport	O
10	Lepi Bosco	Engineer/Civil/ District Community Roads	Ministry of Works and Transport	O
11	Baguma Alex Njuma	Engineer/Civil/ District Community Roads	Ministry of Works and Transport	O
12	Magala Godfrey	Senior Engineer(Civil)/Urban Roads	Ministry of Works and Transport	O
13	Bagyenda Drake	Engineer/Civil/ Urban Roads	Ministry of Works and Transport	O
14	Kintu Joel Munabangogo	Engineer/Civil/ Urban Roads	Ministry of Works and Transport	O
15	Banga Victor Joseph	Engineer/Civil/ Urban Roads	Ministry of Works and Transport	O
16	Kateme Constance	Engineer/Community Access Road	Ministry of Works and Transport	X (Resigned)
17	Robert Balamu	Engineer/Community Access Road	Ministry of Works and Transport	X (Resigned)
18	Mulabbi Elliot	Engineer/Civil/ District Community Roads	Ministry of Works and Transport	O
19	Myers Murumu T	Engineer/ Policy & Planning	Ministry of Works and Transport	O

Annex 5. Local Operation Cost

5-1 Japanese Side

No.	Description	Amount	Unit
1	Local Employment Cost		
1.1	Local Employment Cost Total(USD)	59,200	USD
1.1.1	Local Employment Cost(1 st Phase: Local staff)	25,500	USD
1.1.2	Local Employment Cost(2nd Phase Local staff)	33,700	USD
1.2	Local Employment Cost Total(UGX)	1,504,000	UGX
1.2.1	Local Employment Cost(1st Phase C/P allowance for Survey)	1,504,000	UGX
2	Transport Cost		
2.1	Transport Cost Total	176,600	USD
2.1.1	Transport Cost(1 st Phase)	123,100	USD
2.1.2	Transport Cost(2nd Phase)	53,500	USD
3	Training Cost		
3.1	Training Cost	4,928,000	UGX
4	Other Cost		
4.1	Temporary Project Office rental Cost before preparation of the office in MoWT (3months)	4,680	USD
	Total amount	235,800	USD
		6,432,000	UGX

5-2 Uganda Side

Achievement of Inputs (Local Operation Costs / Uganda Side)

(Unit: UGX)

Items	1st Phase					2nd Phase					
	Qtr1. 2012-12	Qtr2. 2012-13	Qtr3. 2012-13	Qtr4. 2012-13	Qtr1. 2013-14	Qtr2. 2013-14	Qtr3. 2013-14	Qtr4. 2013-14	Qtr1. 2014-15	Qtr2. 2014-15	Qtr3. 2014-15(*)
	Jul-Sep 2012	Oct-Dec 2012	Jan-Mar 2013	Apr-Jun 2013	Jul-Sep 2013	Oct-Dec 2013	Jan-Mar 2014	Apr-Jun 2014	Jul-Sep 2014	Oct-Dec 2014	Jan-Mar 2015
Training Allowances for DUCs	-	11,800,000	6,900,000	5,500,000	-	-	4,400,000	4,650,000	5,000,000	4,500,000	-
Travel Allowance for MoWT	-	-	-	-	14,400,000	-	-	-	-	7,920,000	-
Night Allowance for MoWT	-	-	20,450,000	19,320,000	-	-	15,780,000	24,550,000	43,105,000	38,850,000	-
Fuel Cost	-	-	-	-	-	-	18,150,000	13,200,000	24,750,000	25,410,000	-
Other Cost	-	-	-	-	-	-	-	-	-	-	(40,000,000)
Sub-Total	0	11,800,000	27,350,000	24,820,000	14,400,000	0	38,330,000	42,400,000	72,855,000	76,680,000	(40,000,000)
Total					78,370,000						270,265,000

Note:*)

Other Cost of Qtr3. 2014-15 is 40,000,000UGX for the preparation of 3 sets of the duplication of the Road Atlas/Road database created by the project. This costs will be prepared by end of March.

Annex 6. List of Training

6-1 Counterparts Training in Japan

(1) 1st Phase (from 24th July to 9th August 2013)

Name	Name of Title	Responsibilities
Mr. Okullu Yorobwam	Civil Engineer	Inspection and Monitoring for DUCAR Network (Eastern Region)
Mr. Baguma Alex Njuma	Civil Engineer	Inspection and Monitoring for DUCAR Network (Central Region)
Mr. Ssozi Vincent	Principal Statistician	Transport Sector Management Information System
Mr. Victor. J Banga	Civil Engineer	Inspection and Monitoring for DUCAR Network (Central Region)
Mr. Kisitu Timothy	Senior Engineer	Project Coordinator for JICA DUR Mapping & Database Project

(2) 2nd Phase (from 21st to 30th October 2014)

Name	Name of Title	Responsibilities
Eng. Robert Rwanga	Acting Director of Engineering and Works/Engineering in Chief	Planning & Directing Ministry of Works & Transport
Eng. Alex Onen	Ag. Assistant Commissioner National Roads	Heads the division of National roads, Project coordinator for DUR Data Survey and Mapping, Project Coordinator for World Bank TSDP
Dr. Mbadwe John	Acting Principal Executive Engineer/District Community Access Roads	Project Coordinator for the District, Urban & Community Roads Condition Survey under the World Bank Funding.
Mr. Kisitu Timothy	Senior Engineer	Project Coordinator for JICA DUR Mapping & Database Project
Mr. Muhwezi Bernard Justus	Manager	Take national coordination initiatives in harmonization, standardization and provision of geographically referenced statistics, and build up capacity to fully realize the potential of GIS in data collection, analysis, presentation, research and coordination in the National Statistical System

6-2 Counterparts Training in Uganda

Nos. of Trainees (1st Phase)

Training		Duration	Nos. of Trainees	
GIS Training	Basic Course	17 July to 27 July, 2012	10	MOWT
	Advance Course	31 July to 17 August., 2012	11	MOWT
	Data Processing	2 nd April to 5 th April, 2013	9 3	MOWT KCCA
IRI Training		7 th August to 10 th August, 2012	3 1	MOWT KCCA
Pavement Maintenance Training	Maintenance Training	29 th August to 2 nd September, 2012	7	MOWT
	Pavement O&M Seminar	8 th February, 2013	12 5	MOWT KCCA
Training for Road Inventory Pilot Survey		August, 2012 to July, 2013	14 117 54	MOWT 31Districts 12Municipals
Training in Japan		From July24 to Aug09, 2013 (17days)	5	MOWT

Nos. of Trainees (2nd Phase)

Training		Duration	Nos. of Trainees	
GIS Training	Data processing Quality check Training	4th, 6th and 10th March 2014	5	MOWT
	Road Intervention Prioritization Training	30th September 2014	8	MOWT
	GIS training to Local Consultant of World Bank Project	6th October 2014	7	Local Consultant of World Bank Project
Road Database Maintenance and Update Training		4 th February 2015	3	MOWT
IRI Training	Lecture of measurement , data processing and analysis method of VIMS	14th March 2014	5	MOWT
	Lecture and Introduction of measurement method by iPhone, VIMS mounted on motorbike	8th October 2014	5	MOWT
Training for Road Inventory Pilot Survey		January, 2014 to May, 2014	6 32 9	MOWT 8Districts 3Municipals
Training for Road Inventory C/P initiative Survey (5 trainers by MOWT)		May to December 2014	18 75	8Municipals 51 Town councils
Training in Japan		From Oct21 to Oct30, 2014 (10days)	4 1	MOWT UBOS

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Training Attendance List

Type of Training		Date	Name of Trainer	Name of Attendance	Organization	
<u>GIS TRAINING</u>	BASIC	July17-July27, 2012	Mr. Joel F. Cruz (GIS Engineer)	1	Alex N. Baguma	MOWT
				2	Robert Balamu	MOWT
				3	Bosco Lepi	MOWT
				4	Banga Victor	MOWT
				5	Kayima Fred	MOWT
				6	Kintu Joel Munabangogo	MOWT
				7	Mulabbi Elliot	MOWT
				8	Myers Munumu.T	MOWT
				9	Kateme Constance	MOWT
				10	Kisitu Timothy	MOWT
	ADVANCED(1)	July31-Aug.17, 2012	Mr. Joel F. Cruz (GIS Engineer)	1	Bagyenda Drake	MOWT
				2	Martin Mugavu	MOWT
				3	Alex N. Baguma	MOWT
				4	Robert Balamu	MOWT
				5	Bosco Lepi	MOWT
				6	Banga Victor	MOWT
				7	Okullu Yorobwam	MOWT
				8	Kintu Joel Munabangogo	MOWT
				9	Kateme Constance	MOWT
				10	Kisitu Timothy	MOWT
	ADVANCED(2)	Apr.02-Apr.05, 2013	Mr. Joel F. Cruz (GIS Engineer)	1	Kayima Fred	MOWT
				2	Waswa Joel	KCCA
				3	Inumba Richard	KCCA
				4	Bagyenda Drake	MOWT
				5	Martin Mugavu	MOWT
				6	Alex N. Baguma	MOWT
				7	Robert Balamu	MOWT
				8	Bosco Lepi	MOWT
				9	Banga Victor	MOWT
				10	Kisitu Timothy	MOWT
11	Okullu Yorobwam	MOWT				
12	Kayima Fred	MOWT				
13	Jacob Byamukama	KCCA				
<u>Type of Training</u>		<u>Date</u>	<u>Name of Trainer</u>	<u>Name of Attendance</u>	<u>Organization</u>	
<u>IRI TRAINING</u>		Aug.07-Aug.10, 2012	Dr. Yoshinobu Oshima (in charge of the Training)	1	Lukanda James	UNRA
				2	Bagyenda Drake	MOWT
				3	Martin Mugavu	MOWT
				4	Okullu Yorobwam	MOWT
<u>Type of Training</u>		<u>Date</u>	<u>Name of Trainer</u>	<u>Name of Attendance</u>	<u>Organization</u>	
<u>PAVEMENT TRAINING(1)</u>		Aug.29-Sep.02, 2012	Prof. Eiichi Asano (in charge of the Training)	1	Alex N. Baguma	MOWT
				2	Kintu Joel Munabangogo	MOWT
				3	Muhanguzi	MOWT
				4	Bosco Lepi	MOWT
				5	Mulabbi Elliot	MOWT
				6	Banga Victor	MOWT
				7	Bagyenda Drake	MOWT
<u>PAVEMENT TRAINING(2)</u>		Feb.08, 2013	Prof. Eiichi Asano (in charge of the Training)	1	Busulwa Lambert	MOWT
				2	Isaac Tibhika	MOWT
				3	Opio Olanya	MOWT
				4	Charles Ngeye	MOWT
				5	Muhanguzi Bernard	MOWT
				6	Zirimenya Andrew	MOWT
				7	Kayima Fred	MOWT
				8	Alex N. Baguma	MOWT
				9	Kisitu Timothy	MOWT
				10	Mugavu Martin	MOWT
				11	Mujib Ali	MOWT
				12	Irene N. Musinguzi	KCCA
				13	Patrick Kaweesa	KCCA
				14	Ssekatawa Edward	KCCA
				15	G. Magala	MOWT
				16	Sserunjogi Andrew	KCCA
				17	Ntanyungura Denis	KCCA

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Type of Training	Date	Name of Trainer	Name of Attendance	Organization	
Road Inventory Survey (MCWT Engineers)		Mr. Zenichi Chiba	1 Alex N. Baguma	MCWT	
			2 Robert Balamu	MCWT	
			3 Bosco Lepi	MCWT	
			4 Miwa Christopher	MCWT	
			5 Banga Victor	MCWT	
			6 Kisru Timothy	MCWT	
			7 Kayina Fred	MCWT	
			8 Isaac Tibhika	MCWT	
			9 Zirimenya Andrew D.	MCWT	
			10 Kintu Joel Munabangogo	MCWT	
			11 Bagyenda Drake	MCWT	
			12 John Muslime	MCWT	
			13 Martin Mugavu	MCWT	
			14 Stephen K. Kiwasa	MCWT	
Type of Training	Date	Name of Trainer	Name of Attendance	Organization	
Road Inventory Survey (District & Municipality Engineers)	Soroti District	Aug.13-Aug.22, 2012	Mr. Zenichi Chiba	1 Onega Opio	Soroti District
	Katakwi District	Aug.23-Aug.31, 2012	Mr. Zenichi Chiba	2 Oula Cuthbert	Soroti District
				1 Okware Justus Pascal	Katakwi District
	Mpigi District	Aug.13-Aug.22, 2012	Mr. Mitsutaka Enomoto	2 Malinga Paul	Katakwi District
				3 Imalingat Christopher	Katakwi District
				4 Echatu Andrew	Katakwi District
	Luwero District	Aug.23-Aug.31, 2012	Mr. Mitsutaka Enomoto	5 Apio Ezeza Lydia	Katakwi District
				1 Lukwago Joseph	Mpigi District
				2 Mubiru Rogers	Mpigi District
	Arua District	Oct.21-Oct.30, 2012	Mr. Zenichi Chiba	3 Nakane Flavia.S	Mpigi District
				1 Geoffrey Sebigo	Luwero District
				2 Mazinga Peter	Luwero District
	Mukono District	Oct.21-Oct.30, 2012	Mr. Kazuhiro Ishizuka	1 Draku Anson A.	Arua District
				2 Adroa David	Arua District
				3 Afimani Simon	Arua District
				4 Vukia A. Michael	Arua District
	Jinja District	Oct.21-Oct.30, 2012	Mr. Yukihiro Sakai	1 Alinaffe Christopher	Mukono District
				2 Muresadra David	Mukono District
				3 Kityo Patrick	Mukono District
				4 Lutwama Herbert	Mukono District
				5 Muggisa John S. Apuuli	Mukono District
	Arua Municipality	Oct.31-Nov.8, 2012	Mr. Zenichi Chiba	1 Buyinza Joseph	Jinja District
				2 Mugweri Charles	Jinja District
				3 Dhamunansi Morris	Jinja District
				4 Kabi Aggrey	Jinja District
				5 Mwaga Robert	Jinja District
				1 Olea Herbert	Arua Municipality
	Mukono Municipality	Oct.31-Nov.8, 2012	Mr. Kazuhiro Ishizuka	2 Afubo Mathew	Arua Municipality
				3 Abima Benard	Arua Municipality
				4 Acema Donato	Arua Municipality
	Jinja Municipality	Oct.31-Nov.8, 2012	Mr. Yukihiro Sakai	5 Avuruk Dorow	Arua Municipality
				6 Droma Jimmy	Arua Municipality
				1 Josiah Sserunjogi	Mukono Municipality
				2 Francis Senwondo	Mukono Municipality
				3 Ssebadduka Harunah	Mukono Municipality
				1 Muhamad Saeed	Jinja Municipality
	Nebbi District	Nov.12-Nov.21, 2012	Mr. Zenichi Chiba	2 Nyende Ramadhan	Jinja Municipality
				3 Kawanguzi J.J	Jinja Municipality
				4 Muxoya Fred	Jinja Municipality
				5 Aryemo Florence	Jinja Municipality
				6 Kaliro Geoffrey	Jinja Municipality
				1 Mavunjina Jimmy	Nebbi District
	Kiboga District	Nov.12-Nov.21, 2012	Mr. Kazuhiro Ishizuka	2 Kerumbe Julius	Nebbi District
				3 Opio Robert	Nebbi District
				4 Kubi James	Nebbi District
				1 Kabanda F. Njuki	Kiboga District
	Gulu Municipality	Nov.22-Nov.30, 2012	Mr. Zenichi Chiba	2 Basabe Barnabas	Kiboga District
				3 Mulungwa Joseph	Kiboga District
1 Mulondo Grace				Kamuli District	
2 Muumba Daniel				Kamuli District	
3 Mugeere Charles				Kamuli District	
1 Orema Samuel				Gulu Municipality	
Wakiso District	Nov.22-Nov.30, 2012	Mr. Kazuhiro Ishizuka	2 Oyella Agnes	Gulu Municipality	
			3 Cuma Conny	Gulu Municipality	
			4 Ojak Christopher	Gulu Municipality	
			5 Ocaka James	Gulu Municipality	
			6 Ocolonga Terence	Gulu Municipality	
			1 Mudali Tom Felix	Wakiso District	
Bugiri District	Nov.22-Nov.30, 2012	Mr. Yukihiro Sakai	2 Nakanudde Ruh	Wakiso District	
			3 Namunubi Lillian	Wakiso District	
			4 Seninde Ismail	Wakiso District	
			5 Didumulira Thomas	Wakiso District	
			6 Sherina. N Kibirango	Wakiso District	
			1 Mugoya Peterson	Bugiri District	
Entebbe Municipality	Dec.3-Dec.11, 2012	Mr. Zenichi Chiba	2 Ikaaba Fred	Bugiri District	
			3 Obwapus Stella	Bugiri District	
			1 Ochaya Frederic Ajusi	Kotido District	
			1 Mukithi Joseph Kiwanuka	Entebbe Municipality	
2 Johnnie Yebaza	Entebbe Municipality				
3 Kyambadde Sam	Entebbe Municipality				
4 Kabunga Brian	Entebbe Municipality				

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Busia District	Dec.3-Dec.11, 2012	Mr. Yukihiro Sakai Road Inventory Survey(3)	1	Eng.Denis Bakesigaki Mwebaze	Busia District			
			2	Obel Godfrey	Busia District			
Tororo District	Jan. 17-Jan.28, 2013	Mr. Kazuhiro Ishizuka Road Inventory Survey(2)	1	Okello J. Robert	Tororo District			
			2	Asaya Andrew Peter	Tororo District			
			3	Ateker Charles	Tororo District			
			4	Wangokho David	Tororo District			
Pallisa District	Jan.29-Feb.7, 2013	Mr. Kazuhiro Ishizuka Road Inventory Survey(2)	1	Ongwara Michael	Pallisa District			
			2	Kooli Sam	Pallisa District			
			3	Okslebo Ben	Pallisa District			
			4	Okello Deogracious	Pallisa District			
Kampala Municipality		Mr. Kazuhiro Ishizuka Road Inventory Survey(2)	1	Andrew Kitaka	Kampala Municipality			
			2	Irumba Richard	Kampala Municipality			
			3	Waswa Joel	Kampala Municipality			
			4	Ntanyungura Denis	Kampala Municipality			
			5	Nnassuuna mirembo	Kampala Municipality			
			6	Nyende Hassan	Kampala Municipality			
			7	Henry Byomire	Kampala Municipality			
			8	Robert Wafula	Kampala Municipality			
Lira Municipality	Mar.3-Mar.13, 2013	Mr. Kazuhiro Ishizuka Road Inventory Survey(2)	1	Okune Fred	Lira Municipality			
			2	Egoo Ocen	Lira Municipality			
			3	Omara Geoffrey	Lira Municipality			
			4	Adong Sarah	Lira Municipality			
Lira District	Mar. 14-Mar.25, 2013	Mr. Kazuhiro Ishizuka Road Inventory Survey(2)	5	Apita Fred	Lira District			
			6	Eren Okello Richard	Lira District			
			7	Arlong Francis	Lira District			
Masaka District	Jan. 17-Jan.28, 2013	Mr. Yukihiro Sakai Road Inventory Survey(3)	1	Jiuko Elias	Masaka District			
			2	Bakyama Chris	Masaka District			
			3	Musoke Rajab	Masaka District			
Rakai District	Jan.29-Feb.7, 2013	Mr. Yukihiro Sakai Road Inventory Survey(3)	1	Ssemplija Samuel	Rakai District			
			2	Muyanja Ambrose	Rakai District			
Mbarara District	Feb. 11-Feb.19, 2013	Mr. Yukihiro Sakai Road Inventory Survey(3)	1	Muhwezi Tophier	Mbarara District			
			2	Muhanguzi Asaph	Mbarara District			
			3	Muchunguzi Joseph	Mbarara District			
			4	Tuhawe Cyril	Mbarara District			
			5	Edrida Musinguzi	Mbarara District			
			6	Benanuka William	Mbarara District			
			7	Nuwagaba Vicent	Mbarara District			
Mbarara Municipality	Feb.20-Feb.28, 2013	Mr. Yukihiro Sakai Road Inventory Survey(3)	1	Eng. Silver Byarugaba	Mbarara Municipality			
			2	Baryaya Sabbath	Mbarara Municipality			
			3	Warugaba Carol	Mbarara Municipality			
			4	Atukwase Aggrey	Mbarara Municipality			
			5	Tuguragum Ramathan	Mbarara Municipality			
			6	Tumushabe Emmanuel	Mbarara Municipality			
			7	Baale Yusuf	Mbarara Municipality			
Ntungamo District	Mar.3-Mar.13, 2013	Mr. Yukihiro Sakai Road Inventory Survey(3)	1	Osiime Nkuba Emmanuel	Ntungamo District			
			2	Betsigwa T. Blason	Ntungamo District			
			3	Mutabazi Deogratius	Ntungamo District			
			4	Nankunda Charles	Ntungamo District			
Kabale Municipality	Mar.14-Mar.25, 2013	Mr. Yukihiro Sakai	1	Tumwesigye Alex	Kabale Municipality			
			Mubende District	May23-May31, 2013	Mr. Kazuhiro Ishizuka Road Inventory Survey(2)	1	Mubiru Charles	Mubende District
						2	Lurimba Arnold	Mubende District
						3	Lutaaya Francis	Mubende District
Hoima District	May13-May22, 2013	Mr. Kazuhiro Ishizuka Road Inventory Survey(2)	4	Mutema Charles	Mubende District			
			1	Tibagwa Charles	Hoima District			
			2	Bagade Hassan	Hoima District			
			3	Ssentamu Julius	Hoima District			
			4	Muhuruzi John	Hoima District			
			5	Kusemererwa Erinaard	Hoima District			
			6	Kihangire Chris	Hoima District			
7	Namakula Judith	Hoima District						
Kanungu District	May23-May31, 2013	Mr. Yukihiro Sakai Road Inventory Survey(3)	1	Matsiko Jude Bende	Kanungu District			
			2	Muhwezi Tophan	Kanungu District			
Kabale District	May13-May22, 2013	Mr. Yukihiro Sakai Road Inventory Survey(3)	1	Turinawe Bagamuhunda	Kabale District			
			2	Tusiime Jude	Kabale District			
			3	Kabagamba Fred	Kabale District			
			4	Twesigye David	Kabale District			
Masindi District	July09-July16, 2013	Mr. Mitsutaka Enomoto Road Inventory Survey(3)	1	Birungi Janet	Masindi District			
			2	Julian Mugisha	Masindi District			
			3	Mulindi Dennis	Masindi District			
			4	Tugume Denis Bazale	Masindi District			
Apac District	June30-July08, 2013	Mr. Mitsutaka Enomoto Road Inventory Survey(3)	1	Ogwang Humphrey	Apac District			
			2	Olinga Samson	Apac District			
			3	Okello Nelson	Apac District			
			4	Ogwal-Ogwang Charles	Apac District			
			5	Okwir Johnson	Apac District			
			6	Odongo Francis	Apac District			
Kabardle District	Jun.3-Jun.11, 2013	Mr. Mitsutaka Enomoto Road Inventory Survey(3)	1	Kamwaka Naome Bascona	Kabardle District			
			2	Basudde Bruno	Kabardle District			
Kasese District	July09-July16, 2013	Mr. Kazuhiro Ishizuka Road Inventory Survey(2)	1	Bwarebale Richard	Kasese District			
			2	Katwamba Alphunse	Kasese District			
			3	Kabudu Moses	Kasese District			
			4	Kisembo Thompson	Kasese District			
			5	Rujumba David	Kasese District			
			6	Kalende George	Kasese District			

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Soroti Municipality	June03-June11, 2013	Mr. Kazuhiro Ishizuka Road Inventory Survey(2)	1	Ebola Felix	Soroti Municipality
			2	Chekwojop Stephen	Soroti Municipality
			3	Okello Simon Ekolu	Soroti Municipality
			4	Kwenci Emmanuel	Soroti Municipality
Mbale Municipality	June12-June20, 2013	Mr. Kazuhiro Ishizuka Road Inventory Survey(2)	1	Womasolo Anthony	Mbale Municipality
			2	Komuhangi Brenda	Mbale Municipality
Mbale District	June21-June27, 2013	Mr. Kazuhiro Ishizuka Road Inventory Survey(2)	1	Nangoyah Willy	Mbale District
			2	Kibona Michael	Mbale District
			3	Mutsaka Fredrick	Mbale District
			4	Wanamama Goefrey	Mbale District
Bushenyi District	June30-July08, 2013	Mr. Kazuhiro Ishizuka Road Inventory Survey(2)	1	Katungye Samuel	Bushenyi District
			2	Biira Jennifer	Bushenyi District
			3	Nuwamanya Moses	Bushenyi District
Fort Portal Municipality	Jun.21-Jun.27, 2013	Mr. Mitsutaka Enomoto Road Inventory Survey(3)	1	Twesige Nasur	Fort Portal Municipality
			2	Balewe Jimmy	Fort Portal Municipality
			3	Olivia Bahwayo	Fort Portal Municipality
Type of Training	Date	Name of Trainer	Name of Attendance		Organization
<i>Training in Japan</i>	July24-Aug.09, 2013	JICA Kansai Kobe City/Sakai City in Japan Kyoto & Setsunan Univ. Hanshin Expressway Engineering TOYO Tecs	1	Alex N. Baguma	MOWT
			2	Banga Victor	MOWT
			3	Kisitu Timothy	MOWT
			4	Okulla Yacobwam	MOWT
			5	Ssozi Vincent	MOWT

Annex 7. Equipment inputs by Japanese side

NO	Purchasing Date	Description/Name of equipment / Goods	Specification · Standard	QTY	Price	Unit	Place of Use
1	31 March 2012	Wi-Fi Router Linksys WRT54GL	Wireless-G, 2.4Ghz IEEE 802.3, IEEE 802.3u, IEEE 802.11g, IEEE 802.11b Antennas: 2 External Ethernet ports x speed: 4 x 10/100	1	385,000	UGX	Office
2	02 April 2012	Laser Printer Canon image runner 2520	Paper size, A3,A4 Photocopier black and white	1	3,330	USD	Office
3	02 April 2012	UPS, APC650Va	backup 650v, 3 output	1	170	USD	Office
4	07 May 2012	Projector Acer X1161P	Direct LED lamp 360 view	1	1,900,000	UGX	Office & JCC
5	08 June 2012	Arc GIS Arc View	Ver.10.1	5	15,000	USD	Office
6	08 June 2012	AutoCAD Map 2012	Map 3D 2013	5	39,900	USD	Office
7	08 June 2012	iPhone 4s	64Gb Black	4	4,000	USD	Site
8	08 June 2012	Handy GPS Garmin eTrex 20	3m offset GLONASS,65k color, USB 2.0,	30	9,300	USD	Site
9	08 June 2012	Digital Camera with GPS Nikon Cool Pix AW100	16MP, full HD, world map, shock proof, water proof, internal memory	30	20,550	USD	Site
10	16 June 2012	Laptop PC HP Probook 4530s	Intel Core i5, 4gb RAM, 500GB HDD	12	15,600	USD	Office
11	13 July 2012	Inkjet Color Printer HP office jet 7500A	Inkjet, Wireless, A3/A4, color scanner	1	740	USD	Office
12	20 July 2012	VIMS system DC-204R Controller with Ba-104(Battery pack) Acceleration transducer: ARH-20A /Tokyo Sokki Kenkyujo Co., Ltd.	Miniature size in 84(W)x42(H)x157(D)mm with 4-channel construction, 200kHz sampling(in 1channel mode, at maximum speed)	1	600,000	JPY	Site
13	19 August 2012	Laser measurement equipment Bosch GLM 50	50m direct range	1	36,572	JPY	Site
14	06 March 2014	VIMS software JIP Techno-Science Co.,Ltd.	Ver. 2.4	1	600,000	JPY	Office
15	28 December 2013	Drive recorder Blackvue DR500GW-HD	Full HD, 30fps,Built in wifi, gps, voice guide	4	115,600	JPY	Office
16	05 January 2014	External Hard Disk Drive Western Digital 1TB	Portable Hard Disk, USB3.0/USB2.0, 1TB	4	35,920	JPY	Office

CERTIFICATE OF HANDOVER

DISTRICT AND URBAN ROADS (DUR) MAPPING AND ROADS DATABASE PROJECT

This is to certify that the equipments in the attached list for above-mentioned project have been handed over properly as of October 3rd, 2014 to Ministry of Works and Transport in the Republic of Uganda.


(signature)

Kyosuke Kawazumi
Chief Representative
Japan International Cooperation
Agency (JICA) Uganda Office


(signature)

Alex Onen
Ag. Assistant Commissioner National Roads
Ministry of Works and Transport
The Republic of Uganda

February 6th, 2015
Ministry of Works and Transport
In the Republic of Uganda

List of Equipment

No.	Name of Item	Qty.	Place of Delivery	Date of Handover	Remarks
1	Wi-Fi Router Linksys WRT54GL	1	MoWT	October 03, 2014	Both sides confirmed that this item should be utilized by JICA Study team for Northern Corridor Master Plan.
2	Laser Printer Canon image runner 2520	1	MoWT	October 03, 2014	Both sides confirmed that this item should be utilized by JICA Study team for Northern Corridor Master Plan.
3	UPS APC650Va	1	MoWT	October 03, 2014	Both sides confirmed that this item should be utilized by JICA Study team for Northern Corridor Master Plan.
4	Projector Acer X1161P	1	MoWT	October 03, 2014	Both sides confirmed that this item should be utilized by JICA Study team for Northern Corridor Master Plan.
5	Arc GIS Arc View	5	MoWT	October 03, 2014	
6	AutoCAD Map 2012	5	MoWT	October 03, 2014	
7	iPhone 4s	4	MoWT	October 03, 2014	
8	Handy GPS Garmin eTrex 20	30	MoWT	October 03, 2014	
9	Digital Camera with GPS Nikon Cool Pix AW100	30	MoWT	October 03, 2014	
10	Laptop PC HP Probook 4530s	12	MoWT	October 03, 2014	
11	Inkjet Color Printer HP office jet 7500A	1	MoWT	October 03, 2014	Both sides confirmed that this item should be utilized by JICA Study team for Northern Corridor Master Plan.
12	VIMS system DC-204R Controller with Ba-104 (Battery pack) Acceleration transducer: ARH-20A /Tokyo Sokki Kenkyujo Co., Ltd.	1	MoWT	October 03, 2014	
13	Laser measurement equipment Bosch GLM 50	3	MoWT	October 03, 2014	
14	VIMS software JIP Techno-Science Co.,Ltd.	1	MoWT	October 03, 2014	
15	Drive recorder Blackvue DR500GW-HD	4	MoWT	October 03, 2014	
16	External Hard Disk Drive Western Digital 1TB	4	MoWT	October 03, 2014	