15. SELECTION OF PRIORITY PROJECTS

15.1 Conceptual Methodology of Project Selection

15.1.1 Principle for Project Selection

The results of preliminary cost estimation proffered that the total project cost would exceed 120 million USD, if all national, district and important community access roads in Amuru and Nwoya Districts were upgraded to meet the design standard and service level of the desired functional classification. However, the funds channelled towards road improvement works are very scarce. Thus, there is a need for evaluating the priority of the projects to fully make the best use of the limited budget and maximize the benefits derived from the investment in road improvement projects. The following principles were set for the project evaluation and selection exercise.

- The method for selection of priority projects should be applicable to all the districts in Acholi sub-region (and elsewhere). Therefore, the methodology applied to this selection exercise had to be straightforward and input data required for it had to be locally and reasonably available. The input data could also be subjective if quantifiable data was not available.
- The method applied to this project selection exercise had to be shared among all the stakeholders. Therefore, local participation was encouraged in identification of the criteria, allocation of weights and quantitative/qualitative assessment of the projects, preferably by brain-storming workshops and/or questionnaire surveys.
- The intermediate and target years were set as 2018 and 2030. It was assumed that the implementation of high priority projects, proposed in this project selection exercise, would be completed by 2018. The rest of the proposed projects were assumed to be completed by 2030.

15.2 Step-wise Procedure for Project Selection

Following the above-mentioned principles, this Study proposed formulation of the road improvement master plan in Amuru and Nwoya Districts through the following steps:

- At an initial stage of the selection exercise, a long list of the projects was prepared. This long list of projects was not limited to national roads and district roads, but also included other local roads which did not meet the structural requirements of the desired road classification/class.
- Comparing current structural design and service levels of the study roads to those of the desired road classification/class, the projects were short listed (called ‘necessary

projects') if current service levels and desired service levels of the study roads are dissimilar.

- Project evaluation criteria were determined, considering data availability of evaluation criteria. The following evaluation criteria were, therefore, suggested to be applied to this project selection exercise:

  i. Cost efficiency (e.g., traffic volume, project cost per vehicle km, time distance from district centre)

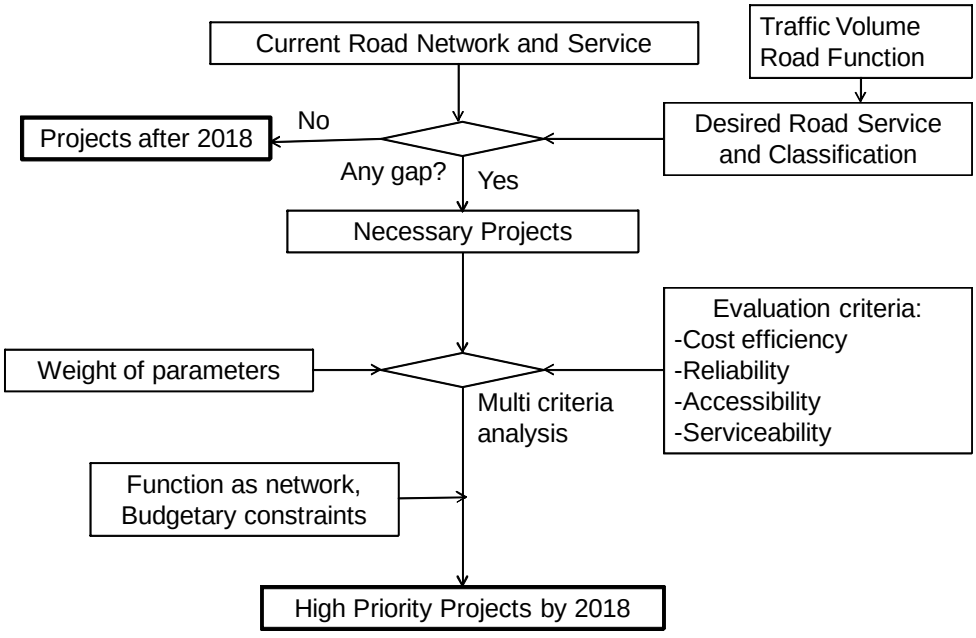
  ii. Reliability (e.g., likely deteriorated road section)

  iii. Accessibility (e.g., access to hospital, access to school)

  iv. Serviceability (e.g., roadside population, availability of safe water, area underserved by social infrastructures, villages where the IDPs tend to return)

- Parameters of each evaluation criterion were prepared in a numerical manner. In practice, the above mentioned evaluation criteria were not always available and, thus, the criteria could be subjectively evaluated based on the ranking method (e.g., positive, neutral and negative) or pair comparison method (e.g., A vs. B, A vs. C, …).

- To determine priority projects, all necessary projects were evaluated by a multi criteria analysis; weighting the evaluation criteria of each project. During this Study, these weights of evaluation criteria were initially proposed by the Study Team and confirmed in the stake holders meetings for the Draft Final Report. A brain-storming workshop, prior to the stake holders meeting, provided a good opportunity to fine tune scores and weights of these evaluation criteria.



Source: JICA Study Team

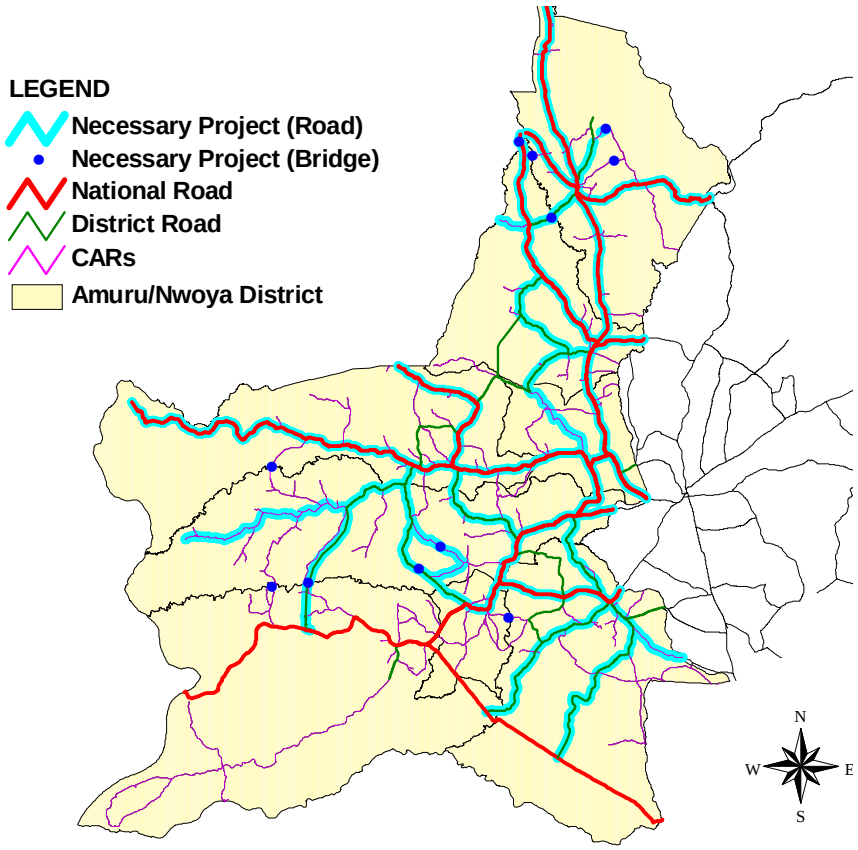
Figure 15.2.1 Procedure for Project Selection

15.3 Necessary Road Improvement Projects in Amuru and Nwoya Districts

As explored in Chapter 14, all the road sections in Amuru and Nwoya Districts were classified into 15 classes, considering desired road functional classification and service level. These study roads were not limited to national roads and district roads, but also included other local

roads such as important community access roads. Comparing current structural design and service levels of the study roads to those of desired road classification/class, the projects were short listed (called 'necessary projects') if current service levels and desired service levels of the study roads were dissimilar.

The following location map shows necessary road and bridge improvement projects in Amuru and Nwoya Districts. These projects were tested by the evaluation criteria and their priorities were evaluated, as shown in the following section, to determine the high priority projects.



Source: JICA Study Team

Figure 15.3.1 Map Showing Locations of Necessary Projects to be implemented by 2018

15.4 Evaluation and Selection of Priority Projects

15.4.1 Evaluation Criteria and Parameters

The following discussion illustrates the process undertaken in establishing the high priority projects from amongst the necessary projects in Amuru and Nwoya Districts. These high priority projects were selected by employing multi criteria analysis. The multi criteria analysis incorporated several evaluation criteria and weights of these criteria; ranking priority of each road section among the necessary projects.

This multi criteria analysis had to involve all the stakeholders for this study. They assisted in identification of the criteria, allocation of weights and quantitative assessment of the projects. To accomplish this, the necessary projects were first evaluated via a quantitative appreciation by which the projects were appreciated and evaluated against a set of decision criteria: (i) cost efficiency criteria, and (ii) social impact criteria.

- Cost efficiency criteria evaluate how the project contributes to future economic development of the region. These criteria include traffic volume, project cost per vehicle km, and travel time from district centre.
- Social impact criteria evaluate how the project contributes to enhancing livelihoods in the community. These criteria include bottlenecks during the rainy season (reliability), access to the social infrastructures (accessibility) and roadside population, and coverage area by social infrastructures (serviceability).

15.4.2 Weights of Parameters

As discussed above, the evaluation criteria of the projects were prepared by ranking. The final evaluation results were reached by weighing the ranking of the evaluation criteria. Two sets of weights allocated to the different evaluation criteria were prepared to aid the decision making process: Cost efficiency oriented weights and social impact oriented weights. The following table summarizes the weights of the evaluation criteria applied to this evaluation exercise.

Table 15.4.1 Weights of Evaluation Parameters

Evaluation Items		Cost efficiency oriented	Social impact oriented
Cost efficiency	Traffic volume	30%	
	Project cost per vehicle km,	40%	
	Time distance from district centre	30%	
Reliability	Likely deteriorated road section		20%
Accessibility	Access to schools		10%
	Access to hospitals		10%
Serviceability	Number of returnees		50%
	Availability of safe water		10%
	Total	100%	100%

Source: JICA Study Team

15.4.3 Local Perspectives on Evaluation Criteria and Weights of Parameters

As mentioned in the first section of this chapter, local participation was essential for identification of the criteria, allocation of weights and quantitative/qualitative assessment of the projects. Therefore, the JICA Study Team conducted a series of interviews with the relevant local officials to confirm the evaluation criteria and weights of the evaluation parameters. At the initial stage of the evaluation exercise, evaluation criteria were tested by the District Engineer of Amuru District and a Social Worker and Planner from Pabbo Sub-county. As a consequence, two evaluation criteria, cost efficiency and social impact, were considered more important and selected from amongst four evaluation criteria (cost, cost efficiency, social impact and the environment). Furthermore, based on the interviews with these officials, two sets of weights of the evaluation parameters were prepared, as presented in Table 15.4.1.

Using these evaluation criteria and the weights of the evaluation parameters, the JICA Study Team preliminarily identified priority projects and demonstrated the progress of this selection exercise to the local officials at the technical workshop held on 26 July, 2010. The methodology and approach applied in the selection of the priority projects were, in general, accepted by the participants at the workshop. The Study Team conducted a questionnaire survey to confirm the weights of the evaluation criteria to select different administrative roads and received six responses from the officials of Kitgum District, Gulu District, Nwoya District, Agago District and Pader District.

Table 15.4.2 summarizes the average weights of the evaluation parameters for selection of national, district and community access roads, estimated from the response to the questionnaire by local officials. Comparing the weights applied to this evaluation exercise (shown in Table 15.4.1), cost efficiency oriented weights showed similar results to those for selection of national roads, as proposed by local officials. On the other hand, results obtained using social impact oriented weights were more or less similar to those obtained in selection of community access roads. Accordingly, it was concluded that the two sets of weights allocated to the evaluation criteria, cost efficiency oriented and social impact oriented weights, were valid for use in selection of the priority projects in the study.

Table 15.4.2 Weights of Evaluation Parameters by Questionnaire Survey

Evaluation Items	National Road	District Road	CARs
Cost efficiency	82.5%	60.0%	2.0%
Reliability	0.0%	0.0%	8.0%
Accessibility	17.5%	22.0%	36.0%
Serviceability	0.0%	18.0%	54.0%
Total	100.0%	100.0%	100.0%

Source: JICA Study Team

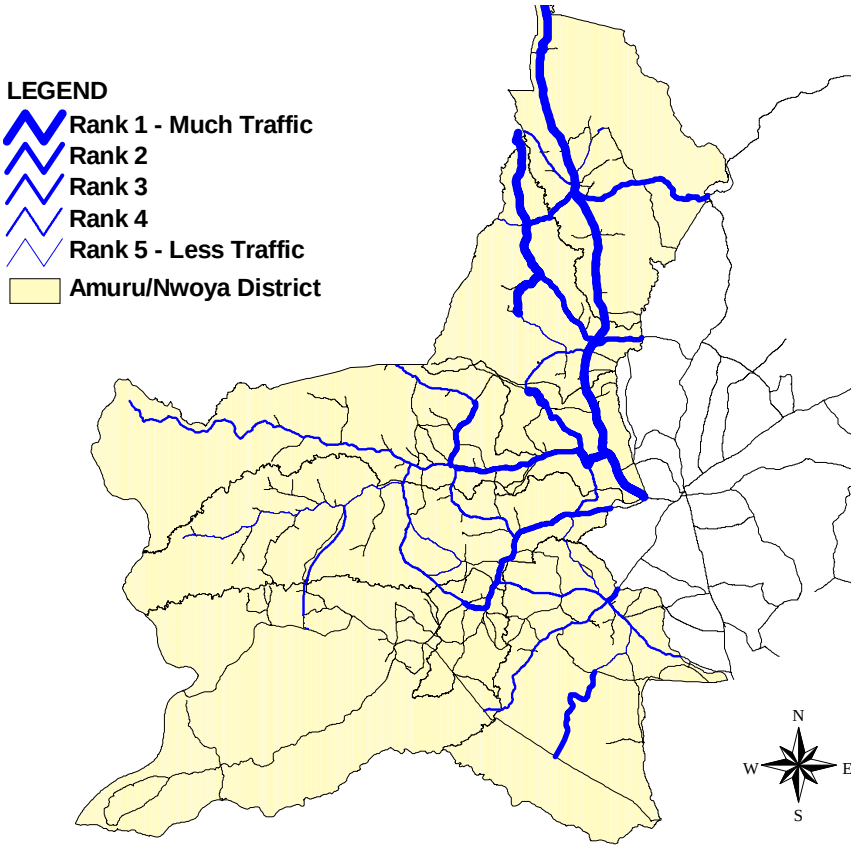
15.4.4 Summary of Project Evaluation

As discussed above, necessary projects as well as evaluation criteria were determined. This section explores evaluation of these projects and provides an input to select the priority projects and the mid-term road/bridge improvement master plan in Amuru and Nwoya Districts. In the course of the evaluation process, evaluation criteria of these projects were expressed in a numerical manner. These evaluation criteria were ranked as follows: from Rank 1, of which the figure of evaluation criteria is considerably large, to Rank 5, of which the figure of evaluation criteria is considerably small. Once all the projects were ranked for each evaluation criterion, the multi criteria analysis was conducted to examine the most attractive projects by testing weighted ranking of the projects. Using the above mentioned weighting of the decision parameters, each project's score was established by multiplying the weighting of the decision parameters and the ranking of each parameter[1].

[1] For the multi criteria analysis, ranking of each evaluation parameter is changed in the following numerical manner: Rank 1: 10-9, Rank 2: 8-7, Rank 3: 6-5, Rank 4: 4-3, Rank 5: 2-1.

(1) Traffic Volume

One of the cost effectiveness indices is the traffic demand on the project road. A daily traffic volume of the project was estimated based on the traffic demand forecast, which was explored in Chapter 12. Figure 15.4.1 illustrates the ranking of each project based on future traffic volume of the project road in 2030 and these traffic volumes vary considerably by project road. Accordingly, the daily traffic volume of each project was ranked as follows: Rank 1 (more than 350 PCU/day), Rank 2 (between 50 PCU/day and 350 PCU/day), Rank 3 (20 PCU/day and 50 PCU/day), Rank 4 (between 10 PCU/day and 20 PCU/day), and Rank 5 (no vehicles projected).

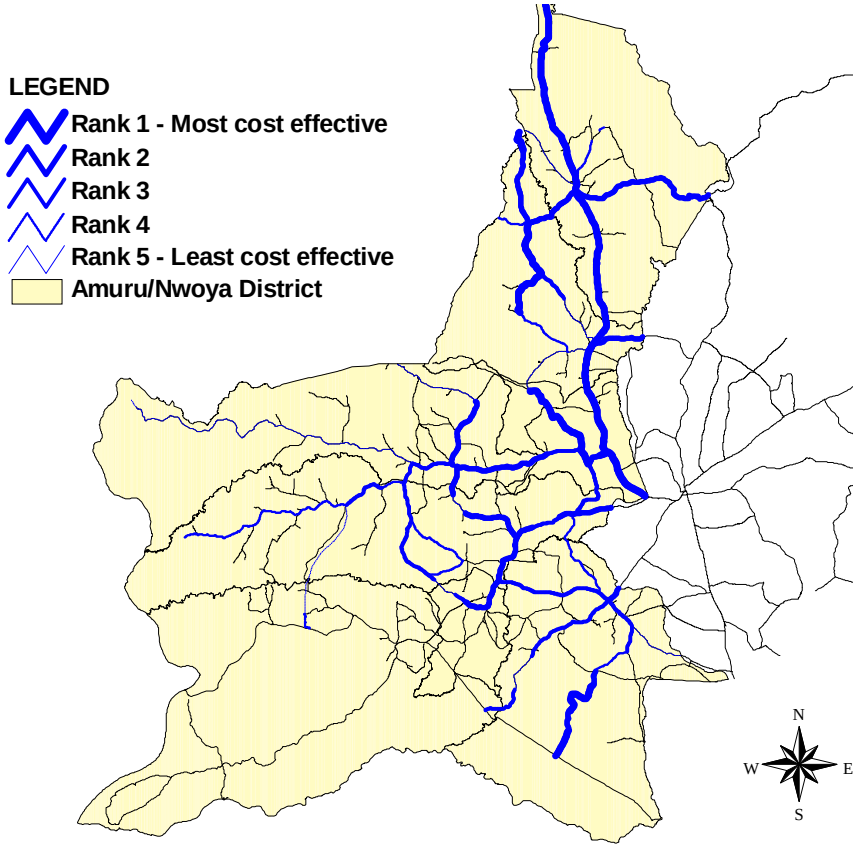


Source: JICA Study Team

Figure 15.4.1 Project Ranking (Traffic Volume)

(2) Cost per Vehicle Kilometre

Another cost effectiveness index of road projects is the cost per vehicle kilometre, dividing unit construction cost by future traffic volume. Figure 15.4.2 illustrates the ranking of the cost per vehicle kilometre of each project road. The cost effectiveness index of each project was ranked as follows: Rank 1 (less than 1.5 million Ushs/vehicle km), Rank 2 (between 1.5 and 4.4 million Ushs./vehicle km), Rank 3 (between 4.4 and 14.6 million Ushs./vehicle km), Rank 4 (between 14.6 and 16.3 million Ushs./vehicle km), and Rank 5 (more than 16.3 million Ushs./vehicle km).

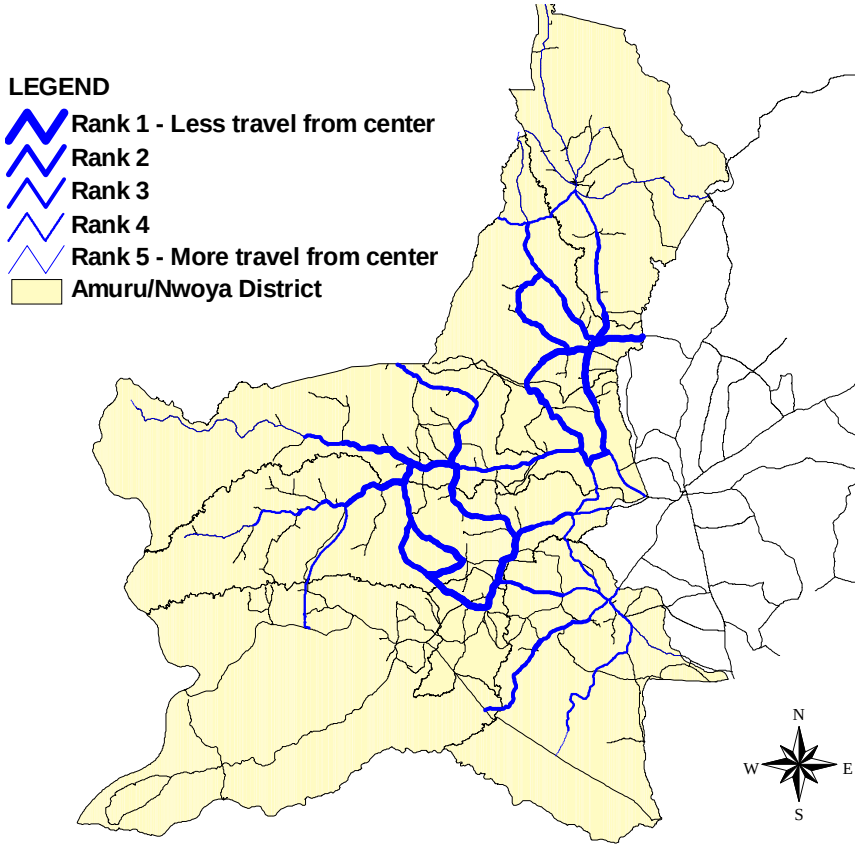


Source: JICA Study Team

Figure 15.4.2 Project Ranking (Cost Efficiency)

(3) Time Distance from District Centre

The last cost effectiveness index of road projects is time distance from the district centre, where economic activities are concentrated and road improvement projects contribute to expansion of the regional economy. Figure 15.4.3 illustrates ranking by time distance from district centres (Pabbo, Otwee and Anaka) of each project road. The cost effectiveness index for each project was ranked as follows: Rank 1 (within 15 km from district centres), Rank 2 (between 15 and 20 km), Rank 3 (between 20 and 25 km), Rank 4 (between 25 and 30 km), and Rank 5 (more than 30 km).

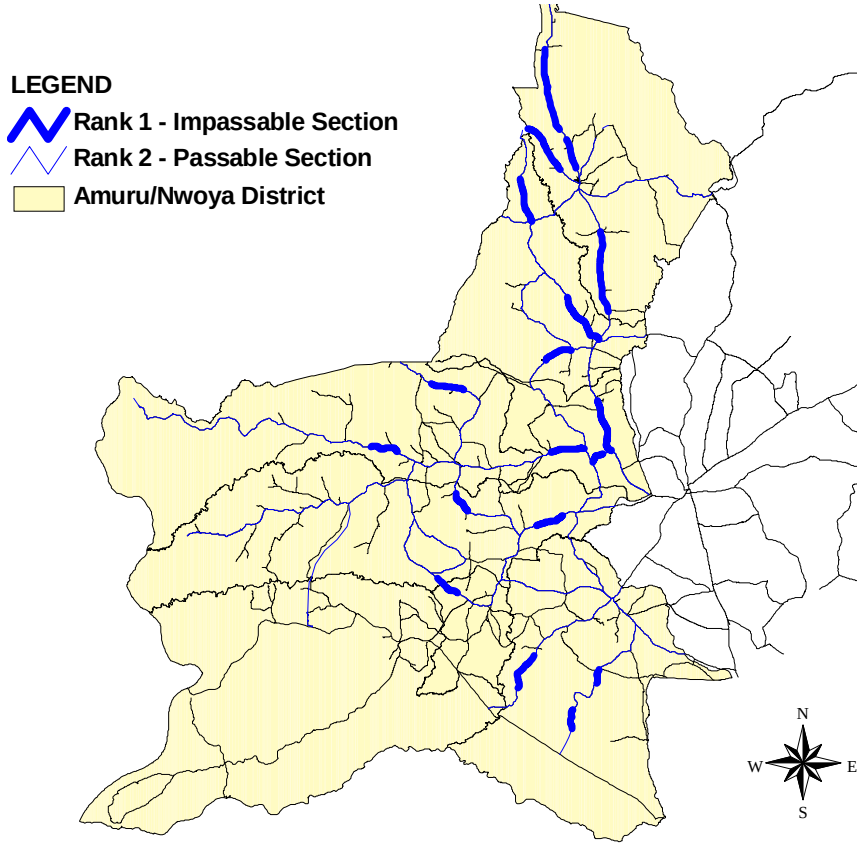


Source: JICA Study Team

Figure 15.4.3 Project Ranking (Time Distance from District Centre)

(4) Likely Deteriorated Road Section

The reliability index of road projects was prepared separately, representing likely deteriorated road sections where the deteriorated surface condition during the rainy season would affect the flow of traffic and pedestrians. These likely deteriorated roads were identified by considering the topography of the study area and the location of the existing roads and rivers. Figure 15.4.4 illustrates likely deteriorated road sections of each project road. The reliability index of each project was therefore ranked as follows: Rank 1 (likely deteriorated road section) and Rank 2 (always passable road sections).

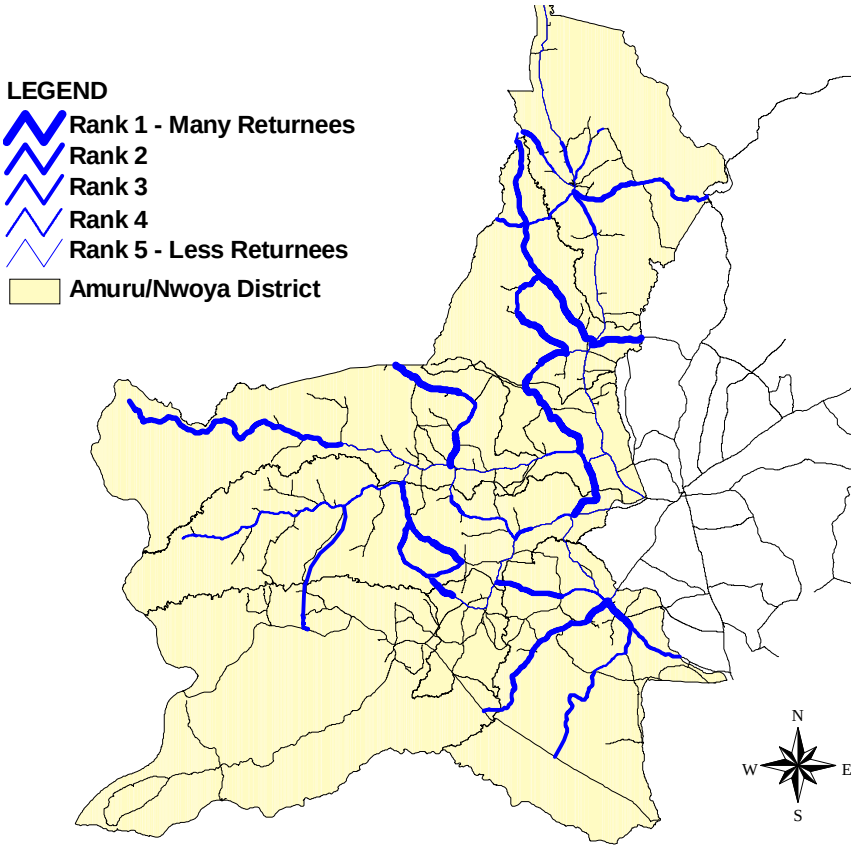


Source: JICA Study Team

Figure 15.4.4 Project Ranking (Likely Deteriorated Road Section)

(5) Number of Returnees

The overall objective of this study is to accelerate the IDPs' return process; therefore, the number of returnees, as a serviceability index of road improvement projects, was employed as one of the evaluation criteria of the project. Figure 15.4.5 illustrates ranking by the number of returnees along the road side. This serviceability index of each project was ranked as follows: Rank 1 (more than 28 returnees/km), Rank 2 (between 11 and 28 returnees/km), Rank 3 (between 2 and 11 returnees/km), Rank 4 (between less than 2 returnees/km and decrease of less than 18 people/km along the project road), and Rank 5 (decrease of more than 18 people/km along the project road).

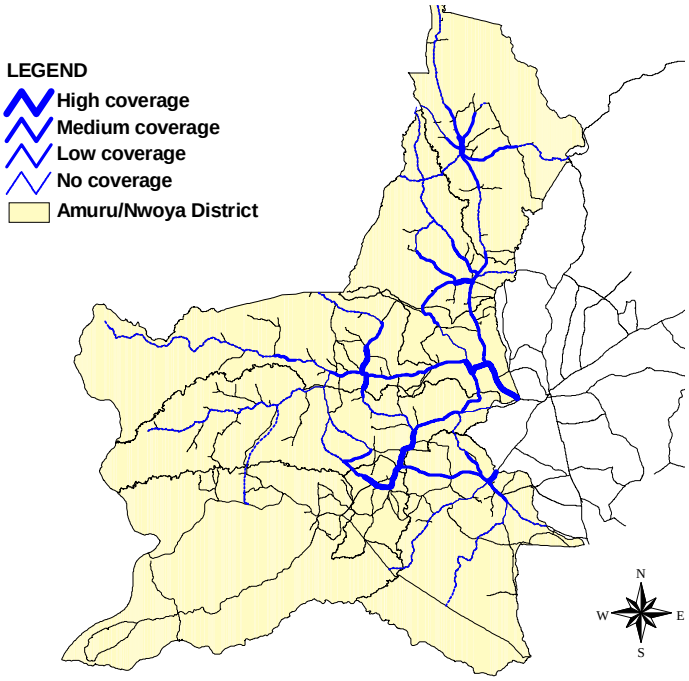


Source: JICA Study Team

Figure 15.4.5 Project Ranking (Number of Returnees)

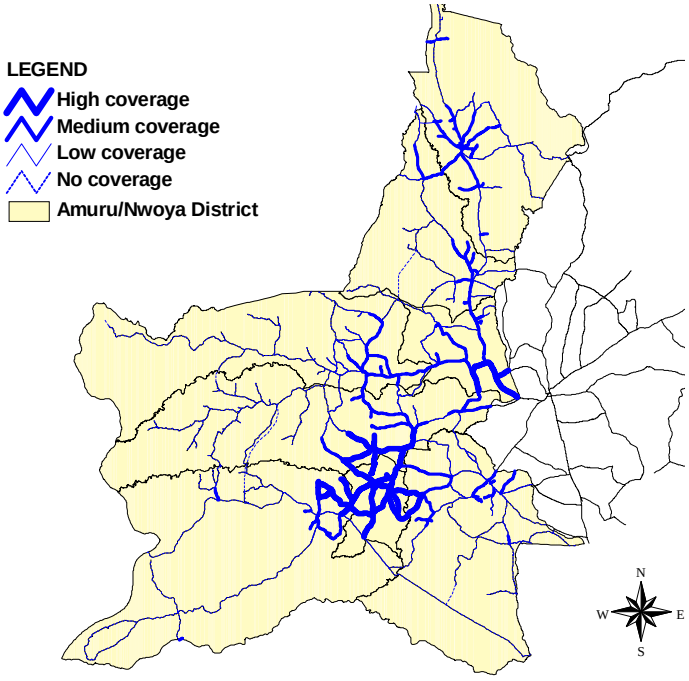
(6) Access to Social Infrastructures

Another serviceability index of road projects is availability and accessibility to the social infrastructures such as schools and hospitals/clinics. Figures 15.4.6 and 15.4.7 illustrate the ranking of the coverage area of the social infrastructures and their access roads. This ranking of coverage area by the social infrastructures was prepared, considering the features of each social infrastructure, such as the number of students, the number of teachers, and type of hospital.



Source: JICA Study Team

Figure 15.4.6 School Coverage



Source: JICA Study Team

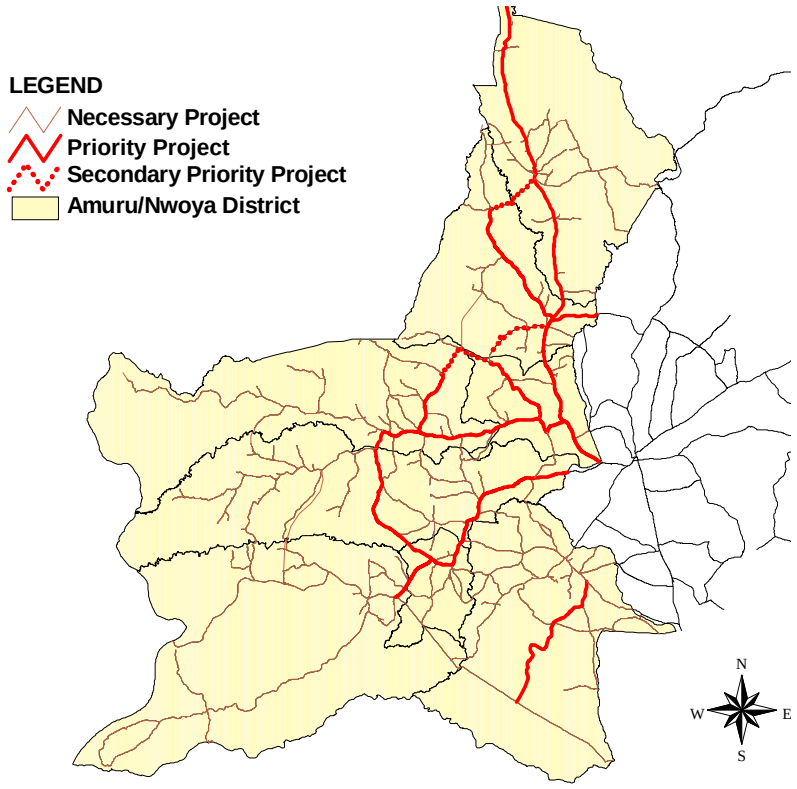
Figure 15.4.7 Health Centre Coverage

(7) Selection of Priority Projects

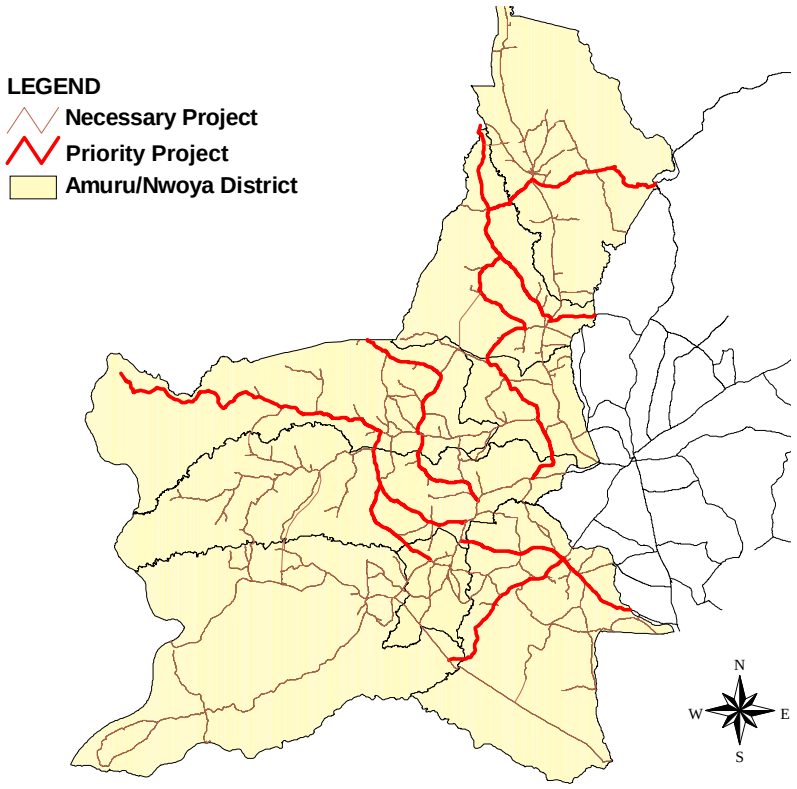
As discussed above, the evaluation criteria of the projects were prepared by ranking (Rank 1-5). The final evaluation was obtained by weighing the ranking of the evaluation criteria. Two sets of weights allocated to the different evaluation criteria were prepared to aid in the decision making process. Using the above mentioned weighting of the decision parameters, each project's score was determined by multiplying the weighting of the decision parameters and the ranking of each parameter. Considering budgetary constraints (assuming the total investment of around 50 million USD up to 2018 can be utilized for road and bridge improvement projects), two sets of priority projects by the different weighting systems were suggested.

- Using the cost efficiency oriented weights of the evaluation parameters, 336.6 km of priority projects were selected in total, including 221.1 km of national roads (66%), 99.4 km of district roads (30%) and 16.1 km of important community access roads (5%). Total project cost (construction cost) for these priority projects would amount to 66.4 million USD, including on-going road improvement projects between Gulu and Nimule.
- Using the social impact oriented weights, 379.6 km of priority projects were selected. More local roads were selected as priority projects, accounting for 46% of the total road length of the priority projects. Total project cost (construction cost) for these priority projects would amount to 53.1 million USD.

In reality, both central and local governments have very limited budgets for road improvement projects. Defining the over-lapping priority projects by both weights of evaluation parameters as the high priority projects, 117.9 km of road sections were considered as the high priority projects. The total project cost for these high priority projects was estimated at 17.5 million USD up to 2018. It should be noted that the high priority projects will be modified, omitting on-going road and bridge projects and adding some road sections to ensure continuity of the road network.



Cost Efficiency Oriented Evaluation



Social Impact Oriented Evaluation

Source: JICA Study Team

Figure 15.4.8 Priority Projects

Table 15.4.3 Evaluation of Priority Projects

Unit: million Ushs.

Road Classification	All Necessary Projects by 2018 (million Ushs.)			Road Length (km)	Priority Projects by 2018 Selected by Cost Efficiency (million Ushs.)			Road Length (km)	Priority Projects by 2018 Selected by Social Impact (million Ushs.)			Road Length (km)	Priority Projects Selected by Both Cost Efficiency and Social Impact (million Ushs.)			Road Length (km)
	Road	Bridge	Total		Road	Bridge	Total		Road	Bridge	Total		Road	Bridge	Total	
AMURU																
CAR	615.1	4,331.1	4,946.2	7.2												
District	10,041.2	817.0	10,858.2	74.5	7,032.6	817.0	7,849.6	39.7	7,570.6	817.0	8,387.6	49.8	5,231.6	817.0	6,048.6	22.8
Important CAR	1,298.8		1,298.8	16.1	1,298.8		1,298.8	16.1	1,298.8		1,298.8	16.1	1,298.8		1,298.8	16.1
National-reclassified	88,184.4	817.0	89,001.4	227.5	36,515.7	817.0	37,332.7	87.0	64,226.8		64,226.8	178.0	21,215.1		21,215.1	51.4
National-existing	59,457.8		59,457.8	97.5	59,457.8		59,457.8	97.5								
Sub-total	**159,597.2**	**5,965.1**	**165,562.3**	**422.7**	**104,304.9**	**1,634.0**	**105,938.9**	**240.3**	**73,096.2**	**817.0**	**73,913.2**	**243.9**	**27,745.5**	**817.0**	**28,562.5**	**90.3**
NWOYA																
CAR	4,529.9	3,401.0	7,930.9	52.9					1,050.7	2,992.5	4,043.2	12.3				
District	27,764.6		27,764.6	170.9	12,031.5		12,031.5	59.6	16,584.1		16,584.1	84.7	5,478.9		5,478.9	27.7
Important CAR	1,112.9		1,112.9	10.9					1,112.9		1,112.9	10.9				
National-reclassified	19,936.8		19,936.8	67.1	11,339.3		11,339.3	36.7	7,751.6		7,751.6	27.9				
National-existing																
Sub-total	**53,344.3**	**3,401.0**	**56,745.3**	**301.9**	**23,370.8**	**0.0**	**23,370.8**	**96.3**	**26,499.3**	**2,992.5**	**29,491.8**	**135.7**	**5,478.9**	**0.0**	**5,478.9**	**27.7**
Grand-total	**212,941.5**	**9,366.1**	**222,307.6**	**724.6**	**127,675.7**	**1,634.0**	**129,309.7**	**336.6**	**99,595.5**	**3,809.5**	**103,405.0**	**379.6**	**33,224.4**	**817.0**	**34,041.4**	**117.9**

Unit: million USD

Road Classification	All Necessary Projects by 2018 (million USD)			Road Length (km)	Priority Projects by 2018 Selected by Cost Efficiency (million USD)			Road Length (km)	Priority Projects by 2018 Selected by Social Impact (million USD)			Road Length (km)	Priority Projects Selected by Both Cost Efficiency and Social Impact (million USD)			Road Length (km)
	Road	Bridge	Total		Road	Bridge	Total		Road	Bridge	Total		Road	Bridge	Total	
AMURU																
CAR	0.3	2.2	2.5	7.2												
District	5.2	0.4	5.6	74.5	3.6	0.4	4.0	39.7	3.9	0.4	4.3	49.8	2.7	0.4	3.1	22.8
Important CAR	0.7		0.7	16.1	0.7		0.7	16.1	0.7		0.7	16.1	0.7		0.7	16.1
National-reclassified	45.3	0.4	45.7	227.5	18.7	0.4	19.2	87.0	33.0		33.0	178.0	10.9		10.9	51.4
National-existing	30.5		30.5	97.5	30.5		30.5	97.5								
Sub-total	**81.9**	**3.1**	**85.0**	**422.7**	**53.5**	**0.8**	**54.4**	**240.3**	**37.5**	**0.4**	**37.9**	**243.9**	**14.2**	**0.4**	**14.7**	**90.3**
NWOYA																
CAR	2.3	1.7	4.1	52.9					0.5	1.5	2.1	12.3				
District	14.3		14.3	170.9	6.2		6.2	59.6	8.5		8.5	84.7	2.8		2.8	27.7
Important CAR	0.6		0.6	10.9					0.6		0.6	10.9				
National-reclassified	10.2		10.2	67.1	5.8		5.8	36.7	4.0		4.0	27.9				
National-existing																
Sub-total	**27.4**	**1.7**	**29.1**	**301.9**	**12.0**		**12.0**	**96.3**	**13.6**	**1.5**	**15.1**	**135.7**	**2.8**		**2.8**	**27.7**
Grand-total	**109.3**	**4.8**	**114.1**	**724.6**	**65.5**	**0.8**	**66.4**	**336.6**	**51.1**	**2.0**	**53.1**	**379.6**	**17.1**	**0.4**	**17.5**	**117.9**

Source: JICA Study Team

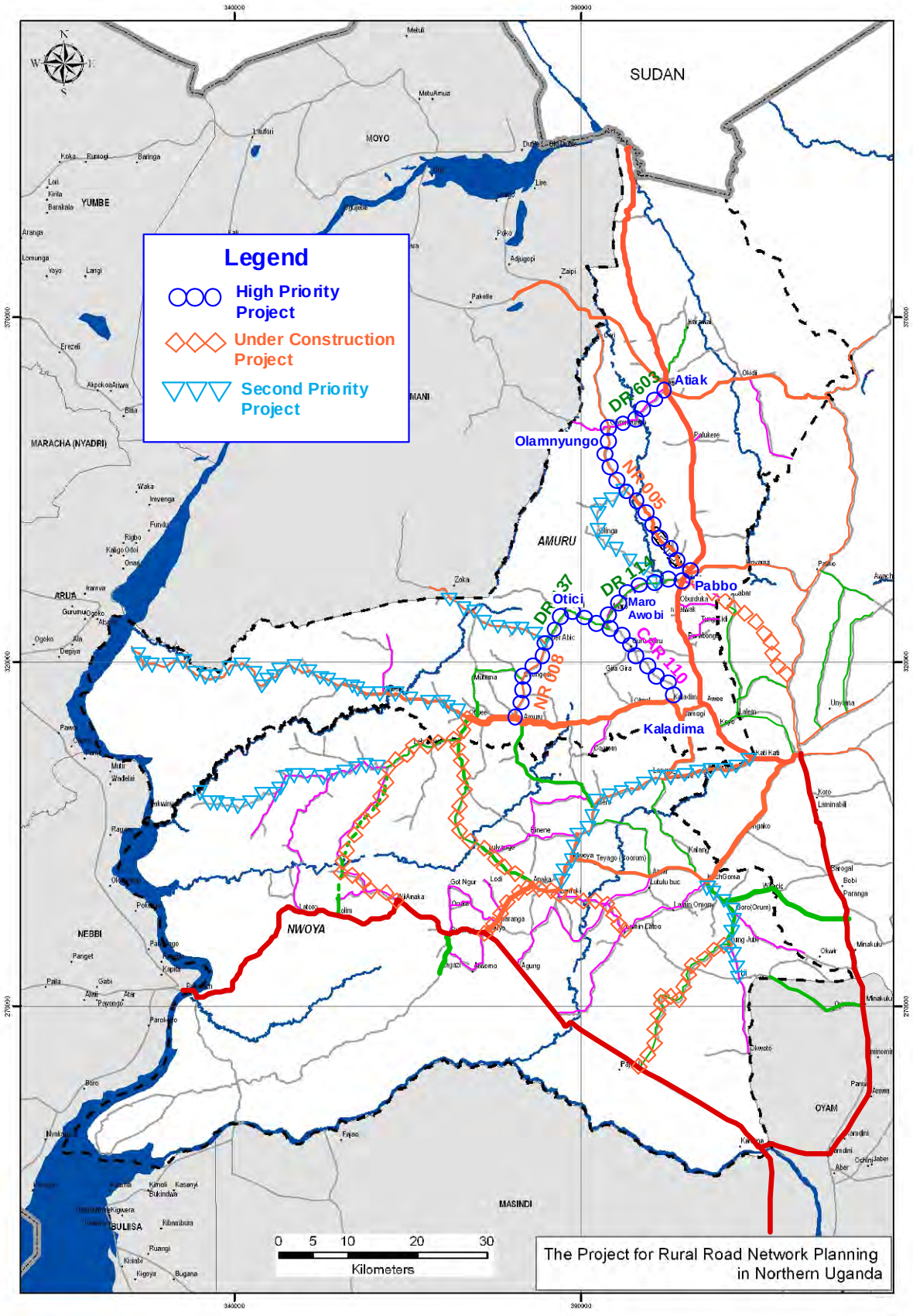
(8) Discussion on Optimum Intervention

As discussed in Chapter 8 of this report, the central and local governments have very limited funds for improvement of both national roads and district/community access roads. The National Transport Master Plan suggests investments in improvement of newly classified national roads. However, the amount of investment only meets required budget for rehabilitation works of these national roads. Former Amuru District received insufficient funds channelled to its district roads: 0.13 million USD for improvement of two district roads in 2008/09 and 0.27 million USD for rehabilitation of the district roads in 2010/11. Thus, Amuru and Nwoya Districts need to be advised on optimum and practical interventions for improvement of the road network, considering the budgetary constraints.

The following bullet points were considered in preparation of the optimum intervention for improvement of the road network in Amuru and Nwoya Districts.

- Some road sections of the district road, mainly in Nwoya District, are under construction as a pilot project of this Study, e.g., road improvement and bridge installation along Otwee-Anaka Road and Otwee-Wii Anaka Road. Also, other road sections of national/district/community access roads are under preparation of the construction works, using Japanese Peace Building Grant Aid, e.g., Owee-Pabbo Road Improvement (CAR), Laminlatoo-Lamoki Road Improvement (CAR), and Anaka-Olwiyo Road Improvement (National Road). The road sections of these on-going road projects were omitted from the selection of high priority projects.
- The high priority projects, selected by both cost efficiency criteria and social impact criteria, could derive and maximize the expected benefits when the road sections of these projects would be fully upgraded as proposed in this study. Accordingly, it was suggested that the road sections of high priority projects would be fully upgraded to meet the desired functional classification and its service level.
- The second priority projects were selected, considering connectivity of the on-going and high priority projects and social impacts generated by the projects. It was suggested that the road sections of second priority projects would be rehabilitated and partially upgraded where likely deteriorated road sections were observed.

Figure 15.4.9 shows the locations of the high priority projects and second priority projects. As a consequence, a total of 94.3 km of road length of high priority projects were identified, amounting to the project cost of 17.1 million USD. An additional 173.6 km of second priority projects were identified at a project cost of 11.2 million USD.



Source: JICA Study Team

Figure 15.4.9 Location Map of High Priority Projects and Second Priority Projects

Table 15.4.4 List of High Priority Projects and Second Priority Projects

SN	Project Title	Administrative Classification	District	Priority Project	Road Length (km)	Project Cost (million USD)
1	CAR110	CAR	Amuru	High	16.1	0.8
2	DR114	District	Amuru	High	15.3	2.9
3	DR137	District	Amuru	High	12.7	0.9
4	DR603	District	Amuru	High	11.0	1.3
5	NR005	National	Amuru	High	26.1	8.4
6	NR008	National	Amuru	High	13.1	2.8
				Sub-total	94.3	17.1
7	NR002	National	Amuru	Second	59.3	4.1
8	CAR151, 162	CAR	Nwoya	Second	32.7	1.9
9	NR003	National	Nwoya	Second	27.4	1.7
10	CAR188, 189	CAR	Nwoya	Second	16.8	1.0
11	NR008	National	Amuru	Second	16.2	1.1
12	DR130	District	Amuru	Second	21.1	1.3
				Sub-total	173.6	11.2
				Total	267.9	28.2

Source: JICA Study Team

15.5 Profiles of High Priority Projects

This section demonstrates the project profile of the high priority projects, identifying the detailed scope of the projects and their implementation schedules. Table 15.5.1 summarises the profiles of the high priority projects that were identified in the previous section. Tables 15.5.2 to 15.5.7 show the details of the project profiles of the high priority projects.

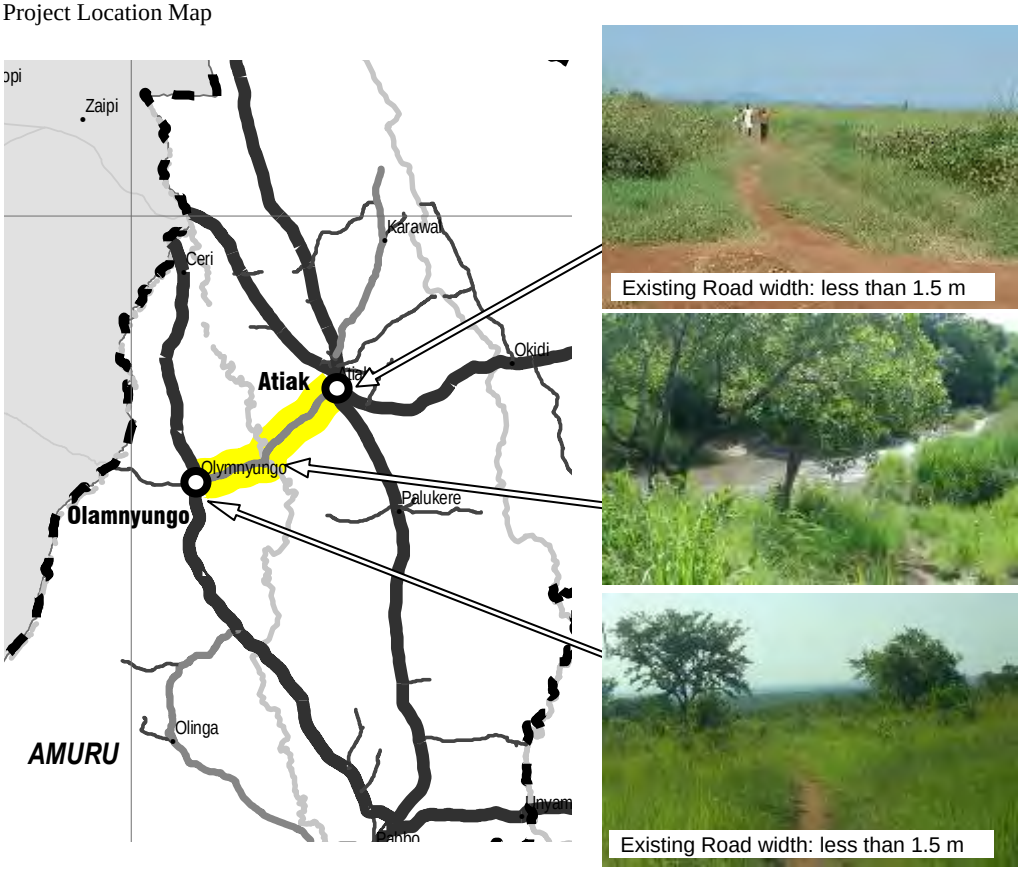
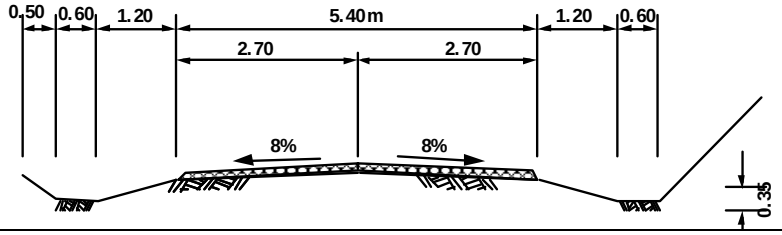
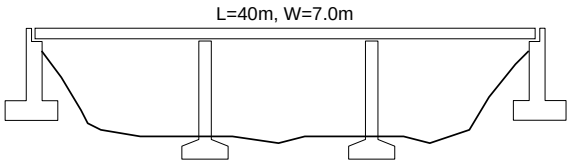
Table 15.5.1 List of High Priority Projects

ID	Projects / Action	Length (km)	Width (m)	Project Cost (million Ushs.)			
				Road Construction	Bridge Construction	Others	Total
DR 603	Service Level 0⇒8	11.0	7.8	1,188	817	531	2,536
NR 005	Service Level 3⇒11 Service Level 3⇒20	14.5 8.1	8.6	12,927	0	3,426	16,353
NR 008	Service Level 2⇒11	13.0	8.6	4,300	0	1,140	5,440
DR 137	Service Level 0⇒7	6.2	6.5	1,357	0	360	1,717
CAR 110	Service Level 1⇒7	16.1	6.5	1,299	0	344	1,643
DR 114	Service Level 2⇒8 Service Level 2⇒17	10.0 5.3	7.8	4,405	0	1,167	5,572

Note: Other costs include contingency, engineering cost and local administration cost.
Source: JICA Study Team

Table 15.5.2 Project Profile (DR 603)

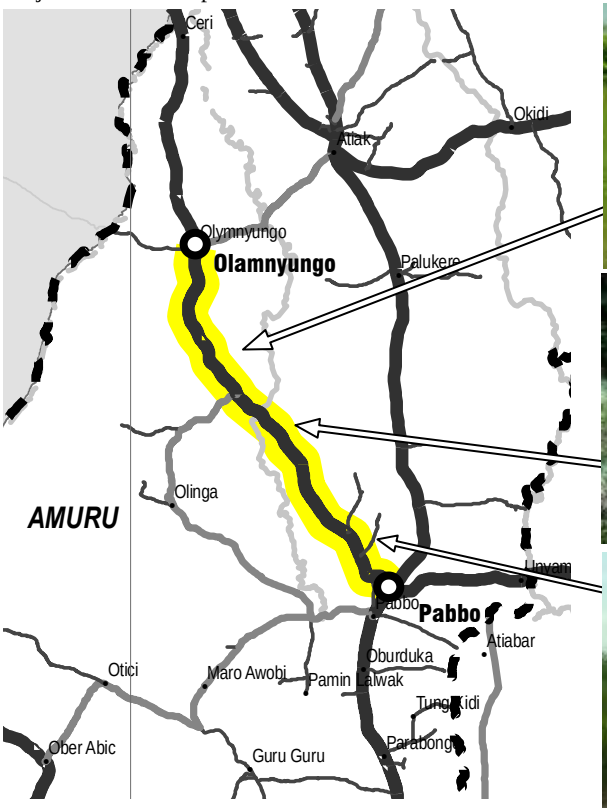
Sub-sector		DUCAR (District, Urban and Community Access Roads)	DR 603
Title of Project		**Attiak-Olamnyungo District Road Improvement Project**	
Objectives		• To develop a backbone for the road network of Amuru District • To enhance the socio-economic environment of IDP returnees • To promote agricultural development by providing better trading linkage to inner areas of the district	
Justification	**Consistency with upper level plan**	• Looking at the District Development Plan (DDP) 2009/10 of the former Amuru District, development of the road network and improvement of road service are clearly stated as one of the priority sectors. • This project is found in the list of priority projects defined in the DDP 2009/10 and it is also confirmed as one of the important projects from interviews conducted in Pabbo sub-county by the JICA Study Team. • The road section of this project is reclassified into the district road by the DDP 2009/10 and is expected to be upgraded to the district road standards.	
	Urgency of the project	• Currently, the road section of this project is a footpath and tends to be impassable during the rainy season, especially at the swampy area near the river. • The IDPs' home villages are located along the whole stretch of the road, including this project section. There is an urgent demand for road improvement to accelerate the IDPs' return process.	
	Necessity of the project	• Based on careful analysis by the JICA Study Team, the road section of this project is functionally classified into District Class II Road (District-level Arterial Road) by 2018. • The whole stretch of the road, including this project, is expected to accommodate 100-150 vehicles (PCU) per day by the year 2030. • The road section of this project passes though less populated areas in Amuru and Nwoya Districts. The project road is, however, expected to function as a District-level Arterial Road Network, mainly for commuting, trading and business purposes.	
	Adverse impact of the project	• There is no significant adverse impact to be caused by the project.	
	Benefits generated from the project	• The result of the economic analysis on this particular project is summarized below: B/C=0.17, Net Present Value=(-)942,000 USD, and EIRR=not countable. Thus, the economical validity of this project is not justified. • However, there are unquantifiable benefits derived from this project: e.g., improvement of accessibility to social infrastructure. For instance, this project may contribute to improving accessibility to Atiak health centre from Olamnyungo.	
Outline	**Period**	2010-2018	
	Location	Northern part of Amuru District (Pabbo Sub-county and Attiak Sub-county). (See the Road Project Location Map.)	
	Beneficiaries (target group)	• Returnees from northern part of Pabbo Sub-county and Attiak Town • Inhabitants of eastern part of Adjumani District	
	Sub Components	• Construction of new bridge (Length=40m, Width=7.0m) over Ayogi River • Road improvement (Length=11.0km) to District Class II Road	

<table>
<tr><td rowspan="6">Outline</td><td colspan="2">Project Location Map
 
</td></tr>
<tr><td colspan="2">Proposed Typical Cross Section (Class II A)
- Road width: 7.8 m - Pavement: Gravel pavement
- Carriageway width: 5.4 m
- Shoulder width: 1.2 m
 
</td></tr>
<tr><td colspan="2">Proposed New Bridge Construction
- Bridge length: 40 m
- Bridge width: 6 m
 
</td></tr>
<tr><td>Operation and Management</td><td>Amuru District</td></tr>
<tr><td>Cost (investment, recurrent)</td><td>2,536 million Ushs. (Road Construction: 1,188 million, Bridge Construction: 817 million, Contingency: 301 million, Engineering Cost: 161 million, Local Administration Cost: 69 million,)</td></tr>
<tr><td>Revenue (if any)</td><td>N/A</td></tr>
<tr><td rowspan="5">Implementation</td><td>Agency</td><td>Amuru District Local Government</td></tr>
<tr><td>Planning Requirement</td><td>No critical technical issues</td></tr>
<tr><td>Funding</td><td>Ministry of Local Government fund or donor fund</td></tr>
<tr><td>Resettlement Requirement</td><td>N/A</td></tr>
<tr><td>Institutional Arrangement</td><td>N/A</td></tr>
</table>

Source: JICA Study Team

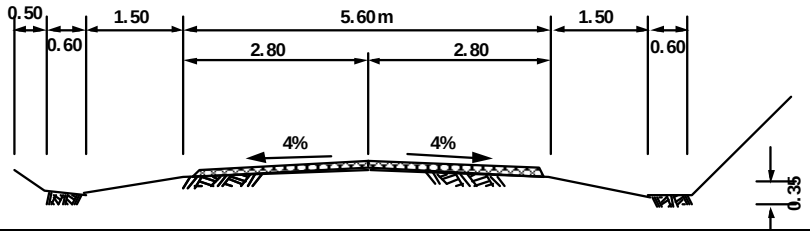
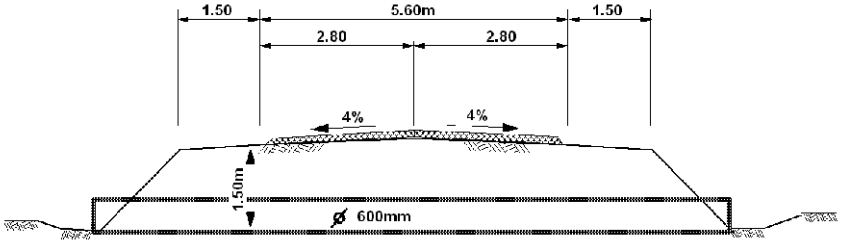
Table 15.5.3 Project Profile (NR 005)

Subsector		National Road	NR 005
Title of Project		**Pabbo-Olamnyungo National Road Improvement Project**	
Objectives		• To develop a backbone for the road network of Amuru District • To enhance the socio-economic environment of IDP returnees • To promote agricultural development by providing better trading linkage to inner areas of the district	
Justification	**Consistency with upper level plan**	• Looking at the District Development Plan (DDP) 2009/10 of the former Amuru District, development of the road network and improvement of road services are clearly stated as one of the priorities. • Over 150 km of roads, including this project road section, were newly reclassified into the national road in December 2008. • Both ends of the road section of this project connect with the priority roads (Ober Abic – Otici – Olinga – Pabbo, Olinga – Olamnyungo – Ayogi – Atiak) proposed by the DDP 2009/10 of the former Amuru District. Implementation of this project would contribute to the realization of the priority projects and derive multiple effects to both economic growth and social development of the district. • In this road master planning study, the road section of this project was selected as one of the five highest priority projects in Amuru and Nwoya Districts, by a comprehensive project evaluation.	
	Urgency of the Project	• An inventory survey by the JICA Study Team found that the road section of this project is an earth road and is in a bad/poor surface condition and tends to be impassable during the rainy season in the swampy areas. • The IDPs' home villages are located along branch roads from the project road. There is an urgent demand for road improvement to sustain the livelihood of returnees, as well as further acceleration of IDPs' return process.	
	Necessity of the Project	• Based on careful analysis by the JICA Study Team, the road section of this project will be functionally classified as a Secondary Road (District-level Arterial Road) by 2018. • The whole stretch of the road, including this project, was estimated to accommodate 50-480 vehicles (PCU) per day by the year 2030. • The road section of this project passes though the relatively populated areas of Amuru and Nwoya Districts. The project road is, accordingly, expected to function as a District-level Arterial Road Network, mainly for commuting, trading and business purposes.	
	Adverse Impact of the Project	• There is no significant adverse impact caused by the project.	
	Benefits generated from the Project	• The result of the economic analysis on this particular project is summarized below: B/C=0.05, Net Present Value=(-)6,660,000 USD, and EIRR=not countable. Thus, the economical validity of this project is not justified. • There are also unquantifiable benefits derived from this project: e.g., improvement of accessibility to social infrastructure. For instance, this project may contribute to improving accessibility to the health centres in Pabbo and Olamnyungu and schools along the project road.	
Outline	**Period**	2010-2018	
	Location	• Northern part of Amuru District (Pabbo Sub-county). (See the Road Project Location Map)	
	Beneficiaries (target group)	• Returnees from northern part of Pabbo Sub-county and Attiak Town • Inhabitants of eastern part of Adjumani District	
	Sub Components	• Road improvement (Length=22.6km) to Secondary Road (District-level Arterial Road)	

<table>
<tr><td rowspan="6">Outline</td><td colspan="2">Project Location Map
 


W ≤ 4.5 m, L = 14.5 m

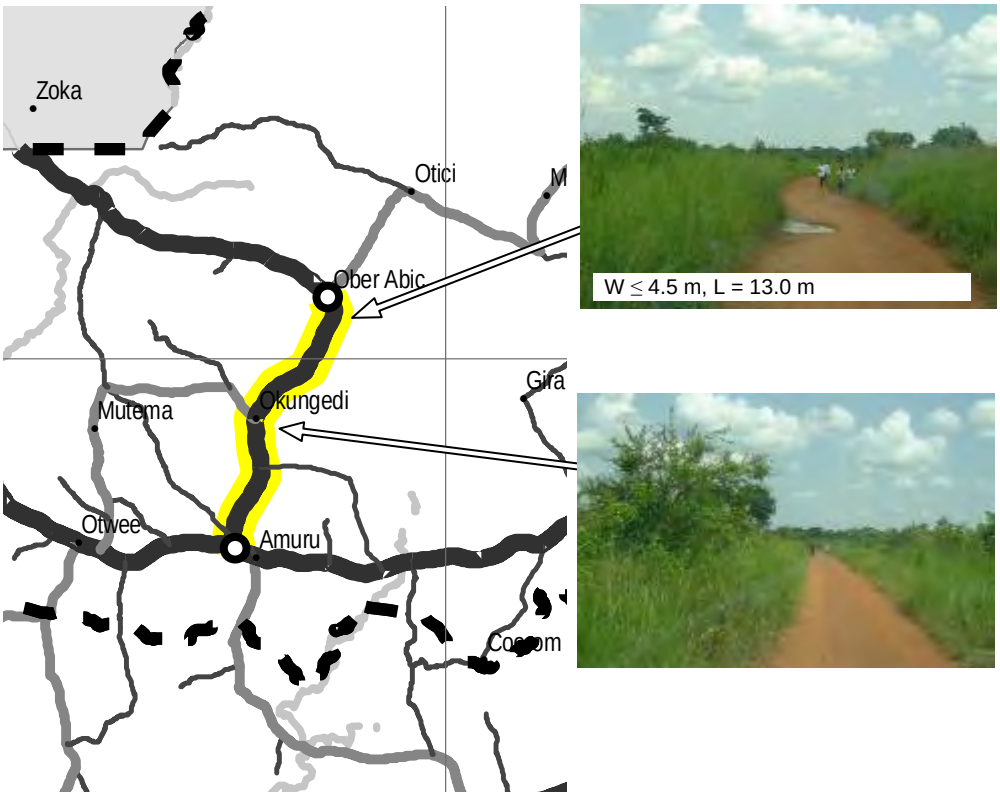
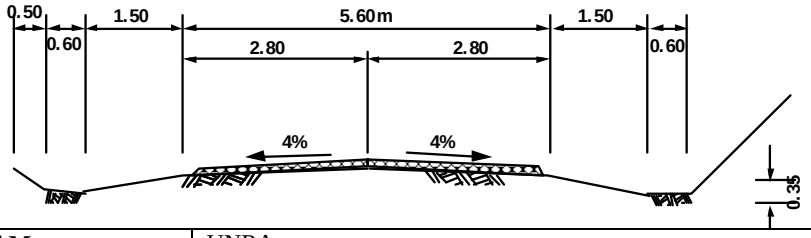
Existing Bridge over Ayogi River
W = 3.8 m, L = 18.0 m

W ≤ 4.5 m, L = 8.1 m, Condition: Bad</td></tr>
<tr><td colspan="2">Proposed Typical Cross Section (Gravel Class B)
- Road width: 8.6 m - Pavement: Gravel pavement
- Carriageway width: 5.6 m
- Shoulder width: 1.5 m
 
</td></tr>
<tr><td colspan="2">Proposed Embankment Section
- Embankment height: about 1.5 m from existing ground level
 
</td></tr>
<tr><td>Operation and Management</td><td>UNRA</td></tr>
<tr><td>Cost (investment, recurrent)</td><td>16,353 million Ushs. (Road Construction: 12,927 million, Contingency: 1,939 million, Engineering Cost: 1,041 million, Local Administration Cost: 446 million)</td></tr>
<tr><td>Revenue (if any)</td><td>N/A</td></tr>
<tr><td rowspan="5">Implementation</td><td>Agency</td><td>UNRA</td></tr>
<tr><td>Planning Requirement</td><td>No critical technical issues</td></tr>
<tr><td>Funding</td><td>UNRA or donor fund</td></tr>
<tr><td>Resettlement Requirement</td><td>N/A</td></tr>
<tr><td>Institutional Arrangement</td><td>N/A</td></tr>
</table>

Source: JICA Study Team

Table 15.5.4 Project Profile (NR 008)

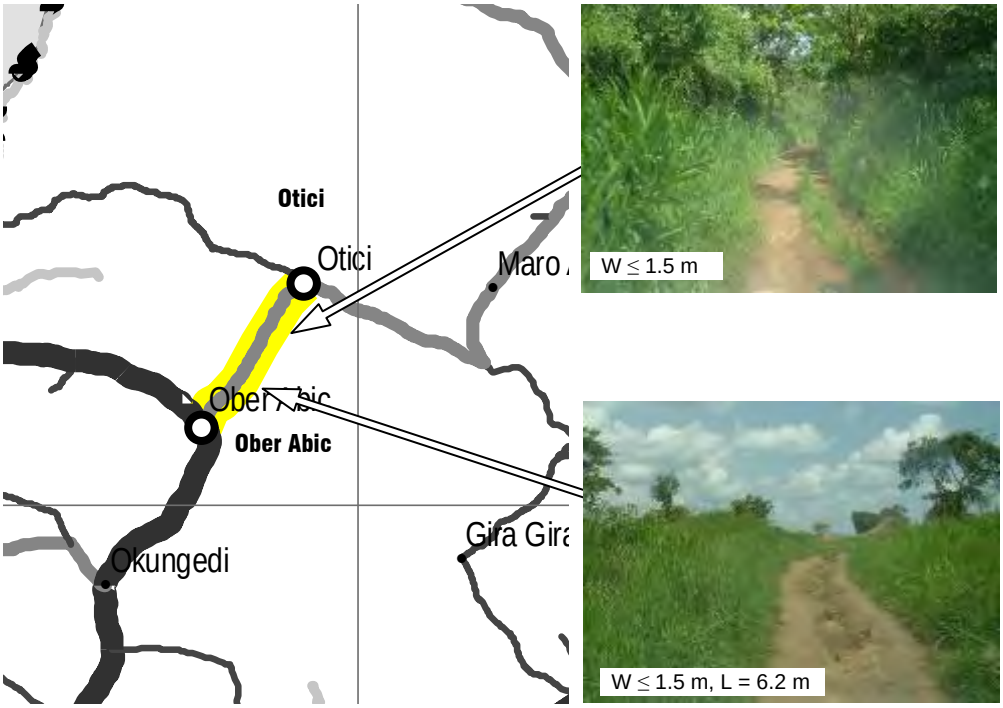
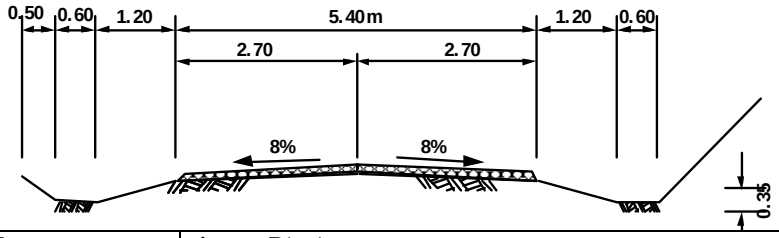
Subsector		National Road	NR 008
Title of Project		**Amuru - Ober Abic National Road Improvement Project**	
Objectives		• To develop a backbone for the road network of Amuru District • To enhance the socio-economic environment of IDP returnees To promote agricultural development by providing better trading linkage to inner areas of the district	
Justification	**Consistency with upper level plan**	• Looking at the District Development Plan (DDP) 2009/10 of the former Amuru District, development of the road network and improvement of road service are clearly stated as one of the priorities. • Over 150 km of roads, including this project road section, were newly reclassified into the national road in December 2008. • The road section of this project connects with the priority road (Ober Abic – Otici – Olinga – Pabbo) proposed in DDP 2009/10 of the former Amuru District. Implementation of this project would contribute to the realization of the priority projects and derive multiple effects to both economic growth and social development of the district. • In this Study, the road section of this project is selected as one of the five highest priority projects in Amuru and Nwoya Districts, by a comprehensive project evaluation.	
	Urgency of the Project	• An inventory survey by the JICA Study Team found that the road section of this project is an earth road and is in a bad surface condition. • The IDPs' home villages are located along the whole stretch of the road, including this project. There is an urgent demand for road improvement to accelerate the IDPs' return process.	
	Necessity of the Project	• Based on careful functional analysis by the JICA Study Team, the road section of this project will be classified into Secondary Road (District-level Arterial Road) by 2018. • The whole stretch of the road, including this project, is expected to accommodate 140 vehicles (PCU) per day by the year 2030. By the definition of the district road manual, this road section is also categorized as District Class I, where more than 50 vehicles per day are observed. • The road section of this project passes though less populated areas in Amuru and Nwoya Districts. The project road is, however, expected to function as a District-level Arterial Road, mainly for commuting, trading and business purposes.	
	Adverse Impact of the Project	• There is no significant adverse impact to be caused by the project.	
	Benefits generated from the Project	• The result of the economic analysis on this particular project is summarized below: B/C=0.02, Net Present Value=(-)2,561,000 USD, and EIRR=not countable. Thus, the economical validity of this project is not justified. • There are also unquantifiable benefits derived from this project: e.g., improvement of accessibility to social infrastructure. For instance, this project may contribute to improving accessibility to the health centres in Amuru and Ober Abic and schools along the project road.	
Outline	**Period**	2010-2018	
	Location	• Western part of Amuru District (Amuru Sub-county). (See the Road Project Location Map)	
	Beneficiaries (target group)	• Returnees of Western part of Amuru Sub-county	
	Sub Components	• Road improvement (Length=13.0km) to Secondary Road (District-level Arterial Road)	

<table>
<tr><td rowspan="6">Outline</td><td colspan="2">Project Location Map
 
</td></tr>
<tr><td colspan="2">Proposed Typical Cross Section (Gravel Class B)
- Road width: 8.6 m - Pavement: Gravel pavement
- Carriageway width: 5.6 m
- Shoulder width: 1.5 m
 
</td></tr>
<tr><td>Operation and Management</td><td>UNRA</td></tr>
<tr><td>Cost (investment, recurrent)</td><td>5,440 million Ushs. (Road Construction: 4,300million, Contingency: 645, Engineering Cost: 346, Local Administration Cost 148 million)</td></tr>
<tr><td>Revenue (if any)</td><td>N/A</td></tr>
<tr><td>Rationale</td><td>Formulation of trunk road network for western part of Amuru</td></tr>
<tr><td rowspan="5">Implementation</td><td>Agency</td><td>UNRA</td></tr>
<tr><td>Planning Requirement</td><td>No critical technical issues</td></tr>
<tr><td>Funding</td><td>UNRA or donor fund</td></tr>
<tr><td>Resettlement Requirement</td><td>N/A</td></tr>
<tr><td>Institutional Arrangement</td><td>N/A</td></tr>
</table>

Source: JICA Study Team

Table 15.5.5 Project Profile (DR 137)

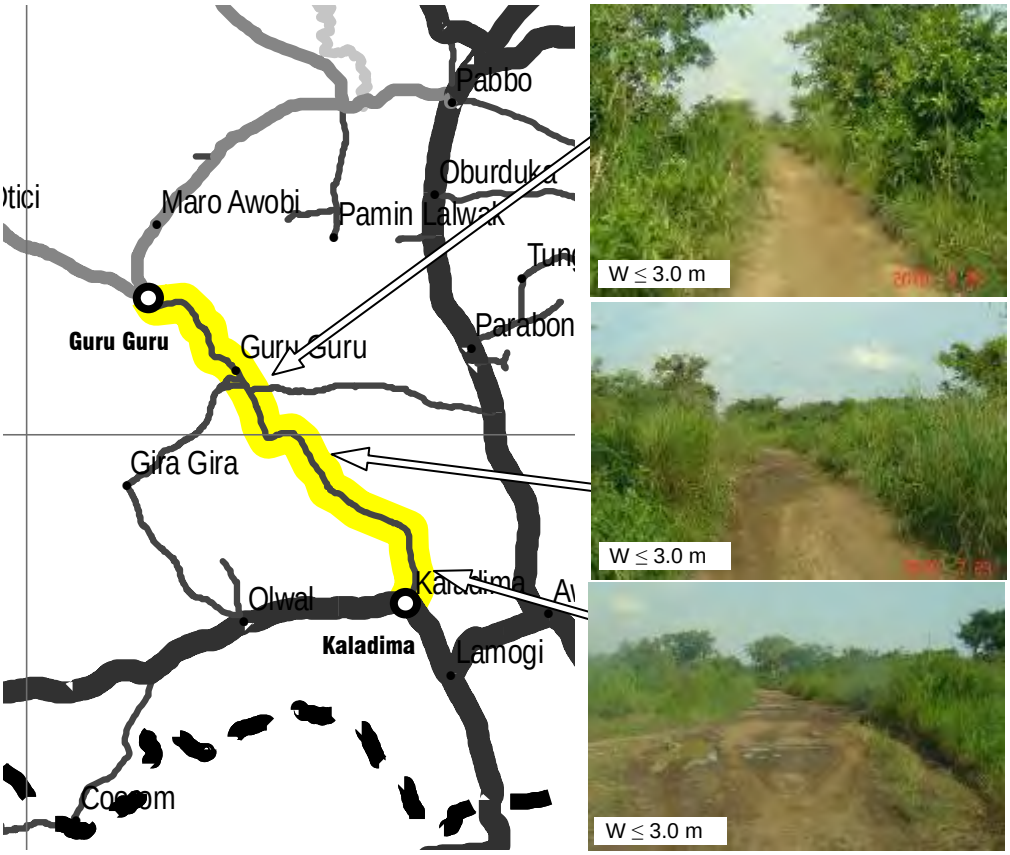
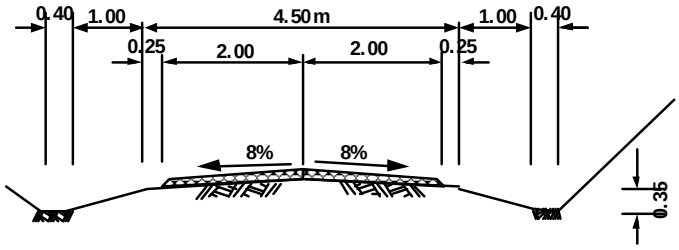
Subsector		DUCAR	DR 137
Title of Project		**Ober Abic – Otici District Road Improvement Project**	
Objectives		• To develop a backbone for the road network of Amuru District • To enhance the socio-economic environment of IDP returnees • To promote agricultural development by providing better trading linkage to inner areas of the district	
Justification	**Consistency with upper level plan**	• Looking at the District Development Plan (DDP) 2009/10 of the former Amuru District, development of the road network and improvement of road service are clearly stated as one of the priorities. • The road section of this project is defined as the priority project (Ober Abic – Otici – Olinga – Pabbo) in proposals by DDP 2009/10 of the former Amuru District. • In this Study, the road section of this project was selected as one of the five highest priority projects in Amuru and Nwoya Districts, by a comprehensive project evaluation.	
	Urgency of the Project	• An inventory survey by the JICA Study Team found that the road section of this project is an earth road and the whole stretch of the project road is in a bad surface condition.	
	Necessity of the Project	• Based on careful analysis by the JICA Study Team, the road section of this project will be functionally classified as District Class II Road (District-level Arterial Road) by 2018. • The whole stretch of the road, including this project, is expected to accommodate 140-350 vehicles (PCU) per day by the year 2030. • The road section of this project passes though the relatively populated areas in Amuru and Nwoya Districts. The project road is, accordingly, expected to function as a District-level Arterial Road, mainly for commuting, trading and business purposes. In particular, this project road contributes to the improvement of trade linkage between the inner areas of Amuru and Nwoya Districts to Gulu-Nimule national road	
	Adverse Impact of the Project	• There is no significant adverse impact to be caused by the project.	
	Benefits generated from the Project	• The result of the economic analysis on this particular project is summarized below: B/C=0.03, Net Present Value=(-)882,000 USD, and EIRR=not countable. Thus, the economical validity of this project is not justified. • There are also unquantifiable benefits derived from this project: e.g., improvement of accessibility to social infrastructure. For instance, this project may contribute to improving accessibility to the health centre in Ober Abic and schools along the project road.	
Outline	**Period**	2010-2018	
	Location	Western part of Amuru District (Amuru Sub-county and Lamogi Sub-county). (See the Road Project Location Map)	
	Beneficiaries (target group)	• Returnees from northern part of Amuru and Otwee. • Inhabitants of Western part of Amuru District	
	Sub Components	• Road improvement (Length=6.20km) to District Class II Road	

<table>
<tr><td rowspan="7">Outline</td><td colspan="2">Project Location Map
 
</td></tr>
<tr><td colspan="2">Proposed Typical Cross Section (Class II A)
- Road width: 7.8 m - Pavement: Gravel pavement
- Carriageway width: 5.4 m
- Shoulder width: 1.2 m
 
</td></tr>
<tr><td>Operation and Management</td><td>Amuru District</td></tr>
<tr><td>Cost (investment, recurrent)</td><td>1,717 million Ushs. (Road Construction: 1,357 million, Contingency: 204 million, Engineering Cost: 109 million, Local Administration Cost: 47 million)</td></tr>
<tr><td>Revenue (if any)</td><td>N/A</td></tr>
<tr><td rowspan="5">Implementation</td><td>Agency</td><td>Amuru District Local Government</td></tr>
<tr><td>Planning Requirement</td><td>No critical technical issues</td></tr>
<tr><td>Funding</td><td>Ministry of Local Government fund or donor fund</td></tr>
<tr><td>Resettlement Requirement</td><td>N/A</td></tr>
<tr><td>Institutional Arrangement</td><td>N/A</td></tr>
</table>

Source: JICA Study Team

Table 15.5.6 Project Profile (CAR 110)

Subsector		DUCAR	CAR 110
Title of Project		**Kaladima-Guru Guru Road Improvement Project**	
Objectives		• To develop a backbone for the road network of Amuru District • To enhance the socio-economic environment of IDP returnees • To promote agricultural development by providing better trading linkage to inner areas of the district	
	Consistency with upper level plan	• Looking at the District Development Plan (DDP) 2009/10 of the former Amuru District, development of the road network and improvement of road services are clearly stated as one of the priority sectors. • The road section of this project connects with the priority road (Ober Abic – Otici – Olinga – Pabbo) proposed by the DDP 2009/10 of the former Amuru District. Implementation of this project would contribute to the realization of the priority projects and derive multiple effects to both economic growth and social development of the district. • In this Study, the road section of this project is selected as one of the five highest priority projects in Amuru and Nwoya Districts, by a comprehensive project evaluation.	
	Urgency of the Project	• An inventory survey by the JICA Study Team found that the road section of this project is an earth road and is in a poor/bad surface condition and tends to be impassable during the rainy season in the swampy areas. • The IDPs' home villages are located along the whole stretch of the road, including this project section. There is an urgent demand for road improvement to accelerate the IDPs' return process.	
	Necessity of the Project	• Based on careful analysis by the JICA Study Team, the road section of this project is functionally classified as District Class III (District-level Collector Road) by 2018. • The whole stretch of the road, including this project, is expected to accommodate 350 vehicles (PCU) per day by year 2030. • The road section of this project passes though the most populated area in Amuru District. The project road is, accordingly, expected to function as a District-level Collector Road, to serve commuting, business and schooling purposes.	
	Adverse Impact of the Project	• There is no significant adverse impact to be caused by the project.	
	Benefits generated from the Project	• The result of the economic analysis on this particular project is summarized below: B/C=0.28, Net Present Value=(-)450,000 USD, and EIRR=not countable. Thus, the economical validity of this project is not justified. • Assuming only 10% of the whole road section of this project requires urgent upgrade works, the project's economic viability is further substantiated with B/C Ratio of 1.28: turning it into an economically feasible project. • There are also unquantifiable benefits derived from this project: e.g., improvement of accessibility to social infrastructure. For instance, this project may contribute to improving accessibility to the health centre(s) and schools along the project road.	
Outline	Period	2010-2018	
	Location	Central part of Amuru District (Lamogi Sub-county). (See the Road Project Location Map)	
	Beneficiaries (target group)	Inhabitants of Pabbo, Lamogi and their adjoining areas	
	Sub Components	• Road improvement (Length=16.1km) to District Class II Road	

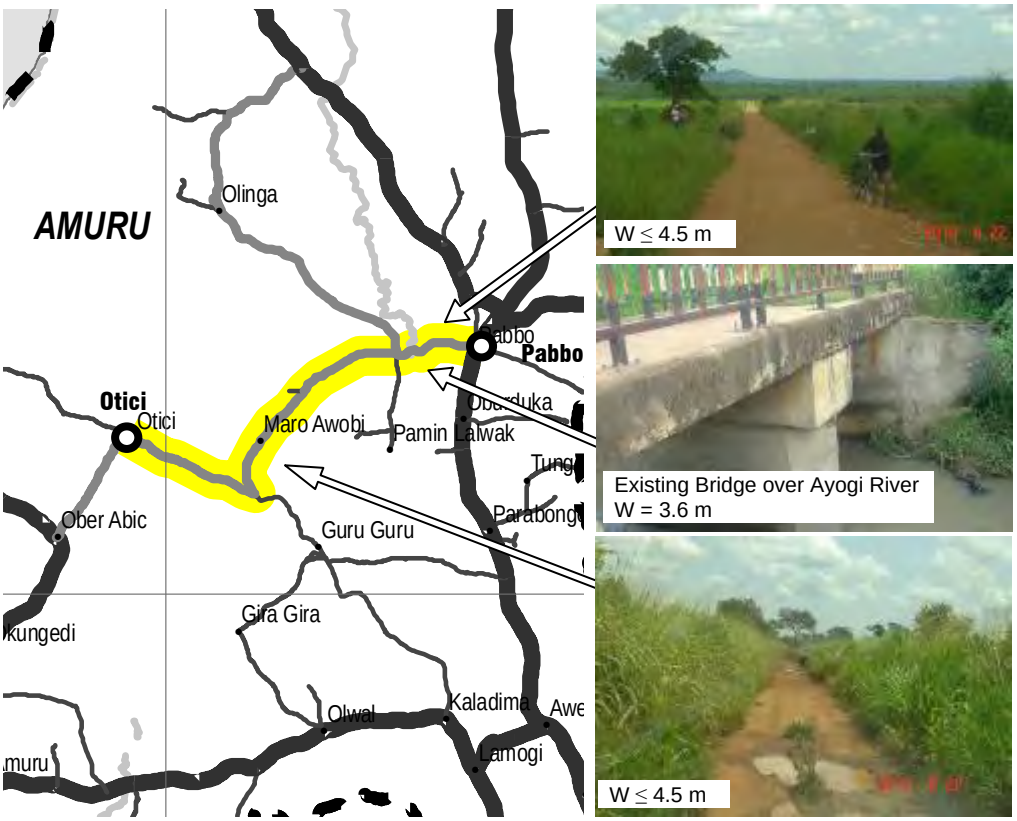
<table>
<tr><td rowspan="6">Outline</td><td colspan="2">Project Location Map
 
</td></tr>
<tr><td colspan="2">Proposed Typical Cross Section (Class II A)
- Road width: 6.5 m - Pavement: Gravel pavement
- Carriageway width: 4.0 m
- Shoulder width: 1.25 m
 
</td></tr>
<tr><td>Operation and Management</td><td>Lamogi Sub-county</td></tr>
<tr><td>Cost (investment, recurrent)</td><td>1,643 million Ushs. (Road Construction: 1,299 million, Contingency: 195 million, Engineering Cost: 105, Local Administration Cost: 45 million)</td></tr>
<tr><td>Revenue (if any)</td><td>N/A</td></tr>
<tr><td>Rationale</td><td>Formulation of district road network for central part of Amuru</td></tr>
<tr><td rowspan="5">Implementation</td><td>Agency</td><td>Lamogi Sub-county</td></tr>
<tr><td>Planning Requirement</td><td>No critical technical issues</td></tr>
<tr><td>Funding</td><td>Ministry of Local Government fund or donor fund</td></tr>
<tr><td>Resettlement Requirement</td><td>N/A</td></tr>
<tr><td>Institutional Arrangement</td><td>N/A</td></tr>
</table>

Source: JICA Study Team

Table 15.5.7 Project Profile (DR 114)

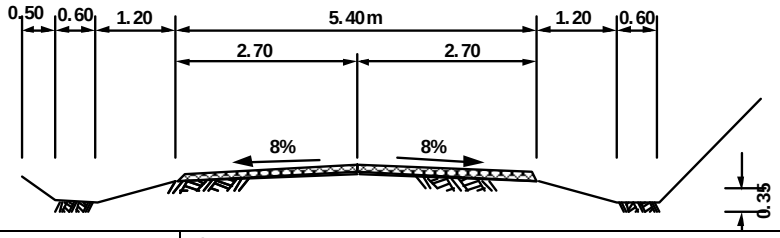
Subsector		DUCAR	DR 114
Title of Project		**Otici - Pabbo District Road Improvement Project**	
Objectives		• To develop a backbone for the road network of Amuru District • To enhance the socio-economic environment of IDP returnees • To promote agricultural development by providing better trading linkage to inner areas of the district	
Justification	**Consistency with upper level plan**	• Looking at the District Development Plan (DDP) 2009/10 of the former Amuru District, development of the road network and improvement of road services are clearly stated as one of the priority sectors. • The road section of this project is defined as the priority project (Ober Abic – Otici – Olinga – Pabbo) identified in DDP 2009/10 of the former Amuru District. • In this Study, the road section of this project was selected as one of the five highest priority projects in Amuru and Nwoya Districts, by a comprehensive project evaluation.	
	Urgency of the Project	• An inventory survey by the JICA Study Team found that the road section of this project is an earth road and most of it is in a poor surface condition and tends to be impassable during the rainy season at the swampy area. • Similar to other projects, the IDPs' home villages are located along some road sections of this project. There is an urgent demand for road improvement to accelerate the IDPs' return process.	
	Necessity of the Project	• Based on careful analysis by the JICA Study Team, the road section of this project is functionally classified as District Class II Road (District-level Arterial Road) by 2018. • The whole stretch of the road, including this project, is expected to accommodate 30 vehicles (PCU) per day by the year 2018. By the definition of the district road manual, this road section is categorized into District Class II, where 20-50 vehicles per day are observed. • The road section of this project passes though the relatively populated areas in Amuru and Nwoya Districts. The project road is, accordingly, expected to function as a district trunk road network, mainly for commuting, trading and business purposes.	
	Adverse Impact of the Project	• There is no significant adverse impact to be caused by the project.	
	Benefits generated from the Project	• The result of the economic analysis on this particular project is summarized below: B/C=0.14, Net Present Value=(-)1,935,000 USD, and EIRR=not countable. Thus, the economical validity of this project is not justified. • There are also unquantifiable benefits derived from this project: e.g., improvement of accessibility to social infrastructure. For instance, this project may contribute to improving accessibility to the health centre in Pabbo and schools along the project road.	
Outline	Period	2010-2018	
	Location	The central part of Amuru District (Pabbo Sub-county and Lamogi Sub-county). (See the Road Project Location Map)	
	Beneficiaries (target group)	• Returnees from northern part of Amuru and Otwee. • Inhabitants of Western part of Amuru District	
	Sub Components	• Road improvement (Length=15.3km) to District Class II Road	

Outline	Project Location Map	



Proposed Typical Cross Section (Class II A)

- Road width: 7.8 m
- Carriageway width: 5.4 m
- Shoulder width: 1.2 m
- Pavement: Gravel pavement



	Operation and Management	Amuru District
	Cost (investment, recurrent)	5,572 million Ushs. (Road Construction: 4,405 million, Contingency: 661 million, Engineering Cost: 355 million, Local Administration Cost: 152 million)
	Revenue (if any)	N/A
	Rationale	Formulation of district road network for central part of Amuru
Implementation	Agency	Amuru District Local Government
	Planning Requirement	No critical technical issues
	Funding	Ministry of Local Government fund or donor fund
	Resettlement Requirement	N/A
	Institutional Arrangement	N/A

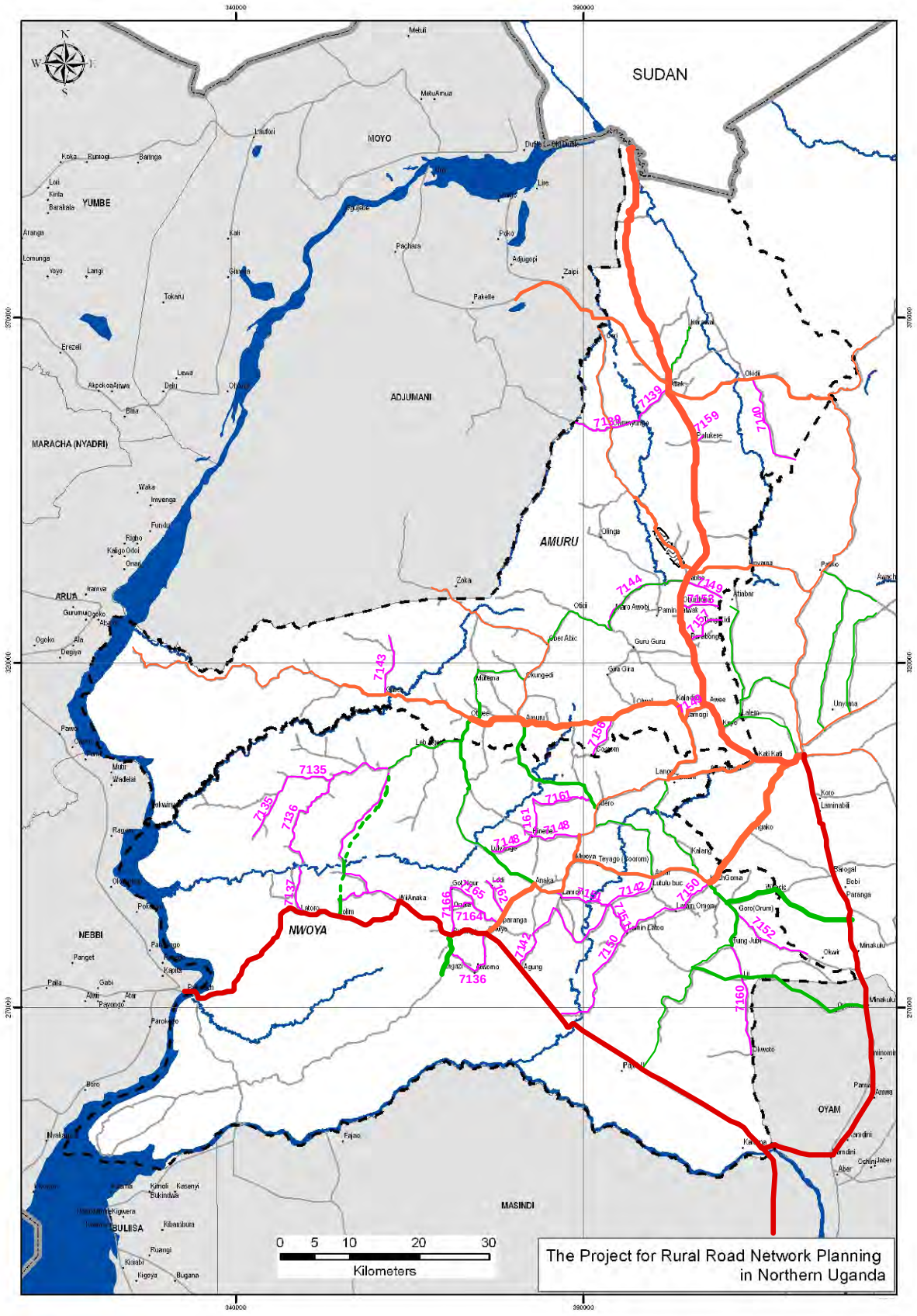
Source: JICA Study Team

15.6 Other Recommended Projects for Community Access Roads

In addition to the selected high priority projects and secondary priority projects, community access roads should be selected as priority projects for implementation.

The District Development Plan of former Amuru District for the fiscal years 2009/10-2011/12 presented a list of important community access roads for consideration as priority projects, as shown in Table 9.5.5. These are good candidates for priority projects among community access roads.

Among the roads listed in Table 9.5.5, some roads are classified as District-level Arterial Roads and District-level Collector Roads in the recommended rural road network plans for Amuru and Nwoya Districts. The rest of the important community access roads are recommended as priority projects. See Figure 15.6.1.



Source: JICA Study Team

Figure 15.6.1 Location Map of Priority Projects of Community Access Roads

16. RURAL ROAD MAINTENANCE PLANNING

16.1 Capacity Assessment and Cause Analysis on Road Maintenance

(1) Capacity Assessment of Former Amuru District

Capacity assessment of former Amuru District pertaining to road maintenance was conducted at three levels, namely individual level, organization and social levels.

At the individual level, officers of the road sector were analyzed; at the organization level, the work department was targeted while the entire former Amuru District was considered at the social level. The capacity assessment was based on the comparison of expected capacity and current capacity.

Table 16.1.1 Capacity Assessment (Individual Level) of Former Amuru District Pertaining to Road Maintenance

	Position	Expected Capacity			Current Capacity			Measures to be Taken (INPUT)
		K: Knowledge	S: Skill	C: Consciousness	K: Knowledge	S: Skill	C: Consciousness	
K-1: English Communication and Composition.	DE	K-11: Uses English as native language in conversation and composition.			N/A			N/A
	SE	K-12: Ditto to K-11			K-12: Using English as native language level.			K-12: Not necessary
	RI	K-13: Speaks English fluently in communication and can prepare government documents.			K-13: Using English at an adequate level in communication and document production.			K-13: Not necessary
	RO	K-14: Ditto to K-13			N/A			N/A
K-2: Road Design (Soil, Pavement, Drainage, Alignment, Traffic, etc)	DE	K-21: Understands basic theory of the design standard and practical works.			N/A			N/A
	SE	K-22: Ditto to K-21			K-22: Understands the basics of road design and practical works. However, does not have adequate training. Faces difficulty in evaluating the private consultant's design.			K-22: Needs training to learn basic theory systematically at MELTC so as to be able to evaluate the private consultant's design.
	RI	K-23: Ditto to K-21			K-23: Ditto to K-22			K-23: Not Necessary
	RO	K-24: Ditto to K-21			N/A			N/A
K-3: Structure Design (Culvert, Retaining wall, and Bridge)	DE	K-31: K-21: Understands basic theory of the design standard and practical works.			N/A			N/A
	SE	K-32: Ditto to K-31			K-32: Understands basics of structure design. However inadequate knowledge of essentials of design and practical construction works. So, finds it difficult to evaluate the private consultant's design.			K-32: Needs training to learn basic theory at MELTC-tailor made course to be able to evaluate the private consultant's design.
	RI	K-33: Ditto to K-32			K-33:Ditto to K-32			K-33: Ditto to K-32
	RO	K-34: Ditto to K-33			N/A			N/A
K-4: Procurement, Tendering, Evaluation and Contract	DE	K-41: Understands necessary procedure of procurement and related laws of contract.			N/A			N/A
	SE	K-42: Ditto to K-41			K-42: Understands necessary procedure of procurement. However, does not have adequate training.			K-42: Needs training at MELTC-tailor made course to acquire systematic understanding.
	RI	K-43: Understands necessary procedure of procurement.			K-43: Understands necessary procedure of procurement.			K-43: Not Necessary
	RO	K-44: Ditto to K-43			N/A			N/A
K-5: Construction Supervision	DE	K-41: Understands technical theory and practical works of Road & Structure construction.			N/A			N/A
	SE	K-42: Ditto to K-41			K-42: Understands necessary technical theory and practical works of Road construction.			K-42: Not necessary
	RI	K-43:			K-43: Understands necessary technical theory and practical works of Road construction. However, inadequate knowledge and has no systematic training experience.			K-43; Needs training at MELTC–tailor made courses to obtain knowledge of practice of structure construction.
	RO	K-44: Ditto to K-43			N/A			N/A
K-5: Labour Based Construction	DE	K-51: Understands practical works of Labour based construction.			N/A			N/A
	SE	K-52: Ditto to K51			K-52: Understands			K-52: Needs training

	Position	Expected Capacity			Current Capacity			Measures to be Taken (INPUT)
		K: Knowledge	S: Skill	C: Consciousness	K: Knowledge	S: Skill	C: Consciousness	
					general theory. However has not been trained systematically.			at MELTC to have systematic understanding of Labour based technology.
	RI	K-53: Ditto to K-51			K-53: Ditto to K-52			K-53: Ditto to K-52
	RO	K-54: Ditto to K-51			N/A			N/A
K-6: Machinery Construction	DE	K-61: Understands practical works of machinery construction.			N/A			N/A
	SE	K-62: Ditto to K-61			K-62: Understands practical works of machinery construction.			K-62: Not Necessary
	RI	K-63: Understands practical works of machinery construction as supervisor in particular.			K-63: Ditto to K-62			K-63: Not Necessary
	RO	K-64: Ditto to K63			N/A			N/A
K-7 :Road Administra-tion	DE	K-71: Understands the process and design standard of road planning and points to consider.			N/A			N/A
	SE	K-72: Ditto to K-71			K-72: Understands the road planning of the district. However, needs to study other cases for further understanding.			K-72: Needs training for further understanding. Training in Japan will be considered.
	RI	K-73: Understands the purpose and point of the road plan.			K-73: Understands the purpose and points of the plan.			K-73: Not necessary
	RO	K-74: Ditto to K-73			N/A			N/A
S-1: Computer Literacy	DE		S-11: Able to operate office software as necessary tool.			N/A		N/A
	SE		S-12: Ditto to S-11			S-12: Has adequate skills to create impressive report		S-12: Not Necessary
	RI		S-13: Ditto to S-11.			S-13: Ditto to S-12		S-13: Not Necessary
	RO		S-14: Ditto to D-11			N/A		N/A
S-2: GIS Literacy	DE		S-21: Able to operate office software as necessary tool.			N/A		N/A
	SE		S-22: Ditto to S-21			S-22:Has no experience using GIS		S-22: Needs training to gain skills to operate GIS software as necessary tool.
	RI		S-23: Ditto to S-21			S-23:Ditto to S-22		S-23: Ditto to S-22.
	RO		S-24: Ditto to S-21.			N/A		N/A
C-1: Positive Attitude C-2: Responsibili ty C-3: Punctuality	DE, SE, RI, RO			Have conscienti ous attitude as public workers for service of people living in former Amuru District.			Have commendable conscientious attitude as public workers towards service of people of former Amuru.	Not Necessary

DE=District Engineer, SE=Senior Engineer, RI=Road Inspector, RO=Road Overseer
Source: JICA Study Team

Table 16.1.2 Capacity Assessment (Organization Level) of Former Amuru District pertaining to Road Maintenance

	Expected Capacity				Current Capacity				Measures to be Taken (INPUT)
	H: Human Asset	F: Financial Asset	P: Physical Asset	I: Intellectual Asset	H: Human Asset	F: Financial Asset	P: Physical Asset	I: Intellectual Asset	
H-1: Organizational Structure	Refer to Table 16.1.1				Refer to Table-16.1.1				Not necessary
H-2: Number of Members and qualification	DE, SE & RE in position.				SE in position (DE & RE Vacant)				Recruitment campaign by district
H-3: Decision-making system	CAO, DE & SE in position.				CAO & RE in position (RE is acting as DE)				Recruitment campaign by district
H-4: Coordination Skills	CAO, DE & SE in position				CAO & RE in position (RE is acting as SE)				Recruitment campaign by district.
H-5: Human Assets (Frequent shuffle, settlement)	Stay in position after C/D.				Staff is recruited by District, so there is no shuffle and they basically stay in their positions.				Not Necessary
H-6: Human Resource Management (Capacity Development program, evaluation method)	Have proper assessment and capacity development system.				Have internal system for personal performance assessment.				Not Necessary
F-1: Financial planning		1) Proper cost estimation. 2) Plan and develop DDP.				Able to evaluate cost estimation properly and to develop DDP.			Not Necessary
F-2: Financial Output		Release funds of donors and Government as scheduled.				Funds Not released on schedule due to bureaucratic procedure.			1) PR and lobby activities to government. 2) Recruitment campaign to fill all vacant positions
F-3: Financial Input		1) Adequate funds from donors 2) Adequate allocation from the government. 3) Secure source of revenue				1) Inadequate funding from donors 2) Inadequate allocation from Government to newly established districts. 3) Poor commercial activities in the district.			1) PR and lobby activities to government. 2) Recruitment campaign to fill all vacant positions
P-1: Construction & Management Machinery			Machinery shown in Table 6.1.5				Have no Machinery		Procurement by donor support.
P-2: Depot/Store (Maintenance & Improvement of workshop, Safety Instructions)			Facilities shown in Table 6.1.5				Ditto		Ditto
P-3: Improvement Plan (Periodic & future Improvement Plan)			RAMPS & QPRS system, GIS from Road Inventory				Ditto		Need GIS system and training for operation.
P-4: IT equipment & software, stationary, furniture (desk, bookshelf)			Facilities shown in Table 6.1.5				Ditto		Procurement by donor support.
I-1: Machinery for Construction & Maintenance				Management and operation manuals & Guidelines				Have no Manuals or guidelines.	Develop Manuals & Guidelines (Support by Donors)
I-2: Depot/Store				Management Manuals & Guidelines				Ditto	Ditto
I-3: Maintenance of Machinery				Ditto				Ditto	Ditto
I-4: Technical Manuals & Guidelines				Technical Manuals & Guidelines				Have Technical Manuals by MoWT.	Not Necessary

Source : JICA Study Team

Table 16.1.3 Capacity Assessment (Society Level) of Former Amuru District pertaining to Road Maintenance

	Expected Capacity			Current Capacity			Measures to be Taken (INPUT)
	S: System	C: Consciousness of the Public	B: Basic Infrastructure	S: System	C: Consciousness of the Public	B: Basic Infrastructure	
S-1: Policy	Have clear and strong policy as regards the road plan.			Have policy and plan but not enough avenues to disclose to the public.			Need for explanation and disclosure of road plan to public through lower local government.
S-2: Regulation	Have clear laws/rules on land procurement for use on roads.			Have to follow the laws of Uganda.			Not necessary.
C-1: Intention and Participation in Road Management		1) Understand importance of building roads. 2) Understand need for use of land for roads. 3) Understand importance of road maintenance.			Understand importance of building and carrying out maintenance on roads. However, need understanding and consent on land procurement.		Maintain polite negotiations with public and land owners in particular.
C-2: Cost Allocation		Understand budget expenditure on road works.			Understand importance of budget allocation to road investment.		Need for explanation and disclosure of road plan to public through lower local government.
B-1: Public Transport System			Have bus routes connecting main towns, residential areas and community facilities.			Have a few bus routes connecting to Gulu but not between internal towns.	Need more road investment to clear bottle necks and for maintenance works to make roads passable throughout the year.
B-2: Establishment of Lifeline			Provision of Power, Water & Sewerage utilities.			No power, water and sewerage system.	Need more investment to ensure that basic human needs are met.

Source: JICA Study Team

(2) Cause Analysis

A cause analysis to clarify the problems and an objective analysis to find the solutions are shown on the next pages. From these analyses, the main causes and measures to be taken were considered as shown below.

- **Cause-1**: Not all positions are occupied by staff (lack of human assets)

  → Measure-1: Recruitment campaign by district or hiring private consultants for support

- **Cause-2**: Not enough equipment and basic facilities for operation (lack of physical assets)

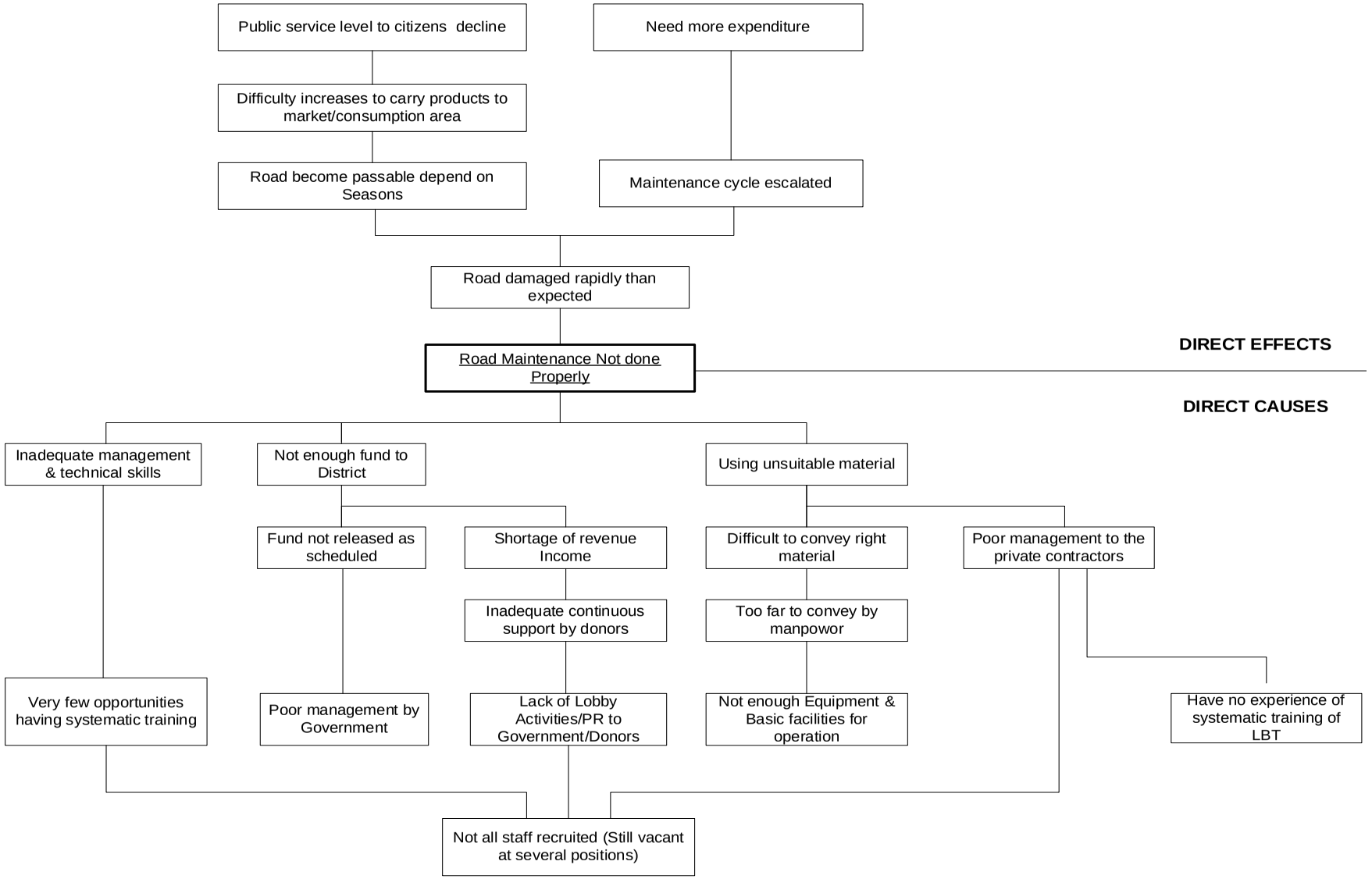
  → Measure-2: Procure and prepare necessary facilities under donor support.

- **Cause-3**: Have no systematic technical training (lack of intellectual assets)

  → Measure-3: Take necessary training at institutes or training centres either domestically or internationally under donor support.

- **Cause-4**: Poor management of policies and budgets by the central government

  → Measure-4: District governments should engage in PR/lobbying activities.



Source: JICA Study Team

Figure 16.1.1 Problem Analysis Tree

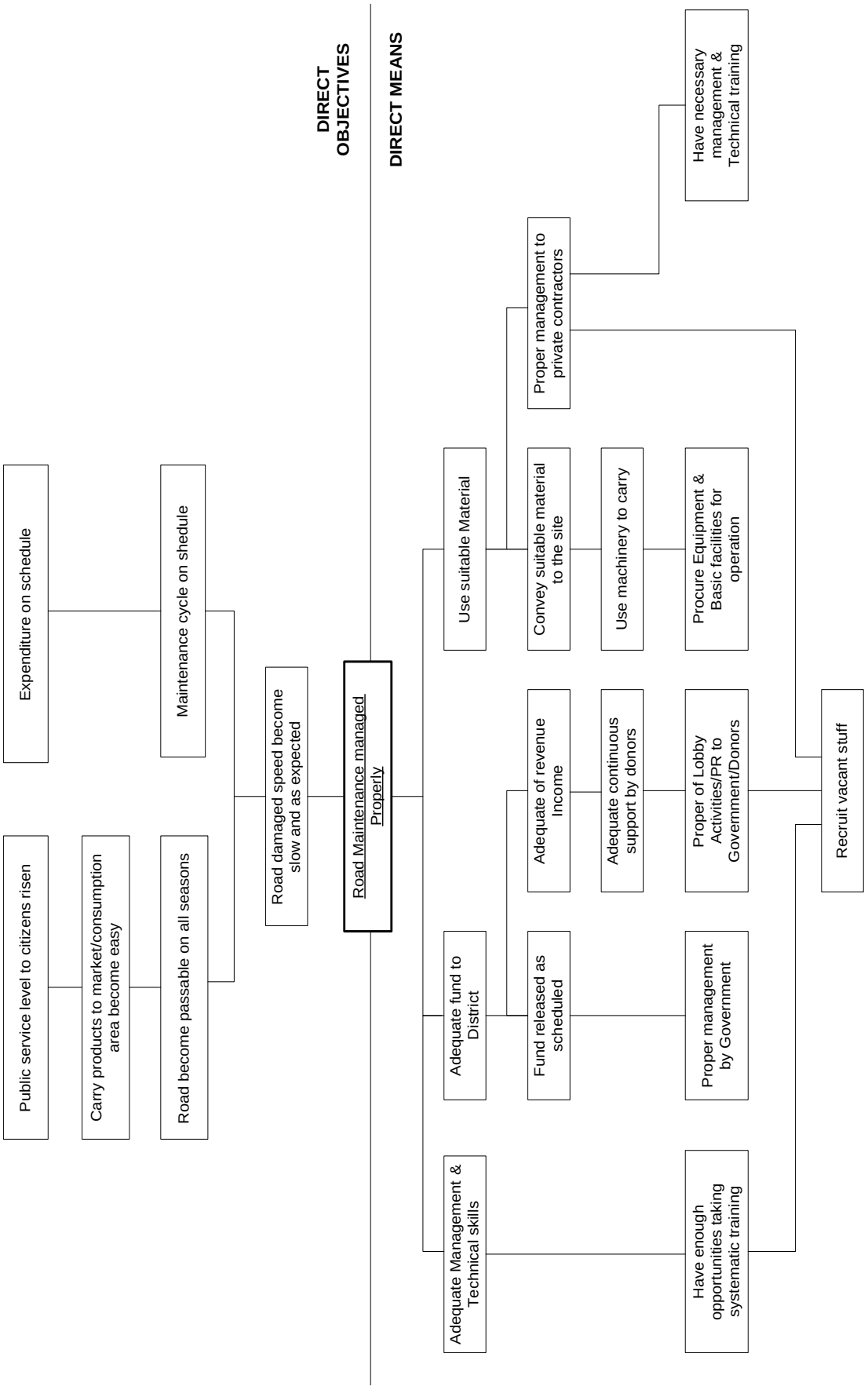


Figure 16.1.2 Objective Analysis Tree

Source: JICA Study Team

16.2 Strategies of Rural Road Maintenance and Equipment Management

16.2.1 Maintenance Policy of the Government

The periodic maintenance backlog of district roads currently stands at approximately 10,000km while the scheduled periodic maintenance demand is 3,500km annually. It is said that the Government had kept disbursing sustainable funds to the local government as conditional grants, the roads however continued to deteriorate despite the increase in the budgetary allocations to the local governments. To respond to the increasingly deteriorating condition of DUCAR (=District, Urban and Community Access Roads), the government has decided to change to an effective maintenance system by utilizing the private sector in the maintenance of equipment.

The gist of the scheme is that the local governments will directly manage routine maintenance activities of their roads while the operator will manage the zonal equipment at a commercial cost to be met by the local governments.

The basics of the scheme, as stipulated in the cabinet paper prepared on April 2010, are shown in further detail below.

- Routine maintenance of district (and urban roads also) will be managed by the district directly. Each district will be provided with light maintenance equipment such as motor grader, tipper truck and pedestrian roller. This equipment will be utilized for light grading and re-graveling of roads expected to be carried out once every 3 months.
- For routine manual maintenance of district roads, workers organized in road gangs will be deployed. A gang of 6 under the overseer will maintain a road section of 12km. The gang will reside in a small camp and will be provided with the requisite road tools and implements.
- The government will procure a firm to maintain and operate the road equipment to re-gravel the district roads and reseal/seal urban roads (which means periodic maintenance). The operator will execute the works at fixed rates that will at least cover direct and operational costs. The operator will be paid a management fee. The local government will pay for the works against pre-set unit rates from their conditional grant allocations.
- Consultancy services will be provided to assist the local governments prepare the documentation required to execute the works. It is envisaged that the local governments will be allocated adequate funds in the form of Conditional Grants to cover these financial requirements, and thereby ensure the viability of the scheme.
- Clear Guidelines for use of road gangs and light equipment will be prepared and local governments will be sensitised on the benefits of the scheme.
- Annually 2,000km of district roads will be rehabilitated and 3,500km will receive periodic maintenance treatments while 150km of urban roads will be resealed or sealed.

16.2.2 Details of the Scheme

The details of the Scheme, in particular the part concerned with district road maintenance, are shown in the following tables.

Table 16.2.1 Operation Costs of Equipment Provided to Districts

		No.	Fuel per day (litre)	No. of days work in a Month	Estimated fuel consumption per month	Total estimated fuel consumption per year
1	Motor Grader	1	150	15	2,250	27,000
2	Dump Truck	1	70	15	1,050	12,600
3	Pedestrian Roller	1	10	8	80	960
4	Pick up	1	20	10	200	2,400
5	Motorcycle	2	5	15	150	1,800
	Sub Total					44,760
	Fuel Cost	2,000	x	44,760	=	89,520,000
	Oil & Lubricants	0.1	x	89,520,000	=	8952000
	Total				UGX	98,472,000

Source: The scheme for use of equipment in district labour (Force Account) operations in maintenance of district and urban roads, garbage collection and disposal, and fire-fighting, MOWT, April 2010

Table 16.2.2 Human resources and associated Salary Scale for Operations in District

	Description	No.	Salary Scale	Annual Salary per person	Total Annual Salary
1	Foreman	1	U5	4,114,241	4,114,241
2	Plant Mechanic	1	U7	2,353,288	2,353,288
3	Plant Operator	2	U7	1,802,502	3,605,004
4	Drivers	2	U8	1,476,763	2,953,526
	Total				13,026,059
5	Allowance		x1.5		19,539,089
6	Road Overseer		U7	1,802,502	
7	Road Gang			1,200,000	

Source: The scheme for use of equipment in district labour (Force Account) operations in maintenance of district and urban roads, garbage collection and disposal, and fire-fighting, MOWT, April 2010

Table 16.2.3 Maintenance Costs for the Equipment Provided to Districts

		No.	Unit Cost ('000)	Total ('000)	Remarks
1	Motor Grader	1	400,000	400,000	
2	Dump Truck	1	170,000	170,000	
3	Pedestrian Roller	1	30,000	30,000	
4	Pick up	1	70,000	70,000	
5	Motorcycle	2	5,000	10,000	
	Total			680,000	
6	Service & Maintenance		x 0.05 x 1.2	40,800	First Year
			x 0.075 x 1.2	61,200	Second Year
			x 0.1 x 1.2	81,600	Third Year
			x 0.125 x 1.2	102,000	Forth Year
			x 0.15 x 1.2	122,400	Fifth Year & more

Source: The scheme for use of equipment in district labour (Force Account) operations in maintenance of district and urban roads, garbage collection and disposal, and fire-fighting, MOWT, April 2010

Table 16.2.4 Jurisdiction of the Zonal Mechanical Workshop (ZMW)

	Zone-1 Gulu	Zone-2 Bubende	Zone-3 Mbarara	Zone-4 Kampala	Zone-5 Jinja	Zone-6 Soroti
District	Koboko Yumbe Moyo Adjumani Arua Maracha/Tegero Nebbi Zombo Former Amuru Gulu former Kitgum Pader Apac Oyam	Bundibungyo Ntoroko Kabarole Kamwenge Kyenjojo Kyaka Mubende Masindi Bulisa Hoima Kibale Kiboga	Kabale Kisoro Rukungiri Ibanda Bushenyi Kiruhara Isingiro Mbarara Rakai Lyantonde Sembalule kasese	Mukono Buikwe Kayunga Nakaseke Wakiso Mpigi Mityana Luwero Kalangala Masaka Mityana	Jinja Iganga Kamuli Kaliro Bulamogi Bugiri Namutumba Pallisa Tororo Busia Butaleja Budaka Mayuge	Kaabong Kotido Abim Moroto Nakapiripirit Amudat Amuria Katakwi Soroti Kaberamaido Kumi Bukedea Sironko Bukwa Kapchorwa
Total Length	3,124 km Note: former Amuru = 121 km, former Kitgum = 342km, Pader+Padibe=186 km, Gulu=291km	3,679 km	4,016 km	4,036 km	3,465 km	2,463 km

Source: CABINET MEMORANDUM CT 2009－Proposals for rehabilitation and maintenance of district and urban roads by force account (Road Equipment and road gangs)

Table 16.2.5 Equipment Provided to ZMW and Its Maintenance Costs

Item	Description	No. of items	Estimated Fuel consumption per day (litre)	No. of operating days in a month	Estimated total fuel consumption per month(litre)	Estimated total fuel consumption per year (litre)
1	Bull dozer	6	150	15	13,500	162,000
2	Traxcavator	6	100	15	9,000	108,000
3	Wheel loader	54	70	22	83,160	997,920
4	Motor grader	60	150	22	196,000	2,376,000
5	Vibrating Roller	42	70	22	64,680	776,160
6	Excavator	6	100	15	9,000	108,000
7	Water Bowser	45	70	22	609,300	831,600
8	Low bed	6	100	15	9,000	108,000
9	Cargo truck with 3 ton crane	6	60	15	5,400	64,800
10	Dump truck	96	70	22	147,840	1,774,080
11	Pickup	60	20	22	26,400	316,800
12	Motorcycle	72	5	22	7,920	95,040
13	Mobile workshop	6	40	15	3,600	43,200
14	20 ton Mobile Crane	2	40	15	1,200	14,400
15	Pedestrian roller	30	10	15	4,500	54,000
16	Pneumatic Roller	1	70	22	1,540	18,480
17	Bitumen sprayer	1	70	22	1,540	18,480
18	Bitumen heater	1	100	22	2,200	26,400
19	Chip Spreader	2	10	22	440	5,280
20	Mechanical Broom	2	10	5	100	1,200
	Total					7,889,840
Note: Fuel costs Ush 2,000 per litre. To cost of Fuel per year add the cost of lubricant per year					7,889,840 x 2,000 = 15.79 BN 15.79 x 0.1 = 1.90 BN TOTAL 15.79+1.90 =17.59 BN	

Source: The scheme for use of equipment in district labour (Force Account) operations in maintenance of district and urban roads, garbage collection and disposal, and fire-fighting, MOWT, April 2010

Table 16.2.6 Human Resources and Associated Salary Scale for ZMW

Item	Description of staff	No. of staff per Unit	Total Number of Staff (x 6)	Basic Salary per month (Ush MN)	Total Pay per year (plus 2 months Gratuity) (Ush MN)
1	Workshop manager (Expatriate)	1	6	22.50	1,840.00
2	Asst. Workshop Manager	1	6	2.50	210.00
3	Workshop Foreman (SEA) (Expatriate)	1	6	20.00	1,680.00
4	Trainer /Instructor	1	6	20.00	1,680.00
5	Asst. Workshop foreman (SEA)	1	6	1.50	126.00
6	Personal Officer	1	6	1.50	126.00
7	Workshop Accountant	1	6	1.50	126.00
8	Internal Auditor	1	6	1.50	126.00
9	Stores Supervisor	1	6	1.30	109.20
10	Stenographer	2	12	0.60	100.80
11	Plant Mechanic	6	36	0.60	302.40
12	Motor vehicle Mechanic	4	24	0.60	201.60
13	Auto-Electrician	2	12	0.60	100.80
14	Operators /Drivers	-	350	0.60	2,940.00
15	Accounts Officers	3	18	0.50	126.00
16	Unit Managers (Civil Works)	3	18	0.50	126.00
17	Asst. Unit Manager (Civil Works)	3	18	0.80	201.60
18	Site foreman (Civil Works)	3	18	0.50	126.00
19	Road Overseers (Civil Works)	3	18	0.50	126.00
20	Stores Officers	3	18	0.50	126.00
21	Security Officers	4	24	0.50	168.00
22	Artisans	6	36	0.35	176.40
	Total				10,844.80
					Labour Cost = Ush 10,844,800,000
					Add 30% for administration and overhead = Ush 3,013,440,000
					Total = 13,858,240,000

Source: The scheme for use of equipment in district labour (Force Account) operations in maintenance of district and urban roads, garbage collection and disposal, and fire-fighting, MOWT, April 2010

16.2.3 The Role of the District

According to the government policy mentioned in the previous pages, the road maintenance system for the national and district roads shall be implemented using the following method.

Table 16.2.7 Method of Road Maintenance and Responsible Organizations

Road type	Responsible organization	Type of road intervention	Method of delivery
District & Urban	District & Urban (LGs)	Routine	Force Account by utilizing Road Gangs and light equipment provided from the Government.
		Periodic and Rehabilitation	Supervision by district under condition of utilizing the machinery and procuring material from the Zonal Mechanical Workshop.
National	UNRA	Routine	Contract basis, however partially by force account.
		Periodic and Rehabilitation	Contract basis.

Source: JICA Study Team

To operate the above required tasks, a private consultant and mechanical staff shall be hired in each district and each district shall take responsibility in the following areas.

- Updating and maintenance of the road inventory system
- Development of road maintenance plan
- Instruction, supervision and evaluation of the private consultants activity

The road inventory survey and maintaining its results is the most significant activity in ensuring capability of preparing the road maintenance plan. Therefore, the road inventory survey shall be implemented by the district itself.

Also, planning the annual and midterm road maintenance plan should be a prominent task undertaken by the district. To support the daily work of the district officer, the private consultant shall prepare the documents, drawings and cost estimations under the district officer's instruction.

Given that the hardware, such as light equipment to use in the district, that is required to conduct the periodic/rehabilitation maintenance and materials will be provided by the government, the strategy of road maintenance shall focus on the development of operational skills related to the 3 principal areas as indicated above.

However, a mechanical workshop building for daily maintenance and office work shall be prepared as well as mechanical tools. These are items which were not included in the government plan.

16.3 Strategy for Rural Road Maintenance Planning

The strategy for rural road maintenance planning will consist of the following five steps.

STEP-1

Estimation of the minimum budget needed for maintenance of existing rural roads. The priority shall be determined from the strength of linkage with the Master Plan.

STEP-2

Determination of priority project of the Master Plan and its fiscal year of operation

STEP-3

Estimation of the required budget for the routes determined in Step-1 and Step-2

STEP-4

Estimation of the expected Road Maintenance Budget from DUCARIP applying the Government Budget Ratio for FY2010. Calculate the shortage for every FY and compile as a proposal

STEP-5

The Capacity Development to obtain the three major capacities required for district engineers. (Three major capacities = Capacity to update Road Inventory survey, Capacity to develop Road Maintenance Plan and Capacity to evaluate the private consultants activities).

16.4 Strategy of Capacity Development for Rural Road Maintenance

(1) Type of Training Units

The capacities required of the district officer are as shown below.

Table 16.4.1 Capacity Required of District Officer

Area	Required Capacity
a) Updating and maintenance of the road inventory system	• Understanding the theory of RAMPS • Practical operational skill to utilize RAMPS • Understanding the technical evaluation skills for defects such as defect type, causes of defects and countermeasures.
b) Development of road maintenance plan	• Road condition evaluation skill by utilizing output of RAMPS. • Road planning skills, utilizing labour based technology in particular.
c) Instruction, supervision and evaluation of private consultants	• Basic knowledge of road design and cost estimation. • Basic knowledge of road construction.

Source: JICA Study Team

According to the results of the capacity assessment mentioned in the previous section and the above mentioned required capacity, it is necessary to conduct the following kinds of training:

Table 16.4.2 Major Training Organizations for Capacity Development

	CD Plan-1	CD Plan-2	CD Plan-3	CD Plan-4
Training Organization	MELTC	JICA	KTC (The Third Country)	UDSM or DIT (The Third Country)
Venue	Mbale, Uganda	Japan	Kisii, Kenya	Dar es Salaam, Tanzania
Character	• The only training institute in Uganda. Covers comprehensive engineering of LBT construction	• Various and comprehensive training courses supported by JICA.	• First established training institute in East Africa. • MELTC introduced its knowledge from KTC initially. • Able to train in techniques regarding bituminous surface which is difficult in Uganda. • Able to conduct comprehensive training which covers most of the fields related to civil engineering.	• Have practical training unit in civil engineering including road & structure design.
Major Target	• District Engineers, Technicians, Private contractors, Foremen	• District engineer, engineer who is responsible for the section, Manager	• District Engineers, Technicians, Private contractors, Foremen and mechanics.	• District Engineers, Technicians, Private contractors, Foremen, Private consultants
Major Contents	• Refer to the following Table	• Refer to the following table	• Tailor made courses.	• (Not Known)
Advantages	• Low cost due to domestic location • Able to gain knowledge of RAMPS. • Specialized institute for training.	• Able to observe the latest technology in the world • Able to gain administrative skills • Able to have international interchange	• Relatively low cost due to neighbouring location. • Able to gain skills aligned with Acholi's needs • Specialized institute for training	• Relatively low cost due to neighbouring location. • Able to gain knowledge from academic perspective

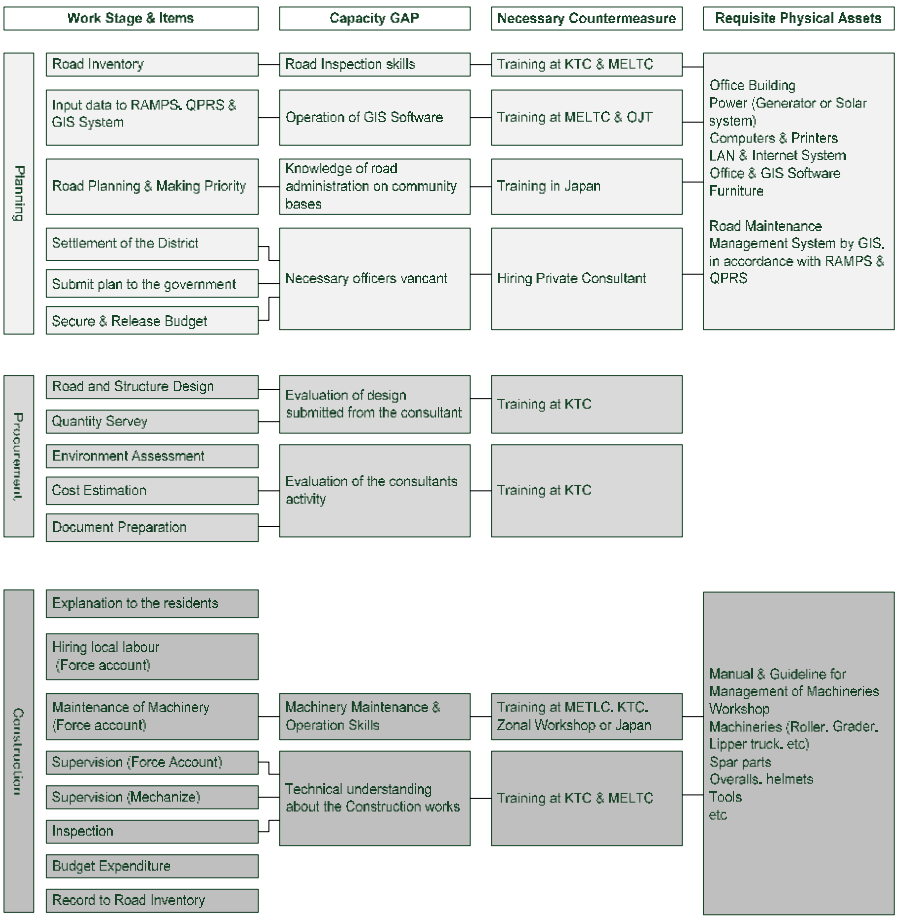
	CD Plan-1	CD Plan-2	CD Plan-3	CD Plan-4
Disadvantages	• Limited to field of Labour Based Technology • Some courses such as GIS need update of curriculum	• High cost due to international location • Limited common ground in terms of Acholi's current needs.	• Need considerable number of participants due to tailor made courses.	• Need considerable number of participants due to tailor made courses. • Narrow spectrum of related fields in engineering compared to other training programs.

Source: JICA Study Team

The training shall be managed under the technical transfer project supported by the Japanese Government. This Project shall be comprehensive to cover the provision of hardware such as construction of mechanical workshops and mechanical tools which are necessary for the sustainability of operations as well as capacity development

(2) Combination of Necessary Training

Figure 16.4.1 shows the combination of necessary training for the pertinent capacity gap at each construction stage.



Source: JICA Study Team

Figure 16.4.1 Necessary Countermeasures at Each Construction Stage

Table 16.4.3 List of Training Courses of MELTC

	Courses	Training Days	Target level in former Amuru
1	Labour-based Road Rehabilitation Course for Assistant Managing Directors	26	DE, SE
2	Labour-based Road Rehabilitation Course for Forepersons	70	RI
3	Labour-based Road Rehabilitation Course for Assistant Forepersons	70	RI
4	Training of Trainers for Routine Road Maintenance Course	70	N/A
5	Labour-based Road Contract Management Course for Engineers	10	SE, RE
6	Labour-based Road Contract Supervision Course for Supervisors of Work	30	RE, RI
7	Labour-based Road Contract Supervision Course for Road Inspector	50	RI
8	Labour-based Awareness for District Administrators and Policy Makers	10	DE, SE
9	Cross-Cutting Issues Related to Planning and Implementation of labour-Based Road Works for Community Based Services Officers	10	RE, RI
10	Community Access Innovations Course for Technical staff	15	N/A

Source: http://meltc.org/, MELTC =Mt. Elegon Labour Based Training Centre

Table 16.4.4 List of Courses under JICA Group Training Pertinent to Road Administration and Maintenance (Implemented in 2009)

Name of Courses	Main Objective	Location / Training Days	Target level in former Amuru
0980216: Road Engineering and Administration	To improve capability for road engineering and administration through acquiring comprehensive knowledge and know-how necessary for appropriate road administration and management.	Sapporo 2 months	SE RE RI
0980948: Comprehensive Bridge Engineering	To provide opportunities to learn the general techniques of bridge engineering used in Japan, including planning, design, and construction	Tokyo 2 months	SE RE
0980949: Seminar on Road Administration	To enhance the capacity of road planning for mid-level officers who are in charge of road planning for the target organizations.	Tokyo 1 month	CAO DE
0984068: Road Maintenance and Maintenance Technology for Africa	To enhance the capacity to plan proper strategies for road maintenance based on the comprehension of problems in each country in Africa.	Osaka 1 month	SE RE
0980230 : Project Management and Evaluation for Civil Engineering in Public Works	To Provide the broader management skills in planning and evaluating the public works so that the participants can create the strategy of ideas to promote their projects effectively.	Yokohama 2 months	CAO DE
0980708 :Construction Equipment and Mechanized contraction Management	To develop human resources in charge of public projects promoting infrastructure development for managers with broad views and high level skills for the supervision and control of the road, bridge and tunnel construction projects mainly executed by construction machinery.	Yokohama 3 months	SE RE
0980984:Participatory Local Social Development ; Project Planning management	To obtain comprehensive knowledge and skills of Participatory Local Social Developments (PLSD) and ability to manage social development projects from the PLSD perspective	Chubu (Nagoya) 1 month	CAO DE
0980212: Seminar on Public Works Administration in Regional Government	To propose improvement plans for Public administration in their governments /Organizations.	Sapporo 2 months	CAO DE

Source: Outline of Group and region-focused training programs in Japan 2009 (JICA)

(3) Logical Framework

Table 16.4.5 Logical Framework (Draft)

	Program Summary	Verifiable Indicators	Means of Verification	Assumptions
Goal	Facilitate the return process of IDPs and revitalize the local economy by improving accessibility to public infrastructure.	Number of IDPs that return to their residences.	United Nations Report	• Road fund provides the road maintenance funds sustainably and promptly to the district.
Purpose	District Road to be maintained properly.	The total distance of routine, periodic and rehabilitation maintenance.	District Annual Report	
Outputs	1) Annual road maintenance program will be prepared using well-maintained road inventory system.	Use road inventory system works	Work record	• Disbursement of budget from the government without delay. • DUCARIP programme on schedule.
	2) The district obtains skills to prepare road maintenance plan.	Road maintenance plan	Maintenance quantified by total road length completed	
	3) The district obtains skills to evaluate the activity of the private consultants properly.	Road maintenance plan	Work record	
Major Activities	Out Put 1 Annual road maintenance program will be prepared by using well-maintained road inventory system.			
	1.1 Update road inventory system using RAMPS.	• District road plan • Road condition assessment form • Structure inventory form	• Results of the road condition and structure inventory. • Operation manual.	
	1.2 Preparation of Guidelines to evaluate defects properly.	• Preparation of the guidelines	• Number of copies to the district • Conducting seminars	
	Out Put 2 The district obtains skills to prepare road maintenance plan.			
	2.1 Training for road planning for road administration is implemented.	(Senior) Road Engineer / District Engineer attend the training.	• Report of training. • Training record • Training curriculum and syllabus.	• Vacant on the JICA group training course. • Able to plan tailor made courses at training organizations.
	2.2 Training of LBT Contract Management.	(Senior) Engineer /District Engineer attend the training.		
	Output-3 The district obtains skills to evaluate the activity of the private consultants properly.			
	3.1 Training for Road and Structure design.	(Senior) Road Engineer and Road Inspector attend the training.	• Report of training. • Training record • Training curriculum and syllabus.	Able to plan tailor made courses at training organizations.
	3.2 Training for LBT technical theory and construction works.	(Senior) Road Engineer and Road Inspector attend the training.		Able to plan tailor made courses at training organizations.
	3.3 Preparation of Management Manual and Guidelines for workshop and construction equipment	Manual and guidelines developed through workshop attended by mechanical engineer, operator and mechanics.	• Work record	• Workshop constructed by government, district or donors.
	3.4 Training for construction machine operation and mechanics.	Operator and Mechanic of district attend the training.	• Report of training. • Training record • Training curriculum and syllabus.	• Able to plan tailor made courses at training organizations.

Source: JICA Study Team

17. RURAL ROAD IMPROVEMENT AND MAINTENANCE PLAN BY 2018

17.1 Cost Estimation of Road Improvement to Achieve Desirable Service Levels

17.1.1 Unit Cost by Functional Classification

As discussed in Chapter 14 of this report, the roads in the existing road network in Amuru and Nwoya Districts are classified into seven classes, based on current service level and geometric characteristics. These classes of the existing road network are translated into seven sets of asset types, each with its own cost to construct the road with a specific carriage way width and pavement type. As shown in Table 17.1.1, the unit cost of these assets ranges between 2.3 million Ushs. (Earth road, Carriageway=1.5m) and 50 million Ushs. (Earth road, Carriageway=4.5m) by the geometric characteristics of the road.

Table 17.1.1 Unit Cost of Assets by Geometric Type

Proposed Functional Classification /Rank		Functional Definition by Rural Road Manual	Functional Definition by District Road Manual	Construction Cost UGX '000/km						
				Existing						CARs
				0	1	2	3	4	5	6
				Footpath (w=1.5m)	0+Widen to 3m	1+widen to 4.5m	2+ Grading	2+widen to 6.0m	2+Gravel	CARs
A	International Trunk Road	International Trunk Road		N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	National Trunk Road	National Trunk Road		N/A	N/A	N/A	N/A	N/A	N/A	N/A
C	Inter-District Trunk Road	Primary Road	District Road I	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D	District Arterial Road	Secondary Road	District Road II	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E	District Feeder Road	Minor Road	District Road III	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F	Community Access Road		Community Access Road	N/A	N/A	N/A	N/A	N/A	N/A	15,733
	Existing			2,351	4,702	8,326	10,930	18,286	50,057	N/A
			Carriage Way	1.50	3.00	4.50	4.50	6.00	4.50	3.00
			Shoulder	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Total Width	1.50	3.00	4.50	4.50	6.00	4.50	3.00
			Pavement Type	Earth	Earth	Earth	Earth	Earth	Gravel	Earth

Source: JICA Study Team

As discussed in Chapter 15 of this report, this Study proposes two types of interventions for improvement of the road network in Amuru and Nwoya Districts: high priority projects and second priority projects. The road sections of high priority projects are suggested to be fully upgraded to meet the desired functional classification and service level. The road sections of second priority projects are suggested to be rehabilitated and partially upgraded where likely deteriorated road sections were observed.

The unit costs for full upgrading, applied to the high priority projects, are prepared based on the current design standard of the national and district roads. For instance, the District Road Class I, with the road width of 9.4m and gravel surface, costs about 135 million Ushs. per km, whereas the National Road Class A, with 10m width and gravel surface, costs 378 million Ushs. per km. Different structural designs, thickness of sub-grade and base course and particularly pavement type contribute to the distorted unit costs between District Road and National Road.

Table 17.1.2 Unit Construction Cost by Functional Classification (Full Improvement)

Unit: 1000 Ushs./km

Proposed Functional Classification /Rank		Functional Definition by Rural Road Manual	Functional Definition by District Road Manual	Construction Cost UGX '000/km								
				District			National					
				7	8	9	10	11	12	13	14	15
				Full Specification			Full Specification					
				DISTRICT CLASS III	DISTRICT CLASS II	DISTRICT CLASS I	NATIONAL CLASS C	NATIONAL CLASS B	NATIONAL CLASS A	NATIONAL CLASS III	NATIONAL CLASS II	NATIONAL CLASS I
A	International Trunk Road	International Trunk Road		N/A	N/A	N/A	N/A	N/A	N/A	664,829	741,569	819,860
B	National Trunk Road	National Trunk Road		N/A	N/A	N/A	N/A	N/A	378,598	664,829	741,569	819,860
C	Inter-District Trunk Road	Primary Road	District Road I	N/A	N/A	135,726	N/A	N/A	378,598	664,829	741,569	N/A
D	District Arterial Road	Secondary Road	District Road II	N/A	110,148	N/A	N/A	337,566	378,598	N/A	N/A	N/A
E	District Feeder Road	Minor Road	District Road III	87,982	N/A	N/A	243,323	337,566	N/A	N/A	N/A	N/A
F	Community Access Road		Community Access Road	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Existing			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Carriage Way	4.00	5.40	6.00	4.00	5.60	6.00	5.60	6.00	7.00
			Shoulder	1.25	1.20	1.70	1.20	1.50	2.00	1.50	2.00	2.00
			Total Width	6.50	7.80	9.40	6.40	8.60	10.00	8.60	10.00	11.00
			Pavement Type	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	LCS	LCS	LCS

Source: JICA Study Team

As tabulated in Table 17.1.3, the unit costs for rehabilitation, applied to the second priority projects, are prepared based on the unit cost currently applied in Uganda (29 million Ushs. per km for district roads and 33 million Ushs. per km for national roads). Also, the road sections of second priority projects are suggested to be partially upgraded where likely deteriorated road sections were observed. Thus, the unit costs for embankment improvement are separately prepared assuming a thickness of 150 cm embankment works is required.

It should be noted that the unit costs discussed above are the construction costs for road improvement projects. Thus, additional costs, such as contingency and engineering costs, should be added to estimate the total project cost. In this study, contingency is proposed at 15% of the construction cost, engineering cost at 7% of the construction cost and local administration cost at 3% of the total cost including construction cost, contingency and engineering cost.

Table 17.1.3 Unit Construction Cost by Functional Classification (Rehabilitation)

Unit: 1000 Ushs./km

Proposed Functional Classification /Rank		Functional Definition by Rural Road Manual	Functional Definition by District Road Manual	Construction Cost UGX '000/km								
				District			National (Re-classified roads only)					
				25	26	27	28	29	30	31	32	33
				General Unit Price			General Unit Price					
				DISTRICT CLASS III	DISTRICT CLASS II	DISTRICT CLASS I	NATIONAL CLASS C	NATIONAL CLASS B	NATIONAL CLASS A	NATIONAL CLASS III	NATIONAL CLASS II	NATIONAL CLASS I
A	International Trunk Road	International Trunk Road		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	National Trunk Road	National Trunk Road		N/A	N/A	N/A	N/A	N/A	33,114	N/A	N/A	N/A
C	Inter-District Trunk Road	Primary Road	District Road I	N/A	N/A	29,219	N/A	N/A	33,114	N/A	N/A	N/A
D	District Arterial Road	Secondary Road	District Road II	N/A	29,219	N/A	N/A	33,114	33,114	N/A	N/A	N/A
E	District Feeder Road	Minor Road	District Road III	29,219	N/A	N/A	33,114	33,114	N/A	N/A	N/A	N/A
F	Community Access Road		Community Access Road	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Existing			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Carriage Way	4.00	5.40	6.00	4.00	5.60	6.00	5.60	6.00	7.00
			Shoulder	1.25	1.20	1.70	1.20	1.50	2.00	1.50	2.00	2.00
			Total Width	6.50	7.80	9.40	6.40	8.60	10.00	8.60	10.00	11.00
			Pavement Type	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	LCS	LCS	LCS

Source: JICA Study Team

Table 17.1.4 Unit Construction Cost by Functional Classification (Embankment Section)

Unit: 1000 Ushs./km

Proposed Functional Classification /Rank		Functional Definition by Rural Road Manual	Functional Definition by District Road Manual	Construction Cost UGX '000/km								
				District			National					
				16	17	18	19	20	21	22	23	24
				Embankment Section			Embankment Section					
				DISTRICT CLASS III	DISTRICT CLASS II	DISTRICT CLASS I	NATIONAL CLASS C	NATIONAL CLASS B	NATIONAL CLASS A	NATIONAL CLASS III	NATIONAL CLASS II	NATIONAL CLASS I
A	International Trunk Road	International Trunk Road		N/A	N/A	N/A	N/A	N/A	N/A	1,090,089	1,192,796	1,288,826
B	National Trunk Road	National Trunk Road		N/A	N/A	N/A	N/A	N/A	933,920	1,090,089	1,192,796	1,288,826
C	Inter-District Trunk Road	Primary Road	District Road I	N/A	N/A	742,665	N/A	N/A	933,920	1,090,089	1,192,796	N/A
D	District Arterial Road	Secondary Road	District Road II	N/A	668,143	N/A	N/A	774,111	933,920	N/A	N/A	N/A
E	District Feeder Road	Minor Road	District Road III	653,041	N/A	N/A	658,460	774,111	N/A	N/A	N/A	N/A
F	Community Access Road		Community Access Road	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Existing			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Carriage Way	4.00	5.40	6.00	4.00	5.60	6.00	5.60	6.00	7.00
			Shoulder	1.25	1.20	1.70	1.20	1.50	2.00	1.50	2.00	2.00
			Total Width	6.50	7.80	9.40	6.40	8.60	10.00	8.60	10.00	11.00
			Pavement Type	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	LCS	LCS	LCS

Source: JICA Study Team

17.1.2 Cost Estimation of High/Second Priority Projects

As discussed above, high priority roads up to the year of 2018, selected by both cost efficiency and social impact oriented weights, are suggested to be fully improved. Applying the unit cost for full upgrading, the project cost of high priority projects is estimated to be 17 million USD in total.

Second priority roads, from which significant social impacts are expected to be derived, are suggested to be rehabilitated and partly improved. Applying the unit costs for both

rehabilitation and embankment improvement (assuming 10% of the road section in length requires embankment improvement), the project cost of second priority projects is estimated to be 11 million USD in total.

Accordingly, this Study proposes an optimum intervention of road improvement projects on 268 km road length in Amuru and Nwoya Districts, amounting to a total of 28.2 million USD up to 2018. If these high priority and second priority projects are implemented, 43% of necessary projects in terms of road length will then meet the desired road functional classification and service level.

Table 17.1.5 Project Cost of High/Second Priority Projects in Amuru and Nwoya Districts

SN	Project Title	Administ - ration	District	Priority Project	Road Length (km)	Project Cost (million USD)
1	CAR 110	CAR	Amuru	High	16.1	0.8
2	DR 114	District	Amuru	High	15.3	2.9
3	DR 137	District	Amuru	High	12.7	0.9
4	DR 603	District	Amuru	High	11.0	1.3
5	NR 005	National	Amuru	High	26.1	8.4
6	NR 008	National	Amuru	High	13.1	2.8
				Sub-total	94.3	17.1
7	NR 002	National	Amuru	Second	59.3	4.1
8	CAR 151, 162	CAR	Nwoya	Second	32.7	1.9
9	NR 003	National	Nwoya	Second	27.4	1.7
10	CAR 188, 189	CAR	Nwoya	Second	16.8	1.0
11	NR 008	National	Amuru	Second	16.2	1.1
12	DR 130	District	Amuru	Second	21.1	1.3
				Sub-total	173.6	11.2
				Total	267.9	28.2

Source: JICA Study Team

17.2 Consideration of Budget Limitation

Chapter 8 of this report discusses the local budgets for road improvement maintenance. In terms of the budgets for road improvement, there are mainly three channels providing funds in Uganda: the MoWT, donors/NGOs and the Ministry of Local Government. Looking at the actual budget disbursements in recent years and the government investment plan, the findings on development funds for both national and district roads in Amuru and Nwoya Districts are summarized below.

- Investment in national road development heavily relies on funding by donors. In recent years, donors annually spent around 100 million USD in total for improvement of the national roads. Currently, the MoWT budgets more than 100 million USD per year for improvement of national roads. These investments in national road development may be channelled to improvement (paving) of 7,000 km of existing unpaved national roads.
- The National Transport Master Plan suggests investments in improvement of newly classified national roads. However, the amount of investment only meets the budget that is required for rehabilitation works.
- District (and urban) roads in the entire nation received lower investment for their improvement, totalling 20 million USD per year from both donors and the MoWT.
- Former Amuru District received only 0.13 million USD from the Local Government Development Programme and the Poverty Action Fund, which was provided through the

Ministry of Local Government, in the year of 2008/09 for the improvement of the district roads.

- Former Amuru District is expected to receive 0.27 million USD from the Road Fund in the year 2010/11 for rehabilitation of the district roads.

Accordingly, it can be concluded that the newly classified national roads in Amuru and Nwoya Districts may receive limited funding for their rehabilitation: those funds will not be adequate for their improvement. Also, there is very little chance for the district roads to be improved due to the limited budget.

17.3 Rural Road Improvement and Maintenance Plan for Amuru and Nwoya Districts by Year of 2018

17.3.1 Types of Intervention for Road Improvement

As discussed in the previous section, there is very limited investment for improvement of both national roads and district roads in Amuru and Nwoya Districts. Now, the question is how to improve the road network in these two districts, using local and external funding. To estimate the costs required for improvement, six sets of options, combining improvement and rehabilitation works, were prepared to facilitate the decision making on the degree of intervention in road improvements in Amuru and Nwoya Districts (see Table 17.3.1).

Table 17.3.1 Six Options of Intervention for Road Improvement

Level of Intervention	Least Minimum-level	Near Minimum-level	Low-level	Medium-level	High-level	Highest-level
High Priority New National Road	Rehabilitation	Rehabilitation	Rehabilitation	Improvement	Improvement	Improvement
Second Priority New National Road	Rehabilitation	Rehabilitation	Rehabilitation	Rehabilitation	Rehabilitation	Rehabilitation + Embankment
Other New National Road	Rehabilitation	Rehabilitation	Rehabilitation	Rehabilitation	Rehabilitation	Rehabilitation
High Priority District Road	Periodic Maintenance	Rehabilitation	Rehabilitation	Rehabilitation	Improvement	Improvement
Second Priority District Road	-	Periodic Maintenance	Rehabilitation	Rehabilitation	Rehabilitation	Rehabilitation + Embankment
Other District Road	No Rehabilitation/Improvement					

Source: JICA Study Team

17.3.2 Rural Road Improvement Plan for Amuru and Nwoya Districts

The project costs and annual disbursements required till the year 2018 were estimated, applying the unit costs calculated in the previous section. Table 17.3.2 shows a summary of the project costs and annual disbursement by type of intervention. For instance, annual disbursements of 626,000 USD for rehabilitation of national roads and 120,000 USD for rehabilitation of high priority district roads are required to accomplish the minimum-level of intervention. Assuming the MoWT has enough funding for rehabilitation of newly classified national roads and local governments receive as much funding as they used to receive, external

funding would be necessary to achieve medium (for national roads) and high (for district and community access roads) level of interventions. In other words, if Amuru and Nwoya Districts select the low-level of intervention, all the national roads and some district roads, identified as high and second priority projects, can be rehabilitated, utilizing local funds (See the detailed project costs in Table 17.4.2 – 17.4.6)

Table 17.3.2 Project Costs and Annual Disbursements Required by Type of Intervention

Unit: thousand USD

Level of Intervention	Minimum-level	Near Minimum-level	Low-level	Medium-level	High-level	Highest-level
National Road						
Project Cost	5,008	5,008	5,008	15,530	15,530	20,743
Annual Disbursement	626	626	626	1,941	1,941	2,593
District Road/CARs						
Project Cost	102	957	1,886	1,886	6,946	10,086
Annual Disbursement	13	120	236	236	868	1,261
Expected Funding Source						
National Road	Local Funding			External Funding		
District Road/CARs	Local Funding				External Funding	

Source: JICA Study Team

The costs estimated for the six options of intervention reveal that external funding is necessary for improvement of both national and district roads. The subsequent issue would then be establishing which level of road improvement can be achieved in Amuru and Nwoya Districts. Table 17.3.3 compares the total road length of the necessary projects and the road length to be improved or rehabilitated at each level of intervention. It can be concluded that all the national roads will either be rehabilitated or improved while most district roads and community access roads, identified as necessary projects, will be left without any improvement or rehabilitation works.

Table 17.3.3 Road Length Improved/Rehabilitated by Type of Intervention

Unit: km

Level of Intervention	Minimum-level	Near Minimum-level	Low-level	Medium-level	High-level	Highest-level
National Road: 294.6 km of Necessary Projects						
Improved	0.0	0.0	0.0	39.2	39.2	142.2
Rehabilitated	294.6	294.6	294.6	255.4	255.4	152.4
No Improvement	0.0	0.0	0.0	0.0	0.0	0.0
% of Improved Road	0%	0%	0%	13%	13%	48%
District Road/CARs: 332.6 km of Necessary Projects						
Improved	0.0	0.0	0.0	0.0	55.1	125.7
Rehabilitated	55.1	125.7	125.7	125.7	70.6	0.0
No Improvement	277.4	206.9	206.9	206.9	206.9	206.9
% of Improved Road	0%	0%	0%	0%	17%	38%

Source: JICA Study Team

17.3.3 Rural Road Maintenance Plan for Amuru and Nwoya Districts

The scope of the maintenance works comprises both routine and periodic maintenance. According to the former MOWHC (2004)[1], the annual cost for maintenance works on the unpaved roads in Uganda is 3,700 USD per km for periodic maintenance and 400 USD per km for routine maintenance, including spot improvements. Using these unit costs, the annual maintenance cost for all the necessary projects in Amuru and Nwoya Districts is estimated to be 186,000 USD for the national roads and 210,000 USD for the district roads. As discussed above, the MoWT, using the Road Fund, will disburse a considerable amount of the budget for both national and district road maintenance. Amuru and Nwoya Districts are expected to receive 270,000 USD for maintenance of the district roads from the Road Fund in the year of 2010/11. The budgetary allocations from the MoWT optimistically suggest that both national roads and priority district roads in Amuru and Nwoya Districts can be maintained using the local funds.

Table 17.3.4 Maintenance Cost for Necessary Projects in Amuru and Nwoya Districts

Unit: thousand USD

Road Classification	Routine Maintenance	Periodic Maintenance	Total
National Road			
Total Cost	943	545	1,488
Annual Disbursement	118	68	186
District Road/CARs			
Total Cost	1,064	615	1,679
Annual Disbursement	133	77	210

Source: JICA Study Team

[1] MOWHC (2004) Strategy for Sustainable Maintenance of District, Urban and Community Access Roads

17.4 Maintenance Cost of Rural Roads by 2018

In the previous section, it was discussed that despite the fact that it would be ideal to improve whole sections of high priority roads, improvement only up to rehabilitation level would have to be considered due to budgetary constraints. Therefore, for the maintenance costs for high priority roads and second priority roads, the following two cases should be considered.

The first case (Case-1) is the case where maintenance activities on national roads, district roads and community access roads are conducted up to only the periodic level. This case can be considered when budgetary allocations cannot support full improvement. The second case (Case-2) is where full improvement is conducted for the high priority roads while rehabilitation is conducted for the second priority roads. This case can be considered when budgetary allocations are sufficient.

17.4.1 Road Maintenance Cost of Case-1

Table 17.4.1 shows the necessary maintenance activities up to 2018. Since service level 0 represents pedestrian walkways where passage of vehicles is difficult, no maintenance costs were assigned. Furthermore, Periodic Maintenance is planned once every 5 years for national roads and once every 3 years for district roads. Since CAR 151, 162, CAR 188, 189 and DR 130 are the targeted roads under the Urgent Projects, it is planned that periodic maintenance will be conducted after 2 years of routine maintenance.

Table 17.4.1 Necessary Maintenance Activity up to 2018 (Case-1)

	Project Title	Administrative Classification	Road Length (km)	Current Service Level	Functional Classification	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
High Priority Road (Improvement)	CAR110	CAR	16.1	1	District II				R+P	R	R	P+R	R	R	P+R
	DR114	District	15.3	2	District II				R+P	R	R	P+R	R	R	P+R
	DR137	District	12.7	0	District II				-	-	-	-	-	-	-
	DR603	District	11.0	0	District II				-	-	-	-	-	-	-
	NR005	National	26.1	3	National B				R+P	R	R	R	R	R+P	R
	NR008	National	13.1	2	National B				R+P	R	R	R	R	R+P	R
Second Priority Road (Rehabilitation)	NR002	National	59.3	3	National C				R+P	R	R	R	R	R+P	R
	CAR151, 162	CAR	33.7	7	District III				R	R	R+P	R	R	R+P	R
	NR003	National	27.4	4	National C				R+P	R	R	R	R	R+P	R
	CAR188,189	CAR	23.3	7	District III				R	R	R+P	R	R	R+P	R
	NR008	National	13.0	0	National C				-	-	-	-	-	-	-
	DR130	District	21.1	7	District III				R	R	R+P	R	R	R+P	R

C: Construction, R=Routine Maintenance. P: Periodic Maintenance

Source: JICA Study Team

In light of necessary maintenance activities shown in Table 17.4.1 above, the estimated road maintenance costs for case-1 are determined as shown in Table 17.4.2.

Table 17.4.2 Estimated Road Maintenance Cost of Case-1

Unit: Million Ushs.

	Project Title	Administrative Classification	Road Length (km)	Current Service Level	Functional Classification	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
High Priority Road (Improvement)	CAR110	CAR	16.1	1	District II				185	32	32	185	32	32	185	684
	DR114	District	15.3	2	District II				176	145	145	176	145	145	176	1,109
	DR137	District	12.7	0	District II				-	-	-	-	-	-	-	
	DR603	District	11.0	0	District II				-	-	-	-	-	-	-	
	NR005	National	26.1	3	National B				1,370	196	196	196	196	1,370	196	3,719
	NR008	National	13.1	2	National B				688	98	98	98	98	688	98	1,867
Sub-Total	National								361	178	178	361	178	178	361	1,794
	District								2,058	294	294	294	294	2,058	294	5,586
Second Priority Road (Rehabilitation)	NR002	National	59.3	3	National C				3,114	445	445	445	445	3,114	445	8,453
	CAR151, 162	CAR	33.7	7	District III				67	67	388	67	67	388	67	1,113
	NR003	National	27.4	4	National C				1,440	206	206	206	206	1,440	206	3,909
	CAR188,189	CAR	23.3	7	District III				47	47	267	47	47	267	47	768
	NR008	National	13.0	0	National C				-	-	-	-	-	-	-	0
	DR130	District	21.1	7	District III				42	42	242	42	42	242	42	696
Sub-Total	National								4,554	651	651	651	651	4,554	651	12,362
	District								156	156	898	156	156	898	156	2,576
Total	National								4,915	828	828	1,012	828	4,732	1,012	14,155
	District								2,214	450	1,192	450	450	2,956	450	8,162

Source: JICA Study Team

17.4.2 Road Maintenance Cost of Case-2

17.4.2.1 Expected Maintenance Budget from Road Fund 2010 and DUCARIP

The road maintenance budget for each year up to 2018 will be determined from the results of the disbursement plan for the road fund 2010 shown in Table 17.4.3.

Table 17.4.3 Disbursement Plan for the Road Fund 2010

No.	Road Network	Amount (Bil. Ushs.)	Remarks/Purpose and Release
1	Trunk road maintenance	189.057	Routine and periodic maintenance of the expanded national road
		6.913	Operational expenses of UNRA
	Total of UNRA	**195.970**	**To maintain the expanded network 21,000km**
2	DUCAR Network	43.312	Routine and Periodic Maintenance of 22,500km of district roads
		7.459	Maintenance of up to 30,000km of Community Access Roads under 922 sub counties.
		16.019	Routine and Periodic Maintenance of urban roads under 137 town councils
		27.168	Routine and Periodic maintenance of urban roads under 13 urban municipalities and 5 Kampala city council divisions
	Regional Mechanical Workshops	4.570	For repair and maintenance of equipment and plant for Districts and Municipalities.
	Total of DUCAR	**98.528**	**Maintenance of DUCAR network and Regional Mechanical Workshop**
3	URF Secretariat	5.071	Administrative expenses of URF secretariat
		0.996	Research
		1.298	Such activities relevant to maintenance of public roads as may be determined by the board
	Total for URF Secretariat	**7.365**	**Provided within vote 118 of URF (2.44% of the budget)**
	Grand Total	**301.863**	**Represents the available budget for maintenance of the 80,000km of national roads.**

Source: The Uganda Road Fund

According to DUCARIP, the annual budget for 2010 was 156.9 billion Ushs whereas 98.5 billion Ushs (62.8%) will be the Government expenditure as indicated in the table above. By

applying the same ratio to the following years, the road maintenance budget can be determined. Table 17.4.4 shows the computations in further detail.

Table 17.4.4 Expected Road Maintenance Budget from DUCARIP and Disbursement Plan 2010

Unit: Billion Ushs.

			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
DUCARIP	District Roads	Routine Maintenance	10.4	10.2	10.0	9.7	9.5	9.3	9.1	8.9	8.8	8.7	94.7
		Periodic Maintenance	38.1	38.1	38.1	36.3	34.4	32.6	30.8	29.2	27.7	26.2	332
		Rehabilitation	17.0	17.0	17.0	21.8	21.8	21.8	21.8	21.8	21.8	21.8	204
		Low-Cost Sealing	9.6	19.2	28.8	37.9	37.9	37.9	37.9	37.9	37.9	37.9	323
		Total	75.1	84.6	94.0	105.7	103.6	101.6	99.7	97.9	96.2	94.6	953
	Urban Roads		14.3	20.5	26.8	32.6	32.7	32.7	32.3	32.3	32.4	32.1	289
	Kampala City		25.2	25.2	25.2	25.0	24.8	24.5	24.3	24.1	23.8	23.8	246
	CARS		8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	80
	Bridge Works		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	20
	Capacity Building		0.9	0.9	0.9	0.9	0.6	0.6	0.4	0.4	0.4	0.4	6
	TOTAL		125.5	141.2	156.9	174.2	171.7	169.4	166.7	164.7	162.8	160.9	1,594
ROAD FUND 2010	UNRA				196.0								
	DUCAR				98.5								
	URF				7.4								
	TOTAL				301.9								
Ratio of Govenment Fund (DUCAR/DUCARIP)					0.628								
Expected Budget Cieling (Apply above ratio to following Years)						109.4	107.9	106.4	104.7	103.5	102.3	101.1	
Expected Allocation to District Roads						66.4	65.1	63.8	62.6	61.5	60.4	59.4	
Expected Allocation to Acholi Sub Region						3.76	3.69	3.62	3.55	3.49	3.43	3.37	
Expected Allocation to Amuru District						**0.56**	**0.55**	**0.54**	**0.53**	**0.52**	**0.51**	**0.50**	

Source: JICA Study Team based on DUCARIP and the Uganda Road Fund

The budget allocation ratios of the Acholi sub-region and former Amuru district are shown in Table 17.4.5.

Table 17.4.5 Allocation Ratios of Acholi Sub-region and Former Amuru District

Unit: Million Ushs.

		District	CARs	Sub Total	Urban	Total
Acholi Sub Region	Amuru	463	70	533	34	567
	Kitgum	438	68	505	357	863
	Pader	759	134	892	186	1,078
	Lamwo	419	56	475	20	495
	Gulu	671	112	784		784
	Sub Total	2,749	440	3,189	597	3,787
Grand Total of District, CARs and Urban Roads				50,771	16,020	66,790
Allocation of Acholi Sub-Region						5.67%
Allocation of Amuru District						0.85%

Source: JICA Study Team (The Uganda Road Fund)

17.4.2.2 Road Construction Period of National and District Roads

To estimate the maintenance costs for case-2, determination of the number of years after the opening of the roads will be required since the maintenance usually starts just after handing over the road to the client. However, determination of the required period for road construction based on the capability of the constructor alone is difficult since there are other factors such as conditions of the market, weather, other peripheral conditions and budgetary allocations by the client.

However, to standardize the construction period, an attempt was made to determine the length of the construction periods based on the cost estimations. Table 17.4.6 shows how construction periods were determined by focusing on machinery used and how much was required at each service level as indicated in the cost estimation. The intensity of machinery utilisation for the case of "Full Specification" was used in the calculations. It was also assumed that construction works would be hampered during the three months of the rainy season. For the other cases such as general price and embankment, the construction periods were determined from the comparison of unit costs.

Table 17.4.6 Estimated Road Construction Period per km

	Work	Critical Utilized Machinery	Unit	Capacity per Day	7		8		9		10		11		12	
					District III		District II		District I		National C		National B		National A	
					Quantity	Days	Quantity	Days	Quantity	Days	Quantity	Days	Quantity	Days	Quantity	Days
1	Bush Cutting	Bull Dozer	m3	500	395	0.8	500	1.0	620	1.2	470	0.9	580	1.2	650	1.3
2	Graveling	Moter Grader	m2	1,110	7,900	7.1	10,000	9.0	12,400	11.2	9,400	8.5	11,600	10.5	13,000	11.7
3	Embankment	Bull Dozer	m3	500	0	0.0	0	0.0	0	0.0	2,538	5.1	3,088	6.2	3,438	6.9
4	Cutting	Bull Dozer	m3	500	975	2.0	1,170	2.3	1,410	2.8	960	1.9	1,290	2.6	1,500	3.0
5	Subgrade	Moter Grader	m2	1,110	0	0.0	0	0.0	0	0.0	2,400	2.2	3,225	2.9	3,750	3.4
6	Sub Base	Moter Grader	m2	1,110	0	0.0	0	0.0	0	0.0	4,000	3.6	5,600	5.0	6,000	5.4
7	Base	Moter Grader	m2	1,110	4,000	3.6	5,400	4.9	7,000	6.3	4,000	3.6	5,600	5.0	6,000	5.4
8	DBST	Tire Roller	m2	490	2,000	4.1	2,000	4.1	2,000	4.1	2,000	4.1	2,000	4.1	2,000	4.1
9	As Concrete	Paver	m2	1,610	20	0.0	24	0.0	28.8	0.0	22.8	0.0	27.2	0.0	30	0.0
				TOTAL		17.6		21.3		25.6		29.9		37.5		41.2
				ROUND		**18**		**22**		**26**		**30**		**38**		**42**

Source: JICA Study Team

Table 17.4.7 gives the assumed construction and rehabilitation distances per year. The distances for rehabilitation were determined by the assumption that works would proceed at double the speed of construction.

Table 17.4.7 Estimated Construction Distance per Year

Service Level		Days of /km	Working Days /Year	Construction distance per Year (km)	Rehabilitation Distance per Year (km)
7	District III	18	274	15	30
8	District II	22	274	12	25
9	District I	26	274	11	21
10	National C	30	274	9	18
11	National B	38	274	7	14
12	National A	42	274	7	13

Source: JICA Study Team

17.4.2.3 Road Maintenance Cost of Case-2

The years after road opening for high and second priority roads were thus determined as shown in the following tables. It should be noted that while the districts will conduct periodic maintenance on district roads every 3 years, UNRA plans to conduct periodic maintenance every 5 years for roads in Amuru and Nwoya Districts.

Table 17.4.8 Necessary Years for Improvement/Rehabilitation of High and Second Priority Roads

	Project Title	Adminitrative Classification	Road Length (km)	Service Level	Functional Classification	Constuction /Rehabilitation Distance per year (km)	Neccesary Years	Distribution of Years			
								1	2	3	4
High Priority Road (Improvement)	CAR110	CAR	16.1	7	District II	12	1.3	1.0	0.3		
	DR114	District	15.3	8	District II	12	1.2	1.0	0.2		
	DR137	District	12.7	7	District II	12	1.0	1.0			
	DR603	District	11.0	8	District II	12	0.9	0.9			
	NR005	National	26.1	11	National B	7	3.6	1.0			
	NR008	National	13.1	11	National B	7	1.8	1.0			
Second Priority Road (Rehablitation)	NR002	National	59.3	10	National C	18	3.3	1.0	1.0	1.0	0.3
	CAR151, 162	CAR	33.7	7	District III	30	1.1	1.0	0.1		
	NR003	National	27.4	10	National C	18	1.5	1.0	0.5		
	CAR188,189	CAR	23.3	7	District III	30	0.8	0.8			
	NR008	National	13.0	10	National C	18	0.7	0.7			
	DR130	District	21.1	7	District III	30	0.7	0.7			

Source: JICA study team

Table 17.4.9 Necessary Maintenance Activities up to 2018 (Case-2)

	Project Title	Administrative Classification	Road Length (km)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
High Priority Road (Improvement)	CAR110	CAR	16.1				C	C+R	R	R	R+P	R	R
	DR114	District	15.3				R	C	C	R	R	R+P	R
	DR137	District	12.7				R	R	C	R	R	R+P	R
	DR603	District	11.0				R	R	R	C	R	R	R+P
	NR005	National	26.1				R	R	R	R	C	R	R
	NR008	National	13.1				R	R	R	R	R	C	R
Second Priority Road (Rehabilitation)	NR002	National	59.3				RE	RE+R	RE+R	RE+R	R	R	R+P
	CAR151, 162	CAR	33.7				R	R	R+P	R	R	R+P	R
	NR003	National	27.4				R	R	RE	R	R	R	R
	CAR188,189	CAR	23.3				R	R	R+P	R	R	R+P	R
	NR008	National	13.0				R	R	R	R	RE	R	R
	DR130	District	21.1				R	R	R	R	R	RE	R

C: Construction, R=Routine Maintenance. P: Periodic Maintenance
RE: Rehabilitation

Source: JICA Study Team

CAR 151, 162 and CAR 188, 189 are the targeted roads under the Urgent Project. Therefore, routine maintenance rather than rehabilitation is planned for them.

From the above tables, the estimated road maintenance costs will be as shown below.

Table 17.4.10 Estimated Road Maintenance Cost of Case-2

Unit: Million Ushs.

	Project Title	Administrative Classification	Road Length (km)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
High Priority Road (Improvement)	CAR110	CAR	16.1				C	16	32	32	185	32	32	330
	DR114	District	15.3				31	C	15	31	31	176	31	283
	DR137	District	12.7				25	25	C	25	25	146	25	222
	DR603	District	11.0				22	22	22	C	22	22	127	171
	NR005	National	26.1				196	196	196	196	C	196	34	229
	NR008	National	13.1				98	98	98	98	98	C	98	98
Sub-Total	National						294	294	294	294	98	196	132	1,602
	District						78	64	70	88	263	376	215	1,153
Second Priority Road (Rehabilitation)	NR002	National	59.3				742	853	964	1,075	445	445	3,114	7,637
	CAR151, 162	CAR	33.7				67	67	388	67	67	388	67	1,113
	NR003	National	27.4				206	206	1,372	206	206	206	206	2,606
	CAR188,189	CAR	23.3				47	47	267	47	47	267	47	768
	NR008	National	13.0				97	97	97	97	649	97	97	1,232
	DR130	District	21.1				42	42	42	42	42	274	42	527
Sub-Total	National						1,045	1,156	2,433	1,378	1,299	748	3,417	11,475
	District						156	156	697	156	156	929	156	2,407
Total	National						1,339	1,450	2,727	1,672	1,397	944	3,549	13,077
	District						234	220	767	244	419	1,306	371	3,561

Source: JICA Study Team

The unit costs for road maintenance used in the calculations are shown in Table 17.4.11.

Table 17.4.11 Unit Costs for Road Maintenance

Unit: Million Ushs./km

		Routine	Periodic	Rehabilitation
National	Paved	1.5	150	
	Gravel	7.5	45	50
District		2.0	9.5	13

Source: The scheme for use of equipment in district labour (Force Account) operations in maintenance of district and urban roads, garbage collection and disposal, and fire-fighting, MoWT, April 2010 & JICA Study Team

17.5 Recommendations

As discussed above, an optimum intervention for road improvement in Amuru and Nwoya Districts, i.e., improvement for high priority projects and rehabilitation for second priority projects, would improve 43% of the road sections of necessary projects up to 2018. The project cost for this optimum intervention is estimated to be 28 million USD in total. However, local funding currently available for road improvement works is very limited. The current amount of local funding would only rehabilitate most national roads while most district roads in Amuru and Nwoya districts would be left without any rehabilitation works. Accordingly, the following recommendations are made to improve/rehabilitate district roads and community access roads.

- The rural road master plan can guide selection of priority projects and allocation of scarce local funds to these priority projects. This master plan should associate with the monitoring and evaluation plans to assess the achievement of the preset targets.
- According to the comments given at the stakeholder meeting, held on 6th August, 2010 at the MoWT, the Road Fund is going to provide the fixed percentage (23%) of its revenue for maintenance of the district roads. This definitely contributes to enhancing sustainability of rural road maintenance in Amuru and Nwoya Districts. Ideally, more funding should be available to rehabilitate more district and community access roads.

- Another recommendation can be made on reduction in investment. One of the possibilities is use of cost efficient technology, e.g., low cost sealing for low traffic roads.
- Donor coordination and inter-ministerial coordination should be in place to efficiently use the scarce resources.
- Capacity development, in particular human resources development, is vital for planning, execution of physical works, and monitoring and evaluation exercises to improve district roads. Chapter 16 of this report provides several recommendations for human resources development in properly managing rural road maintenance.

Table 17.5.1 Detailed Project Cost in Amuru and Nwoya Districts (Minimum-level Intervention)

1. Least Minimum-level Intervention

District/Road Class	Level of Intervention		Total Road Length (km)	Unit Cost for Intervention (USD)	Total Project Cost for Intervention up to 2018 (thousand USD)	Total Maintenance Cost up to 2018 (thousand USD)	Note
1) Amuru							
High Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	39.2	17,000	666	125	
Second Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	75.5	17,000	1,284	242	
Other Newly-classified National Roads	Rehabilitation	Routine Maintenance	112.8	17,000	1,917	361	
High Priority District/Community Access Roads	Periodic Maintenance	Routine Maintenance	55.1	1,850	102	176	Every 4 years, 2 times till 2018
Second Priority District/Community Access Roads		Routine Maintenance	21.1		0	67	
Other District/Community Access Roads		Routine Maintenance	21.6		0	69	
		Sub-total	**325.3**		**3,969**	**1,041**	
2) Nwoya							
High Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	0.0	17,000	0	0	
Second Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	27.4	17,000	466	88	
Other Newly-classified National Roads	Rehabilitation	Routine Maintenance	39.7	17,000	675	127	
High Priority District/Community Access Roads	Periodic Maintenance	Routine Maintenance	0.0	1,850	0	0	Every 4 years, 2 times till 2018
Second Priority District/Community Access Roads		Routine Maintenance	49.5		0	158	
Other District/Community Access Roads		Routine Maintenance	185.3		0	593	
		Sub-total	**301.9**		**1,141**	**966**	
		Grand-total	**627.2**		**5,110**	**2,007**	

Source: JICA Study Team

Table 17.5.2 Detailed Project Cost in Amuru and Nwoya Districts (Near Minimum-level Intervention)

2. Minimum-level Intervention

District/Road Class	Level of Intervention		Total Road Length (km)	Unit Cost for Improvement (USD)	Project Cost for Improvement up to 2018 (thousand USD)	Maintenance Cost up to 2018 (thousand USD)	Note
1) Amuru							
High Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	39.2	17,000	666	125	
Second Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	75.5	17,000	1,284	242	
Other Newly-classified National Roads	Rehabilitation	Routine Maintenance	112.8	17,000	1,917	361	
High Priority District/Community Access Roads	Rehabilitation	Routine Maintenance	55.1	15,000	827	176	
Second Priority District/Community Access Roads	Periodic Maintenance	Routine Maintenance	21.1	1,850	39	67	Every 4 years, 2 times till 2018
Other District/Community Access Roads		Routine Maintenance	21.6		0	69	
		Sub-total	**325.3**		**4,733**	**1,041**	
2) Nwoya							
High Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	0.0	17,000	0	0	
Second Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	27.4	17,000	466	88	
Other Newly-classified National Roads	Rehabilitation	Routine Maintenance	39.7	17,000	675	127	
High Priority District/Community Access Roads	Rehabilitation	Routine Maintenance	0.0	15,000	0	0	
Second Priority District/Community Access Roads	Periodic Maintenance	Routine Maintenance	49.5	1,850	92	158	Every 4 years, 2 times till 2018
Other District/Community Access Roads		Routine Maintenance	185.3		0	593	
		Sub-total	**301.9**		**1,233**	**966**	
		Grand-total	**627.2**		**5,966**	**2,007**	

Source: JICA Study Team

Table 17.5.3 Detailed Project Cost in Amuru and Nwoya Districts (Low-level Intervention)

3. Low-level Intervention

District/Road Class	Level of Intervention		Total Road Length (km)	Unit Cost for Improvement (USD)	Project Cost for Improvement up to 2018 (thousand USD)	Maintenance Cost up to 2018 (thousand USD)	Note
1) Amuru							
High Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	39.2	17,000	666	125	
Second Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	75.5	17,000	1,284	242	
Other Newly-classified National Roads	Rehabilitation	Routine Maintenance	112.8	17,000	1,917	361	
High Priority District/Community Access Roads	Rehabilitation	Routine Maintenance	55.1	15,000	827	176	
Second Priority District/Community Access Roads	Rehabilitation	Routine Maintenance	21.1	15,000	316	67	
Other District/Community Access Roads		Routine Maintenance	21.6		0	69	
		Sub-total	**325.3**		**5,010**	**1,041**	
2) Nwoya							
High Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	0.0	17,000	0	0	
Second Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	27.4	17,000	466	88	
Other Newly-classified National Roads	Rehabilitation	Routine Maintenance	39.7	17,000	675	127	
High Priority District/Community Access Roads	Rehabilitation	Routine Maintenance	0.0	15,000	0	0	
Second Priority District/Community Access Roads	Rehabilitation	Routine Maintenance	49.5	15,000	743	158	
Other District/Community Access Roads		Routine Maintenance	185.3		0	593	
		Sub-total	**301.9**		**1,884**	**966**	
		Grand-total	**627.2**		**6,894**	**2,007**	

Source: JICA Study Team

Table 17.5.4 Detailed Project Cost in Amuru and Nwoya Districts (Medium-level Intervention)

4. Medium-level Intervention

District/Road Class	Level of Intervention		Total Road Length (km)	Unit Cost for Improvement (USD)	Project Cost for Improvement up to 2018 (thousand USD)	Maintenance Cost up to 2018 (thousand USD)	Note
1) Amuru							
High Priority Newly-classified National Roads	Upgrading	Routine Maintenance	39.2		11,188	125	
Second Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	75.5	17,000	1,284	242	
Other Newly-classified National Roads	Rehabilitation	Routine Maintenance	112.8	17,000	1,917	361	
High Priority District/Community Access Roads	Rehabilitation	Routine Maintenance	55.1	15,000	827	176	
Second Priority District/Community Access Roads	Rehabilitation	Routine Maintenance	21.1	15,000	316	67	
Other District/Community Access Roads		Routine Maintenance	21.6		0	69	
		Sub-total	**325.3**		**15,532**	**1,041**	
2) Nwoya							
High Priority Newly-classified National Roads	Upgrading	Routine Maintenance	0.0		0	0	
Second Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	27.4	17,000	466	88	
Other Newly-classified National Roads	Rehabilitation	Routine Maintenance	39.7	17,000	675	127	
High Priority District/Community Access Roads	Rehabilitation	Routine Maintenance	0.0	15,000	0	0	
Second Priority District/Community Access Roads	Rehabilitation	Routine Maintenance	49.5	15,000	743	158	
Other District/Community Access Roads		Routine Maintenance	185.3		0	593	
		Sub-total	**301.9**		**1,884**	**966**	
		Grand-total	**627.2**		**17,415**	**2,007**	

Source: JICA Study Team

Table 17.5.5 Detailed Project Cost in Amuru and Nwoya Districts (High-level Intervention)

5. High-level Intervention

District/Road Class	Level of Intervention		Total Road Length (km)	Unit Cost for Improvement (USD)	Project Cost for Improvement up to 2018 (thousand USD)	Maintenance Cost up to 2018 (thousand USD)	Note
1) Amuru							
High Priority Newly-classified National Roads	Upgrading	Routine Maintenance	39.2		11,188	125	
Second Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	75.5	17,000	1,284	242	
Other Newly-classified National Roads	Rehabilitation	Routine Maintenance	112.8	17,000	1,917	361	
High Priority District/Community Access Roads	Upgrading	Routine Maintenance	55.1		5,887	176	
Second Priority District/Community Access Roads	Rehabilitation	Routine Maintenance	21.1	15,000	316	67	
Other District/Community Access Roads		Routine Maintenance	21.6		0	69	
		Sub-total	**325.3**		**20,592**	**1,041**	
2) Nwoya							
High Priority Newly-classified National Roads	Upgrading	Routine Maintenance	0.0		0	0	
Second Priority Newly-classified National Roads	Rehabilitation	Routine Maintenance	27.4	17,000	466	88	
Other Newly-classified National Roads	Rehabilitation	Routine Maintenance	39.7	17,000	675	127	
High Priority District/Community Access Roads	Upgrading	Routine Maintenance	0.0		0	0	
Second Priority District/Community Access Roads	Rehabilitation	Routine Maintenance	49.5	15,000	743	158	
Other District/Community Access Roads		Routine Maintenance	185.3		0	593	
		Sub-total	**301.9**		**1,884**	**966**	
		Grand-total	**627.2**		**22,476**	**2,007**	

Source: JICA Study Team

Table 17.5.6 Detailed Project Cost in Amuru and Nwoya Districts (Highest-level Intervention)

6. Highest-level Intervention

District/Road Class	Level of Intervention		Total Road Length (km)	Unit Cost for Improvement (USD)	Project Cost for Improvement up to 2018 (thousand USD)	Maintenance Cost up to 2018 (thousand USD)	Note
1) Amuru							
High Priority Newly-classified National Roads	Upgrading	Routine Maintenance	39.2		11,188	125	
Second Priority Newly-classified National Roads	Rehabilitation +Embankment	Routine Maintenance	75.5		5,260	242	
Other Newly-classified National Roads	Rehabilitation	Routine Maintenance	112.8	17,000	1,917	361	
High Priority District/Community Access Roads	Upgrading	Routine Maintenance	55.1		5,887	176	
Second Priority District/Community Access Roads	Rehabilitation +Embankment	Routine Maintenance	21.1		1,254	67	
Other District/Community Access Roads		Routine Maintenance	21.6		0	69	
		Sub-total	**325.3**		**25,505**	**1,041**	
2) Nwoya							
High Priority Newly-classified National Roads	Upgrading	Routine Maintenance	0.0		0	0	
Second Priority Newly-classified National Roads	Rehabilitation +Embankment	Routine Maintenance	27.4		1,704	88	
Other Newly-classified National Roads	Rehabilitation	Routine Maintenance	39.7	17,000	675	127	
High Priority District/Community Access Roads	Upgrading	Routine Maintenance	0.0		0	0	
Second Priority District/Community Access Roads	Rehabilitation +Embankment	Routine Maintenance	49.5		2,945	158	
Other District/Community Access Roads		Routine Maintenance	185.3		0	593	
		Sub-total	**301.9**		**5,323**	**966**	
		Grand-total	**627.2**		**30,828**	**2,007**	

Source: JICA Study Team

18. PROJECT EVALUATION FOR SELECTED HIGH PRIORITY PROJECTS

18.1 Introduction

This chapter will reveal the benefits that would be generated from necessary projects and high priority projects proposed in the previous chapter so as to ascertain whether road improvement projects are economically and socially feasible. In general, a road improvement project generates a wide range of direct benefits; including travel cost/time saving, decrease in traffic accidents, saving in energy consumption, and so forth. Indirect benefits from road projects include income generation, stimulation of the regional economy, and in the particular case of Amuru and Nwoya Districts; the acceleration of the IDP's return process through enhancement of accessibility to social infrastructure.

In the following section, high priority projects are tested in a numerical manner by the conventional economic analysis. In the latter section, the road improvement projects in Amuru and Nwoya Districts are also examined, identifying indirect benefits; the extent to which these projects will contribute to satisfying local needs for social infrastructure and hence accelerating the IDP's return process.

18.2 Economic Analysis

18.2.1 General

The primary objective of the economic analysis is to examine the effects of the project investment. The following discussion will reveal economic validity of necessary projects and high priority projects proposed in Chapter 15, by the conventional economic analysis – Cost Benefit Ratio, Net Present Value and Economic Internal Rate of Return.

18.2.2 Basic Assumption

(1) "With project" and "Without Project"

"With Project" implies the situation where the proposed projects are implemented, and "Without Project" implies where no investment takes place. The quantified economic benefits generated from the implementation of the projects are defined as savings in Vehicle Operating Costs (VOC) and Travel Time Cost (TTC) derived from the difference between "With Project" and "Without Project".

(2) Implementation Schedule

The implementation schedule incorporates the following assumptions: projects will commence in 2010 and be completed by 2018. The roads and bridges will be sequentially opened to traffic from 2013.

(3) Evaluation Period for Economic Evaluation

The period of the economic evaluation for road projects is set at 30 years after the completion of the projects.

(4) Prices

A base year price is prepared based on the exchange rates in the second and third quarter of the fiscal year 2009/10 (between Oct. 2009 and March 2010) and exchange rates applied to this analysis are set as follows:

1.0 USD = 1,947.9 Ushs. = 96.27 Yen

18.2.3 Traffic Demand Forecast

The traffic demand in Acholi sub-region is forecast, as discussed in Chapter 12 of the Draft Final Report, and the summary of the estimated 'vehicle-km' and 'vehicle-hour' under different network conditions of 'With' and 'Without' project, is tabulated in Table 18.2.1-18.2.7.

Table 18.2.1 Forecast Vehicle-Km and Vehicle-Hour (With All Necessary Projects Case)

Case	Note	Vehicle * Distance Traveled (Vehicle*km)						Vehicle * Travel Time (Vehicle *hour)					
		Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle	Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle
Base Year (2009)	(1)	126,792	5,294	6,737	16,079	62,300	209,381	2,338	89	115	283	1,073	4,262
Without Projects (2030)	(2)	315,700	14,869	14,862	38,776	133,826	538,426	5,924	255	255	708	2,382	11,071
With Projects (2030)	(3)	316,885	14,851	15,002	39,006	134,333	538,941	5,559	240	242	652	2,200	10,475

Note: Figures for (3) are under the assumption that all proposed necessary projects are implemented.
Source: JICA Study Team

Table 18.2.2 Forecast Vehicle-Km and Vehicle-Hour (With CAR110 Project)

Case	Note	Vehicle * Distance Traveled (Vehicle*km)						Vehicle * Travel Time (Vehicle *hour)					
		Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle	Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle
Base Year (2009)	(1)	0	0	0	0	0	0	0	0	0	0	0	0
Without Projects (2030)	(2)	1,853	3	741	940	2,059	26	46	0	19	24	51	1
With Projects (2030)	(3)	1,853	3	741	940	2,059	26	37	0	15	19	41	1

Note: Figures for (3) are under the assumption that the high priority project is implemented.
Source: JICA Study Team

Table 18.2.3 Forecast Vehicle-Km and Vehicle-Hour (With DR114 Project)

Case	Note	Vehicle * Distance Traveled (Vehicle*km)						Vehicle * Travel Time (Vehicle *hour)					
		Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle	Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle
Base Year (2009)	(1)	73	15	2	6	40	101	2	0	0	0	1	3
Without Projects (2030)	(2)	2,570	55	702	991	2,449	693	64	1	18	25	61	17
With Projects (2030)	(3)	2,570	55	702	991	2,449	693	43	1	12	17	41	12

Note: Figures for (3) are under the assumption that the high priority project is implemented.
Source: JICA Study Team

Table 18.2.4 Forecast Vehicle-Km and Vehicle-Hour (With DR137 Project)

Case	Note	Vehicle * Distance Traveled (Vehicle*km)						Vehicle * Travel Time (Vehicle *hour)					
		Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle	Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle
Base Year (2009)	(1)	61	13	0	5	33	84	2	0	0	0	1	2
Without Projects (2030)	(2)	677	43	0	83	414	558	17	1	0	2	10	14
With Projects (2030)	(3)	677	43	0	83	414	558	11	1	0	1	7	9

Note: Figures for (3) are under the assumption that the high priority project is implemented.
Source: JICA Study Team

Table 18.2.5 Forecast Vehicle-Km and Vehicle-Hour (With DR603 Project)

Case	Note	Vehicle * Distance Traveled (Vehicle*km)						Vehicle * Travel Time (Vehicle *hour)					
		Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle	Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle
Base Year (2009)	(1)	0	0	0	0	0	0	0	0	0	0	0	0
Without Projects (2030)	(2)	345	18	0	54	318	383	34	2	0	5	32	38
With Projects (2030)	(3)	345	18	0	54	318	383	6	0	0	1	5	6

Note: Figures for (3) are under the assumption that the high priority project is implemented.
Source: JICA Study Team

Table 18.2.6 Forecast Vehicle-Km and Vehicle-Hour (With NR005 Project)

Case	Note	Vehicle * Distance Traveled (Vehicle*km)						Vehicle * Travel Time (Vehicle *hour)					
		Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle	Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle
Base Year (2009)	(1)	0	0	0	0	0	0	0	0	0	0	0	0
Without Projects (2030)	(2)	1,707	49	574	596	1,671	494	43	1	14	15	42	12
With Projects (2030)	(3)	1,707	49	574	596	1,671	494	21	1	7	7	21	6

Note: Figures for (3) are under the assumption that the high priority project is implemented.
Source: JICA Study Team

Table 18.2.7 Forecast Vehicle-Km and Vehicle-Hour (With NR008 Project)

Case	Note	Vehicle * Distance Traveled (Vehicle*km)						Vehicle * Travel Time (Vehicle *hour)					
		Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle	Passenger Car	Small Bus	Large Bus	Light Truck	Heavy Truck	Motor -cycle
Base Year (2009)	(1)	63	13	0	5	34	86	2	0	0	0	1	2
Without Projects (2030)	(2)	695	44	0	85	424	572	17	1	0	2	11	14
With Projects (2030)	(3)	695	44	0	85	424	572	9	1	0	1	5	7

Note: Figures for (3) are under the assumption that the high priority project is implemented.
Source: JICA Study Team

18.2.4 Economic Project Benefit

(1) Estimation of the Benefit

The future traffic demand is forecast under the road network conditions of "With" and "Without" project cases. The "With" case scenario assumes that all the project roads are upgraded and all the proposed bridges are newly constructed and passable, while the "Without" case scenario assumes that all roads are left without any rehabilitation works.

Savings are derived from the comparison between costs ("With" case scenario) of road users who would enjoy roads and bridges in good condition and costs ("Without" case scenario) of those who expend considerable time/money by using roads that are in poor condition. Those savings are composed of:

- Vehicle Operating Costs (Both distance and time related costs);
- Travel Time Costs (Savings in passenger travel time for users of Motorcycles, Sedans, Mini Buses and Large Buses); and
- Initial Investment, Operation and Maintenance Costs.

(2) Vehicle Operating Costs

Vehicle operating costs that were estimated in the previous JICA study (the Feasibility Study on the Construction of a New Bridge across River Nile at Jinja) were applied to this analysis. These vehicle operating costs are summarized in Table 18.2.8.

Table 18.2.8 Vehicle Operating Costs by Vehicle Type (at Economic Prices)

Items		Motorcycle	Sedan	Mini Bus	Large Bus	Truck	Trailer
Time Related VOC(USD/yr)	Crew cost	-	-	1,647	8,943	19,357	19,357
	Maintenance Cost	13.3	107.9	161.8	313.8	313.8	313.8
	Insurance Cost	328	496	613	580	357	357
	Depreciation Cost	128	722	1,299	2,438	2,244	3,456
	Sub-Total	469	2,809	3,721	12,275	22,272	23,483
	Overhead Cost	-	-	372	1228	2227	2348
	Total	469	2,809	4,093	13,503	24,499	25,831
USD / Hour		0.063	0.375	0.547	1.803	3.272	3.450
Distance Related VOC(USD/yr)	Fuel Cost	269.7	4,247.2	4,853.9	12,973.1	11,892.0	12,973.1
	Lubricant Cost	19.0	42.8	76.0	582.7	662.3	722.5
	Tyre Cost	25.7	207.3	173.3	582.8	884.1	2,818.1
	Maintenance Cost	21.8	136.2	263.0	774.1	591.4	910.5
	Depreciation Cost	237	1,341	2,413	4,529	4,168	6,417
	Sub-Total	573.1	5,974.8	7,778.9	19,441.3	18,197.9	23,841.7
	Overhead Cost	-	-	777.9	1,944.1	1,819.8	2,384.2
	Total	573.1	5,974.8	8,556.7	21,385.4	20,017.7	26,225.9
USD / 000km,		*34.4*	*159.3*	*213.9*	*356.4*	*364.0*	*437.1*

Source: JICA (2009) The Feasibility Study on the Construction of a New Bridge across River Nile at Jinja

(3) Travel Time Cost

Passenger's travel time costs were also estimated in the previous JICA study (the Feasibility Study on the Construction of a New Bridge across River Nile at Jinja) and applied to this economic analysis. Table 18.2.9 shows the summary of Travel Time Costs of passengers at 2009 prices.

Table 18.2.9 Travel Time Costs by Vehicle Type of Passenger

Items	Motorcycle	Sedan	Mini Bus	Large Bus
No. of Average PAX/ Vehicle [*1]	1.46	2.51	13.03	46.36
Time Value (USD)/PAX /Month [*2]	119.4	119.4	119.4	119.4
Aggregated Time Value (USD)/Month/Vehicle	174.4	299.1	1,555.3	5,534.4
Aggregated Time Value (USD) /Hour/Vehicle	0.96	1.64	8.55	30.41

Source: JICA (2009) The Feasibility Study on the Construction of a New Bridge across River Nile at Jinja
Note[*1]: Based on Traffic Survey in Jinja; [*2]: Estimates from Uganda National Household Survey 2005/2006 and Consumer Price Index (CPI) source: Bank of Uganda

18.2.5 Economic Project Cost

(1) Estimation of Economic Project Cost

The project costs in terms of financial prices were estimated in Chapter 17. For the economic analysis, financial costs are converted to economic costs by deducting the tax portion and applying a standard conversion factor to the portion of non-trade goods.

All the costs of the projects, excluding tax, are classified as non-trade goods as all the construction materials are available in Uganda. In this Study, the following conversion factors are applied;

- For tax, conversion factor of zero is applied and
- For construction and administration costs (e.g., land acquisition and compensation), a standard conversion factor is applied.

The standard conversion factor (SCF) is an index, which converts domestic prices to border prices by adjusting the distortion of prices in the domestic market. The SCF is estimated based on the following equation:

$$SCF = \frac{M + X}{(M + T_m) + (X - T_x - S_x)}$$

Where:

M : Total value of imports (CIF)
X : Total value of exports (FOB)
T_m : Total value of import duty
T_x : Total value of export duty
S_x : Total value of export subsidy

Based on statistical data on foreign trade and governmental revenues in Uganda, the SCF is estimated at 0.90 as shown in Table 18.2.10.

Table 18.2.10 Calculation of Standard Conversion Factor

Financial Year	2005/06
Export (Mil. USD.)	889.8
Import (Mil. USD)	1,991.4
Tax on Imports (Bil. Ushs.)	
Duties - non-oil products	171.5
Excise taxes	
Petroleum products	362.6
Other imports	57.6
Total import taxes (Bil. Ushs.)	591.7
Exchange rate (USD 1.0)	1,825.2
Total import taxes (Mil. USD)	324.2
SCF	0.90

Source: Uganda Bureau of Statistics

The total economic project cost of each project, consisting of 'Local Administration Costs', 'Engineering Costs' and 'Construction Costs', in economic prices was estimated as shown in Table 18.2.11.

Table 18.2.11 Estimated Project Costs

Unit: 1000 USD

Cost Item	All necessary projects	CAR110	DR114	DR137	DR603	NR005	NR008
(1) Construction Cost							
Road Construction	109,318.5	666.8	2,261.3	696.7	609.9	6,636.5	2,207.5
Bridge Construction	4,808.3	0.0	0.0	0.0	419.4	0.0	0.0
Contingency	17,119.0	100.0	339.2	104.5	154.4	995.5	331.1
(2) Engineering Cost	9,187.2	53.7	182.0	56.1	82.9	534.2	177.7
(3) Local Administration Cost	3,937.4	23.0	78.0	24.0	35.5	229.0	76.2
Total Project Cost	144,370.4	843.5	2,860.5	881.3	1,302.1	8,395.1	2792.5
Economic Project Cost	129,933.3	759.1	2,574.5	793.2	1,171.8	7555.6	2513.2

Source: JICA Study Team

(2) Operation and Maintenance Costs of the Project

The operation and maintenance costs for the proposed projects in terms of financial prices were provided based on the unit costs studied by JICA Study Team. Table 18.2.12 shows the routine and periodic maintenance costs by road surface type and classification.

Table 18.2.12 Routine and Periodic Maintenance Costs

Unit: 1000 Ushs./km

Activity	National		District		Note
	Paved	Unpaved	Machine based	Labor-based	
Routine Maintenance	1,500	7,500	2,000	-	Every year
Periodic Maintenance	150,000	45,000	25,000	9,500	Every 5 years (National) Every 3 years (District)

Source: JICA Study Team

18.2.6 Cost Benefit Analysis

As mentioned earlier, a cost benefit analysis, comparing costs and benefits generated from the projects, was used to examine the economic validity of the projects. Investment of the projects and operation and maintenance costs were analyzed as cost factors while the savings in both Vehicle Operating Costs and Travel Time Costs were estimated as benefit factors as shown in Table 18.2.13. This cost benefit analysis was tested under the following assumptions:

- In the 'Without' Project case, the level of service of all the serviceable roads was assumed to remain at the current service level.
- In the 'With' Project case, the level of service of the project roads will improve while that of the rest of the roads will remain at the current service level.

Table 18.2.13 Cost Benefit Items of the Project for Economic Analysis

	For Supplier		For User		Net Cash Flow for the Cases
	Cash-Out	Cash-In	Cash-Out	Cash-In	
Case: [Without] Project					
			VOC Travel Time Costs		-VOC -Travel Time Costs
Case: [With] Project					
	Investment & O&M		VOC Travel Time Costs		-Investment -O&M -VOC -Travel Time Costs
					Cash-In items -Savings in VOCs -Savings in Travel Time Costs **Cash-Out items** -Investment -O&M

Source: JICA Study Team

18.2.7 Overall Evaluation of Project

Economic benefits derived from the proposed necessary projects and high priority projects are composed of savings in time-related vehicle operating costs and travel time costs. Savings in the distance-related vehicle operating costs show negative gains since the road users travel longer distances as they divert from their routes to the project roads when the level of service of the project roads improves. As tabulated in the Table 18.2.14, the projected B/C ratio is estimated to be 0.02-0.28. Assuming the social discount rate of 12% per annum, it can be concluded that the proposed necessary projects and high priority projects are NOT economically feasible. Also, any adverse effects, such as increase in the project cost and/or reduction in the traffic demand, will further worsen economic feasibility of those projects.

Having said that, there is a high probability that these high priority projects can turn into economically viable projects. For instance, the project cost of these high priority projects can be significantly reduced when the scope of project work is limited to improvement of specific road sections that require urgent upgrade works, e.g., embankment works in swampy areas. Assuming only 10% of the whole road section of the high priority projects requires urgent upgrade work, the economic viability of the projects would be further substantiated with B/C Ratio of 0.06-1.28 and some priority projects, i.e., CAR110, show ample positive NPV, as shown in the Table 18.2.15. (See the detailed cash flow of the economic evaluation in Table 18.2.16- 18.2.22)

Table 18.2.14 Summary of Economic Analysis

Case	Net Present Cost (thousand USD)		Net Present Benefit (thousand USD)	Economic Analysis Indicators		
	Construction Cost	Maintenance Cost		B/C	Net Present Value (thousand USD)	EIRR
All necessary projects	92,880	9,476	2,821	0.03	-99,534	#DIV/0!
CAR110	543	85	177	0.28	-450	3.6%
DR114	1,840	415	320	0.14	-1,935	#DIV/0!
DR137	567	346	31	0.03	-882	#DIV/0!
DR603	838	299	195	0.17	-942	#DIV/0!
NR005	5,401	1,133	361	0.06	-6,173	#DIV/0!
NR008	1,797	566	48	0.02	-2,315	#DIV/0!

Source: JICA Study Team

Table 18.2.15 Summary of Economic Analysis (Reduced Project Cost Case)

Case	Net Present Cost (thousand USD)		Net Present Benefit (thousand USD)	Economic Analysis Indicators		
	Construction Cost	Maintenance Cost		B/C	Net Present Value (thousand USD)	EIRR
All necessary projects	9,288	9,476	2,821	0.15	-15,942	#DIV/0!
CAR110	54	85	177	1.28	38	14.9%
DR114	184	415	320	0.53	-279	4.9%
DR137	57	346	31	0.08	-371	#DIV/0!
DR603	84	299	195	0.51	-188	4.1%
NR005	540	1,133	361	0.22	-1,312	#DIV/0!
NR008	180	566	48	0.06	-698	#DIV/0!

Note: The cost of each project is assumed to be reduced by 90%.
Source: JICA Study Team

Table 18.2.16 Estimated Net Cash Flow for Economic Evaluation of Project (With All Necessary Projects Case)

Unit: 1000 USD (Economic Price)

Year		Cash-out		Total	Cash-in			Total	Net Cash Flow
		Project			User's Cost Saving				
		Investment	O&M		VOC (D)[1]	VOC (T)[2]	TTC		
	2009	0	0	0				0	0
	2010	43,311	0	43,311				0	-43,311
	2011	43,311	0	43,311				0	-43,311
	2012	43,311	0	43,311				0	-43,311
1	2013		1,851	1,851	-102	187	301	386	-1,465
2	2014		1,851	1,851	-107	195	314	402	-1,449
3	2015		1,851	1,851	-111	203	328	420	-1,431
4	2016		1,851	1,851	-115	211	342	438	-1,413
5	2017		1,851	1,851	-120	220	357	457	-1,394
6	2018		1,851	1,851	-125	229	373	477	-1,374
7	2019		1,851	1,851	-130	239	390	498	-1,353
8	2020		1,851	1,851	-136	248	407	520	-1,331
9	2021		1,851	1,851	-141	259	425	542	-1,309
10	2022		1,851	1,851	-147	269	444	566	-1,285
11	2023		1,851	1,851	-153	280	464	591	-1,260
12	2024		1,851	1,851	-160	292	484	616	-1,235
13	2025		1,851	1,851	-166	304	506	643	-1,208
14	2026		1,851	1,851	-173	316	528	671	-1,180
15	2027		1,851	1,851	-180	329	551	700	-1,151
16	2028		1,851	1,851	-188	343	576	731	-1,120
17	2029		1,851	1,851	-196	357	601	763	-1,088
18	2030		1,851	1,851	-204	372	628	796	-1,055
19	2031		1,851	1,851	-212	387	656	831	-1,020
20	2032		1,851	1,851	-221	403	685	867	-984
21	2033		1,851	1,851	-230	420	715	905	-946
22	2034		1,851	1,851	-239	437	747	944	-907
23	2035		1,851	1,851	-249	455	780	985	-866
24	2036		1,851	1,851	-260	473	815	1,028	-823
25	2037		1,851	1,851	-270	493	851	1,073	-778
26	2038		1,851	1,851	-282	513	888	1,120	-731
27	2039		1,851	1,851	-293	534	928	1,169	-682
28	2040		1,851	1,851	-305	556	969	1,220	-631
29	2041		1,851	1,851	-318	579	1,012	1,273	-578
30	2042		1,851	1,851	-331	603	1,057	1,328	-523
Total		129,933	55,529	185,463	-5,867	10,709	18,120	22,962	-162,501
NPV		92,880	9,476	102,356	-1,154	2,110	3,484	2,821	-99,534
B/C		Discount Rate		12%					0.03
EIRR									#DIV/0!

Notes: VOC (D)[1] means distance related vehicle operating costs
VOC (D)[2] means time related vehicle operating costs

Source: JICA Study Team

Table 18.2.17 Estimated Net Cash Flow for Economic Evaluation of Project (With CAR110 Case)

Unit: 1000 USD (Economic Price)

Year		Cash-out		Total	Cash-in			Total	Net Cash Flow
		Project			User's Cost Saving				
		Investment	O&M		VOC (D)[1]	VOC (T)[2]	TTC		
	2009	0.0	0.0	0.0				0.0	0.0
	2010	253.0	0.0	253.0				0.0	-253.0
	2011	253.0	0.0	253.0				0.0	-253.0
	2012	253.0	0.0	253.0				0.0	-253.0
1	2013		16.5	16.5	0.0	2.9	9.6	12.6	-4.0
2	2014		16.5	16.5	0.0	3.3	10.6	13.9	-2.6
3	2015		16.5	16.5	0.0	3.7	11.6	15.3	-1.2
4	2016		16.5	16.5	0.0	4.2	12.7	16.9	0.4
5	2017		16.5	16.5	0.0	4.7	14.0	18.7	2.1
6	2018		16.5	16.5	0.0	5.3	15.3	20.6	4.1
7	2019		16.5	16.5	0.0	6.0	16.8	22.8	6.2
8	2020		16.5	16.5	0.0	6.7	18.4	25.2	8.6
9	2021		16.5	16.5	0.0	7.6	20.2	27.8	11.3
10	2022		16.5	16.5	0.0	8.6	22.1	30.7	14.2
11	2023		16.5	16.5	0.0	9.6	24.3	33.9	17.4
12	2024		16.5	16.5	0.0	10.8	26.6	37.5	21.0
13	2025		16.5	16.5	0.0	12.2	29.2	41.4	24.9
14	2026		16.5	16.5	0.0	13.8	32.0	45.8	29.3
15	2027		16.5	16.5	0.0	15.5	35.1	50.6	34.1
16	2028		16.5	16.5	0.0	17.4	38.5	56.0	39.5
17	2029		16.5	16.5	0.0	19.6	42.3	61.9	45.4
18	2030		16.5	16.5	0.0	22.1	46.4	68.5	52.0
19	2031		16.5	16.5	0.0	24.9	50.9	75.8	59.2
20	2032		16.5	16.5	0.0	28.0	55.8	83.8	67.3
21	2033		16.5	16.5	0.0	31.6	61.2	92.8	76.2
22	2034		16.5	16.5	0.0	35.6	67.1	102.7	86.1
23	2035		16.5	16.5	0.0	40.0	73.6	113.6	97.1
24	2036		16.5	16.5	0.0	45.1	80.7	125.8	109.3
25	2037		16.5	16.5	0.0	50.8	88.5	139.3	122.8
26	2038		16.5	16.5	0.0	57.2	97.1	154.3	137.7
27	2039		16.5	16.5	0.0	64.4	106.5	170.9	154.4
28	2040		16.5	16.5	0.0	72.5	116.8	189.3	172.8
29	2041		16.5	16.5	0.0	81.7	128.1	209.8	193.2
30	2042		16.5	16.5	0.0	92.0	140.5	232.5	215.9
Total		759	496	1,255	0	798	1,493	2,290	1,035
NPV		543	85	627	0	85	194	177	-450
B/C		Discount Rate		12%					0.28
EIRR									3.6%

Notes: VOC (D)[1] means distance related vehicle operating costs
VOC (D)[2] means time related vehicle operating costs

Source: JICA Study Team

Table 18.2.18 Estimated Net Cash Flow for Economic Evaluation of Project (With DR114 Case)

Unit: 1000 USD (Economic Price)

Year		Cash-out		Total	Cash-in			Total	Net Cash Flow
		Project			User's Cost Saving				
		Investment	O&M		VOC (D)[1]	VOC (T)[2]	TTC		
	2009	0.0	0.0	0.0				0.0	0.0
	2010	858.2	0.0	858.2				0.0	-858.2
	2011	858.2	0.0	858.2				0.0	-858.2
	2012	858.2	0.0	858.2				0.0	-858.2
1	2013		81.0	81.0	0.0	5.7	16.9	22.5	-58.5
2	2014		81.0	81.0	0.0	6.4	18.5	24.9	-56.1
3	2015		81.0	81.0	0.0	7.2	20.3	27.5	-53.5
4	2016		81.0	81.0	0.0	8.1	22.3	30.4	-50.6
5	2017		81.0	81.0	0.0	9.1	24.4	33.5	-47.5
6	2018		81.0	81.0	0.0	10.2	26.8	37.1	-44.0
7	2019		81.0	81.0	0.0	11.5	29.4	40.9	-40.1
8	2020		81.0	81.0	0.0	13.0	32.3	45.2	-35.8
9	2021		81.0	81.0	0.0	14.6	35.4	50.0	-31.0
10	2022		81.0	81.0	0.0	16.5	38.8	55.3	-25.7
11	2023		81.0	81.0	0.0	18.5	42.6	61.1	-19.9
12	2024		81.0	81.0	0.0	20.9	46.7	67.6	-13.5
13	2025		81.0	81.0	0.0	23.5	51.2	74.7	-6.3
14	2026		81.0	81.0	0.0	26.5	56.1	82.6	1.6
15	2027		81.0	81.0	0.0	29.8	61.6	91.4	10.4
16	2028		81.0	81.0	0.0	33.6	67.5	101.1	20.1
17	2029		81.0	81.0	0.0	37.8	74.1	111.9	30.9
18	2030		81.0	81.0	0.0	42.6	81.2	123.8	42.8
19	2031		81.0	81.0	0.0	47.9	89.1	137.1	56.0
20	2032		81.0	81.0	0.0	54.0	97.7	151.7	70.7
21	2033		81.0	81.0	0.0	60.8	107.2	168.0	87.0
22	2034		81.0	81.0	0.0	68.5	117.6	186.0	105.0
23	2035		81.0	81.0	0.0	77.1	128.9	206.0	125.0
24	2036		81.0	81.0	0.0	86.8	141.4	228.2	147.2
25	2037		81.0	81.0	0.0	97.8	155.1	252.9	171.9
26	2038		81.0	81.0	0.0	110.1	170.1	280.2	199.2
27	2039		81.0	81.0	0.0	124.0	186.6	310.6	229.6
28	2040		81.0	81.0	0.0	139.6	204.6	344.3	263.3
29	2041		81.0	81.0	0.0	157.2	224.5	381.7	300.7
30	2042		81.0	81.0	0.0	177.1	246.2	423.2	342.2
Total		2,574	2,430	5,005	0	1,536	2,615	4,151	-853
NPV		1,840	415	2,255	0	164	340	320	-1,935
B/C		Discount Rate		12%					0.14
EIRR									#DIV/0!

Notes: VOC (D)[1] means distance related vehicle operating costs
VOC (D)[2] means time related vehicle operating costs

Source: JICA Study Team

Table 18.2.19 Estimated Net Cash Flow for Economic Evaluation of Project (With DR137 Case)

Unit: 1000 USD (Economic Price)

Year		Cash-out		Total	Cash-in			Total	Net Cash Flow
		Project			User's Cost Saving				
		Investment	O&M		VOC (D)[1]	VOC (T)[2]	TTC		
	2009	0.0	0.0	0.0				0.0	0.0
	2010	264.4	0.0	264.4				0.0	-264.4
	2011	264.4	0.0	264.4				0.0	-264.4
	2012	264.4	0.0	264.4				0.0	-264.4
1	2013		67.5	67.5	0.0	0.8	1.3	2.1	-65.5
2	2014		67.5	67.5	0.0	0.9	1.4	2.3	-65.2
3	2015		67.5	67.5	0.0	1.0	1.5	2.6	-65.0
4	2016		67.5	67.5	0.0	1.2	1.7	2.8	-64.7
5	2017		67.5	67.5	0.0	1.3	1.8	3.1	-64.4
6	2018		67.5	67.5	0.0	1.5	2.0	3.5	-64.0
7	2019		67.5	67.5	0.0	1.7	2.2	3.9	-63.7
8	2020		67.5	67.5	0.0	1.9	2.4	4.3	-63.2
9	2021		67.5	67.5	0.0	2.1	2.7	4.8	-62.8
10	2022		67.5	67.5	0.0	2.4	2.9	5.3	-62.3
11	2023		67.5	67.5	0.0	2.7	3.2	5.9	-61.7
12	2024		67.5	67.5	0.0	3.0	3.5	6.5	-61.0
13	2025		67.5	67.5	0.0	3.4	3.9	7.2	-60.3
14	2026		67.5	67.5	0.0	3.8	4.2	8.0	-59.5
15	2027		67.5	67.5	0.0	4.3	4.6	8.9	-58.6
16	2028		67.5	67.5	0.0	4.8	5.1	9.9	-57.6
17	2029		67.5	67.5	0.0	5.4	5.6	11.0	-56.5
18	2030		67.5	67.5	0.0	6.1	6.1	12.2	-55.3
19	2031		67.5	67.5	0.0	6.9	6.7	13.6	-54.0
20	2032		67.5	67.5	0.0	7.7	7.4	15.1	-52.4
21	2033		67.5	67.5	0.0	8.7	8.1	16.8	-50.8
22	2034		67.5	67.5	0.0	9.8	8.8	18.6	-48.9
23	2035		67.5	67.5	0.0	11.0	9.7	20.7	-46.8
24	2036		67.5	67.5	0.0	12.4	10.6	23.1	-44.5
25	2037		67.5	67.5	0.0	14.0	11.7	25.7	-41.9
26	2038		67.5	67.5	0.0	15.8	12.8	28.6	-39.0
27	2039		67.5	67.5	0.0	17.8	14.0	31.8	-35.7
28	2040		67.5	67.5	0.0	20.0	15.4	35.4	-32.1
29	2041		67.5	67.5	0.0	22.5	16.9	39.4	-28.1
30	2042		67.5	67.5	0.0	25.4	18.5	43.9	-23.7
Total		793	2,026	2,819	0	220	197	417	-2,402
NPV		567	346	913	0	23	26	31	-882
B/C		Discount Rate		12%					0.03
EIRR									#DIV/0!

Notes: VOC (D)[1] means distance related vehicle operating costs
VOC (D)[2] means time related vehicle operating costs

Source: JICA Study Team

Table 18.2.20 Estimated Net Cash Flow for Economic Evaluation of Project (With DR603 Case)

Unit: 1000 USD (Economic Price)

Year		Cash-out		Total	Cash-in			Total	Net Cash Flow
		Project			User's Cost Saving				
		Investment	O&M		VOC (D)[1]	VOC (T)[2]	TTC		
	2009	0.0	0.0	0.0				0.0	0.0
	2010	390.6	0.0	390.6				0.0	-390.6
	2011	390.6	0.0	390.6				0.0	-390.6
	2012	390.6	0.0	390.6				0.0	-390.6
1	2013		58.5	58.5	0.0	5.8	6.9	12.7	-45.8
2	2014		58.5	58.5	0.0	6.5	7.5	14.1	-44.4
3	2015		58.5	58.5	0.0	7.4	8.3	15.6	-42.8
4	2016		58.5	58.5	0.0	8.3	9.1	17.3	-41.1
5	2017		58.5	58.5	0.0	9.3	9.9	19.3	-39.2
6	2018		58.5	58.5	0.0	10.5	10.9	21.4	-37.1
7	2019		58.5	58.5	0.0	11.8	11.9	23.8	-34.7
8	2020		58.5	58.5	0.0	13.3	13.1	26.4	-32.0
9	2021		58.5	58.5	0.0	15.0	14.4	29.4	-29.1
10	2022		58.5	58.5	0.0	16.9	15.8	32.7	-25.8
11	2023		58.5	58.5	0.0	19.1	17.3	36.3	-22.1
12	2024		58.5	58.5	0.0	21.5	19.0	40.4	-18.1
13	2025		58.5	58.5	0.0	24.2	20.8	44.9	-13.5
14	2026		58.5	58.5	0.0	27.2	22.8	50.0	-8.5
15	2027		58.5	58.5	0.0	30.6	25.0	55.6	-2.8
16	2028		58.5	58.5	0.0	34.5	27.4	61.9	3.5
17	2029		58.5	58.5	0.0	38.9	30.1	68.9	10.5
18	2030		58.5	58.5	0.0	43.8	33.0	76.7	18.3
19	2031		58.5	58.5	0.0	49.3	36.2	85.5	27.0
20	2032		58.5	58.5	0.0	55.5	39.7	95.2	36.7
21	2033		58.5	58.5	0.0	62.5	43.5	106.0	47.6
22	2034		58.5	58.5	0.0	70.4	47.7	118.1	59.6
23	2035		58.5	58.5	0.0	79.2	52.4	131.6	73.1
24	2036		58.5	58.5	0.0	89.2	57.4	146.7	88.2
25	2037		58.5	58.5	0.0	100.5	63.0	163.5	105.0
26	2038		58.5	58.5	0.0	113.2	69.1	182.2	123.8
27	2039		58.5	58.5	0.0	127.4	75.8	203.2	144.7
28	2040		58.5	58.5	0.0	143.5	83.1	226.6	168.1
29	2041		58.5	58.5	0.0	161.6	91.1	252.7	194.3
30	2042		58.5	58.5	0.0	182.0	100.0	281.9	223.5
Total		1,172	1,754	2,926	0	1,579	1,062	2,641	-285
NPV		838	299	1,137	0	169	138	195	-942
B/C		Discount Rate		12%					0.17
EIRR									#DIV/0!

Notes: VOC (D)[1] means distance related vehicle operating costs
VOC (D)[2] means time related vehicle operating costs

Source: JICA Study Team

Table 18.2.21 Estimated Net Cash Flow for Economic Evaluation of Project (With NR005 Case)

Unit: 1000 USD (Economic Price)

Year		Cash-out			Cash-in				Net Cash Flow
		Project		Total	User's Cost Saving			Total	
		Investment	O&M		VOC (D)[1]	VOC (T)[2]	TTC		
	2009	0.0	0.0	0.0				0.0	0.0
	2010	2,518.5	0.0	2,518.5				0.0	-2,518.5
	2011	2,518.5	0.0	2,518.5				0.0	-2,518.5
	2012	2,518.5	0.0	2,518.5				0.0	-2,518.5
1	2013		221.3	221.3	0.0	5.7	20.0	25.7	-195.6
2	2014		221.3	221.3	0.0	6.4	21.9	28.4	-193.0
3	2015		221.3	221.3	0.0	7.2	24.1	31.3	-190.0
4	2016		221.3	221.3	0.0	8.2	26.4	34.6	-186.8
5	2017		221.3	221.3	0.0	9.2	29.0	38.1	-183.2
6	2018		221.3	221.3	0.0	10.3	31.8	42.1	-179.2
7	2019		221.3	221.3	0.0	11.6	34.8	46.5	-174.9
8	2020		221.3	221.3	0.0	13.1	38.2	51.3	-170.0
9	2021		221.3	221.3	0.0	14.8	41.9	56.7	-164.7
10	2022		221.3	221.3	0.0	16.6	46.0	62.6	-158.8
11	2023		221.3	221.3	0.0	18.7	50.4	69.1	-152.2
12	2024		221.3	221.3	0.0	21.1	55.3	76.4	-145.0
13	2025		221.3	221.3	0.0	23.7	60.6	84.4	-137.0
14	2026		221.3	221.3	0.0	26.7	66.5	93.2	-128.1
15	2027		221.3	221.3	0.0	30.1	72.9	103.0	-118.3
16	2028		221.3	221.3	0.0	33.9	80.0	113.9	-107.4
17	2029		221.3	221.3	0.0	38.2	87.7	125.9	-95.4
18	2030		221.3	221.3	0.0	43.0	96.2	139.2	-82.1
19	2031		221.3	221.3	0.0	48.4	105.6	154.0	-67.4
20	2032		221.3	221.3	0.0	54.5	115.8	170.3	-51.1
21	2033		221.3	221.3	0.0	61.4	127.0	188.4	-33.0
22	2034		221.3	221.3	0.0	69.1	139.3	208.4	-12.9
23	2035		221.3	221.3	0.0	77.9	152.7	230.6	9.3
24	2036		221.3	221.3	0.0	87.7	167.5	255.2	33.9
25	2037		221.3	221.3	0.0	98.7	183.7	282.5	61.1
26	2038		221.3	221.3	0.0	111.2	201.5	312.7	91.4
27	2039		221.3	221.3	0.0	125.2	221.0	346.2	124.9
28	2040		221.3	221.3	0.0	141.0	242.4	383.4	162.1
29	2041		221.3	221.3	0.0	158.8	265.9	424.7	203.3
30	2042		221.3	221.3	0.0	178.8	291.6	470.4	249.1
Total		7,556	6,640	14,196	0	1,551	3,098	4,649	-9,547
NPV		5,401	1,133	6,534	0	166	402	361	-6,173
B/C		Discount Rate		12%					0.06
EIRR									#DIV/0!

Notes: VOC (D)[1] means distance related vehicle operating costs
VOC (D)[2] means time related vehicle operating costs

Source: JICA Study Team

Table 18.2.22 Estimated Net Cash Flow for Economic Evaluation of Project (With NR008 Case)

Unit: 1000 USD (Economic Price)

Year		Cash-out		Total	Cash-in			Total	Net Cash Flow
		Project			User's Cost Saving				
		Investment	O&M		VOC (D)[1]	VOC (T)[2]	TTC		
	2009	0.0	0.0	0.0				0.0	0.0
	2010	837.7	0.0	837.7				0.0	-837.7
	2011	837.7	0.0	837.7				0.0	-837.7
	2012	837.7	0.0	837.7				0.0	-837.7
1	2013		110.6	110.6	0.0	1.2	2.0	3.2	-107.4
2	2014		110.6	110.6	0.0	1.4	2.1	3.6	-107.1
3	2015		110.6	110.6	0.0	1.6	2.4	3.9	-106.7
4	2016		110.6	110.6	0.0	1.8	2.6	4.4	-106.3
5	2017		110.6	110.6	0.0	2.0	2.8	4.8	-105.8
6	2018		110.6	110.6	0.0	2.3	3.1	5.4	-105.3
7	2019		110.6	110.6	0.0	2.5	3.4	6.0	-104.7
8	2020		110.6	110.6	0.0	2.9	3.7	6.6	-104.0
9	2021		110.6	110.6	0.0	3.2	4.1	7.3	-103.3
10	2022		110.6	110.6	0.0	3.6	4.5	8.1	-102.5
11	2023		110.6	110.6	0.0	4.1	4.9	9.0	-101.6
12	2024		110.6	110.6	0.0	4.6	5.4	10.0	-100.6
13	2025		110.6	110.6	0.0	5.2	5.9	11.1	-99.5
14	2026		110.6	110.6	0.0	5.8	6.5	12.4	-98.3
15	2027		110.6	110.6	0.0	6.6	7.1	13.7	-96.9
16	2028		110.6	110.6	0.0	7.4	7.8	15.2	-95.4
17	2029		110.6	110.6	0.0	8.3	8.6	16.9	-93.7
18	2030		110.6	110.6	0.0	9.4	9.4	18.8	-91.8
19	2031		110.6	110.6	0.0	10.6	10.3	20.9	-89.7
20	2032		110.6	110.6	0.0	11.9	11.3	23.3	-87.4
21	2033		110.6	110.6	0.0	13.4	12.4	25.9	-84.8
22	2034		110.6	110.6	0.0	15.1	13.6	28.8	-81.9
23	2035		110.6	110.6	0.0	17.0	15.0	32.0	-78.6
24	2036		110.6	110.6	0.0	19.2	16.4	35.6	-75.1
25	2037		110.6	110.6	0.0	21.6	18.0	39.6	-71.0
26	2038		110.6	110.6	0.0	24.3	19.7	44.0	-66.6
27	2039		110.6	110.6	0.0	27.4	21.6	49.0	-61.6
28	2040		110.6	110.6	0.0	30.8	23.7	54.6	-56.1
29	2041		110.6	110.6	0.0	34.7	26.0	60.8	-49.9
30	2042		110.6	110.6	0.0	39.1	28.6	67.7	-43.0
Total		2,513	3,319	5,832	0	339	303	643	-5,189
NPV		1,797	566	2,363	0	36	39	48	-2,315
B/C		Discount Rate		12%					0.02
EIRR									#DIV/0!

Notes: VOC (D)[1] means distance related vehicle operating costs
VOC (D)[2] means time related vehicle operating costs

Source: JICA Study Team

18.3 Other Significant Benefits from the Project

The previous section discusses quantifiable economic benefits derived from the project by testing the economic viability of high priority projects. In addition to these quantifiable economic benefits, there are various unquantifiable impacts generated by the project, including decrease in traffic accidents, saving in energy consumption, income generation, stimulation of the regional economy and for the particular case of Amuru and Nwoya Districts; acceleration

of the IDPs' return process. The following discussions will, accordingly, reveal how the road improvement project will accelerate the IDPs' return process in Amuru and Nwoya Districts by enhancing social infrastructure development in the home/return villages.

To do so, a series of social infrastructure surveys have been carried out at the initial stage of the study, to identify local perspectives (issues) on social infrastructure; water, health and education. The unquantifiable impacts of the road improvement project are measured, identifying the extent to which the project would contribute to solving these issues. The degree to which the IDPs' return process would be accelerated can be determined by the degree of influence of the road improvement project in solving these issues.

(1) Water

A variety of local perspectives on water were raised from selected survey villages in Amuru and Nwoya Districts. The concerns of the residents were centred mainly on the poor infrastructure of the water points and their poor maintenance. Road improvement projects can generate multiple effects to solve these issues, by (i) enabling service providers to reach water points, (ii) enabling district officers to reach water points for supervision works, and (iii) encouraging district officers to collect baseline data of the water point condition for maintenance purposes.

Table 18.3.1 Issues and Degree of Influence on these Issues (Water)

Local perspectives	Contribution of road improvement in solving the issue	Other factors to solve the issue	Degree of influence of road improvement in solving the issue
Condition of water points in the home/ return villages is still poor.	Road improvement enables service providers to reach the necessary sites with heavy equipment.	• Funds for opening/ repairing water points	High
O&M of water points is not done satisfactorily.	Road improvement enables district officers and NGOs to reach water and sanitation committees to provide supervision and training, which would be done more easily and more often.	• Funds for training • Transportation for supervision (vehicles, fuels) • Capable/ available district officers	Fair
District office does not have proper data for planning.	Road improvement makes it possible to collect necessary data and to conduct necessary surveys more easily.	• Funds for data collection • Capable district officers • Transportation and equipment	Fair

Source: JICA Study Team

(2) Health

Similarly to water issues, a great deal of local perspective on health issues was collected from selected survey villages in Amuru and Nwoya Districts. The concerns of the residents were centred mainly on both quality and quantity of health facilities and also quality and quantity of the health services. Road improvement projects can generate multiple effects to solve these issues, e.g., by (i) providing access for district officers to develop necessary health facilities, (ii) providing good access to health facilities for the patients, (iii) encouraging quality staff to work at health facilities, and (iv) enabling district officers to conduct regular monitoring of the existing health facilities.

Table 18.3.2 Issues and Degree of Influence on These Issues (Health)

Local perspectives	Contribution of road improvement in solving the issue	Other factors to solve the issue	Degree of influence of road improvement in solving the issue
Number of health units is not at the level of the national standard.	Road improvement makes it easier for district offices and NGOs to transport construction materials to areas where new health units are needed.	• Funds for construction • Lands for new health units • Staff for new health units • Operation costs • O&M funds	High
Accessibility to existing health units is bad.	Road improvement makes health units accessible.	•	High
Existing health units do not have sufficient facilities.	Road improvement makes it easier for district offices and NGOs to reach health units to construct necessary facilities.	• Funds for construction • Lands for new facilities • O&M funds	Fair
There are not enough staff members for health units.	Road improvement eases commuting and may encourage more people to apply for positions as well as to stay in positions.	• Improved salaries • Improved facilities and equipment • Existence of enough staff houses with good security • Qualified candidates	Fair
Communication between people and health units, among health units, and between the district offices and health units is bad.	Road improvement makes communication among stakeholders by roads easier.	• Transportation (ambulances, vehicles, fuels) • Communication tools (phones, radios) • Staff for this purpose	Fair
The health services department of the district office does not have proper capacity to provide required services.	Road improvement may attract more people to apply for district officer positions.	• Improved salaries • Improved office and equipment • Existence of enough staff houses with good security • Qualified candidates	Fair
	Road improvement enables more visitations to health units for monitoring purposes.	• Transportation (Vehicles, fuels)	Fair

Source: JICA Study Team

(3) Education

A wide range of local perspectives on education were also raised from selected survey villages in Amuru and Nwoya Districts. The concerns of the residents were centred mainly on both quality and quantity of educational facilities and also quality and quantity of education services. Road improvement projects can generate multiple effects to solve these issues, e.g., by (i) providing easier access for district officers to develop necessary educational facilities, (ii) providing easier access for the school staff to commute to schools, (iii) encouraging quality staff to work in remote schools, and (iv) enabling district officers to conduct regular monitoring of the existing educational facilities.

Table 18.3.3 Issues and Degree of Influence on These Issues (Education)

Local perspectives	Contribution of road improvement in solving the issue	Other factors to solve the issue	Degree of influence of road improvement in solving the issue
The number of schools is still inadequate.	Road improvement enables district offices and NGOs to reach areas where new schools are needed to be constructed with construction equipment and materials.	• Lands for new schools • Funds for construction • Teachers for new schools • O&M funds	Fair
Existing schools do not have adequate facilities.	Road improvement makes it easier for district offices and NGOs to reach schools which need adequate facilities.	• Funds for construction • Lands for new facilities • O&M funds	Fair
There are not enough teachers in schools.	Road improvement eases commuting and may encourage more people to apply for positions as well as to stay in positions.	• Improved salaries • Prompt payment of salaries • Improved facilities and equipment • Existence of enough teachers' houses with good security • Qualified candidates	Fair
Teachers' irregular attendance and high rate of absenteeism	Road improvement shortens commuting time from Gulu and IDP Camps.	• Improved salaries • Prompt payment of salaries • Improved facilities and equipment • Existence of enough teachers' houses with good security	Fair
Irregular attendance and absenteeism among children	Road improvement shortens commuting time from houses to schools	• Parents' understanding towards education • Lunch availability	Low
Parents' understanding towards education is low.	Road improvement enables district officers to meet these parents.	• Sufficient capable district officers • Transportation (Vehicles, Fuels)	Low
Support from community is low.	Road improvement enables district officers to talk with community people as well as to train them.	• Sufficient capable district officers • Transportation (Vehicles, fuel) • Training packages	Low
The district office lacks officers and equipment.	Road improvement may attract more people to apply for district officer positions.	• Improved salaries • Improved office and equipment • Existence of enough staff houses with good security • Qualified candidates	Fair

Source: JICA Study Team

SECTION 4: TECHNICAL TRANSFER

19. TECHNICAL TRANSFER TO AMURU AND NWOYA DISTRICTS

19.1 Introduction

In order to enhance the sustainability of the rural road network planning in Northern Uganda, technical transfer for the District Engineer, District Planner, Senior Engineer, Road Inspector, District Water Officer and Borehole Maintenance Officer of former Amuru District were conducted. The overall goal of the technical transfer was to increase their capacity to develop and update the "Rural Road Master Plan".

Table 19.1.1 Schedule of Technical Transfer

Date	Contents	Venue	Participants
2009/10/23	• Rural Road Master Planning and Capacity Building (Tsukahara)	Study Team Gulu Office	• Okello Louis P'Abur (Acting District Engineer) from former Amuru District
2009/10/27	• Rural Road Master Planning and Capacity Building (Tsukahara) • Social Infrastructure Survey (Tsukahara) • Road Inventory Survey (Nakajima)	Study Team Gulu Office	• Geofrey Nyeko (Acting District Water Officer) from former Amuru District • Ojok Robert (Road Inspector) from former Amuru District
2010/03/12	• Formulation of Rural Road Development Master Plan for Amuru District (Sasaki)	Study Team Gulu Office	• Okello Louis P'Abur (Acting District Engineer) from former Amuru District
2010/03/13	• Confirmation of current status at Master Planning (Tsukahara) • Result of Road Inventory Survey (Nakajima) • Formulation of Rural Road Development Master Plan for Amuru District (Sasaki)	Study Team Gulu Office	• Geofrey Nyeko (Acting District Water Officer) • Ojok Robert (Road Inspector) • Robinson Payolem (Borehole Maintenance) • Odoch Stephen Aranya (Intern) from former Amuru District
2010/07/01	• Utilization of GIS Maps • Explanation of GIS system	Acholi Inn	• 18 people from all districts in Acholi
2010/07/26	• Rural road improvement planning • Rural road maintenance planning • Traffic survey and demand forecast	Acholi Inn	• 24 people from all districts in Acholi
2010/07/28	• To enable the participants to use their Garmin GPS for capturing the road centrelines • To enable the participants to download the data using Garmin Map Source and edit using AutoCAD	Study Team Gulu Office	• 3 engineers from former Amuru District

Date	Contents	Venue	Participants
2010/08/03	• Introduce GIS Concepts • To enable the participants to appreciate the usefulness of GIS and how it can help them in their Planning • To enable the participants to prepare Simple Thematic Maps	Study Team Gulu Office	• 2 engineers from former Amuru District
2010/07/26 - 2010/08/05	• To enable the participants to handle processing of GPS centerline data coming from the district engineers • To enable the participants to link GPS centerline data to RAMPS • Produce Thematic Maps and Tabular reports based on the linked RAMPS data	MoWT Entebbe	• About 10 engineers from MoWT Entebbe

Source: JICA Study Team

The contents of all these programs were based on the actual study flow in the Project for Rural Road Network Planning in Northern Uganda, and are prepared as specific and detailed for ease of understanding.

19.2 Technical Transfer of Rural Road Network Planning

An extended technical transfer on rural road network planning was conducted in Gulu (a conference room in Acholi Inn) on 26th July, 2010 and a total of 24 participants from all districts in Acholi Sub-region attended this program.

Source: JICA Study Team

Photo 19.2.1 Extended Technical Transfer on Rural Road Network Planning

Table 19.2.1 Number of Participants

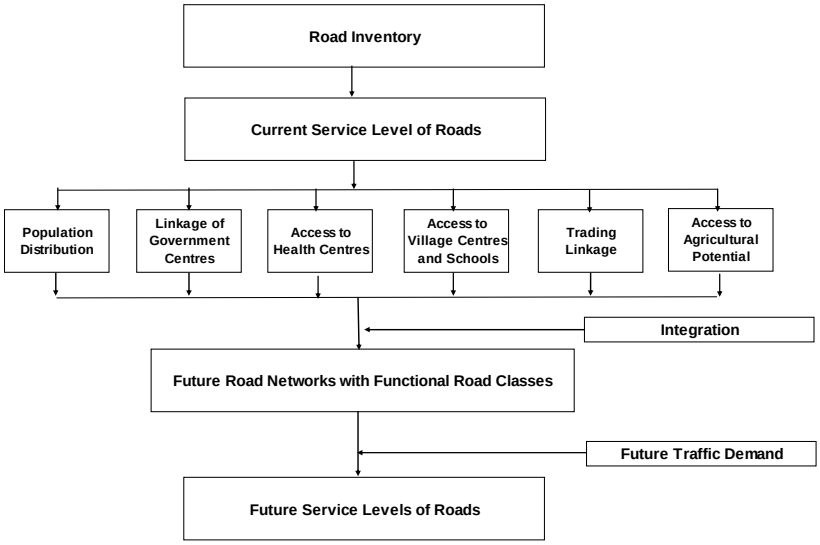
District	Number of Participants
Amuru	5
Nwoya	7
Gulu	1
Kitgum	2
Lamwo	1
Pader	1
Agago	2
MoWT (Entebbe)	1
UNRA (Gulu)	1
UNRA (Kitgum)	1
JICA Gulu Field Office	2
TOTAL	**24**

Source: JICA Study Team

The extended technical transfer focused on district-level road network planning and the agenda was as follows:

- What is the road network plan?
- Why are road network plans needed?
- Who should be involved in road network planning?
- For road planning, what do you need?
- How to do road network planning?
- What aspects are to be considered for road network planning?
- What is functional road classification?
- How to use functional road classification?
- How to set service level of roads (design standards)?

Firstly, this program emphasised the necessity of road maps and the study steps as shown in Figure 19.2.1. Although, road inventory data and road maps are the fundamental input in road network planning, all the districts had failed to collect the data adequately. Consequently, the districts could not find the existing road distribution and conditions on the maps.



Source: JICA Study Team

Figure 19.2.1 Work Flow of Road Network Planning

Secondly, a method of using functional road classification (integration of Trunk Road System and District Road System) was proposed for districts because it could be a tool for guiding the development and management of roads. Now, there are two different systems of functional road classification in Uganda. One is for trunk roads, and the other is for district roads. For rural road network planning for a particular district, it is necessary to utilize both systems of functional road classification. However, it is not easy to use the two functional classification systems simultaneously for road network planning. Furthermore, during this study, Amuru, Kitgum and Pader Districts were each split up into two districts such that further decentralization of the district would be promoted in Acholi Sub-region in the near future. Therefore, road network planning should be discussed based not on jurisdiction such as National Roads or District Roads but on functional road classification.

Table 19.2.2 Proposed Integrated Functional Classification

Class	Trunk Road System	District Road System	Method of Integrating Existing Two Functional Road Classifications Proposed by JICA Study Team
A	International Trunk Road		International Trunk Road
B	National Trunk Road		National Trunk Road (Inter-regional Trunk Road)
C	Primary Trunk Road	District Class I Road	Primary Trunk Road (Inter-District Trunk Road)
D	Secondary Road	District Class II Road	Secondary Trunk Road (District Trunk Road)
E	Tertiary Road (Minor Road)	District Class III Road	Tertiary Trunk Road (District Feeder Road)
F		Important Community Access Road	District Collector Road
G		Community Access Road	Community Access Road

Source: JICA Study Team

19.3 Technical Transfer on Rural Road Maintenance Planning

Extended technical transfer on rural road maintenance planning was conducted after the session on Rural Road Network Planning. This workshop explained the role of the District and

the capacity required to conduct maintenance planning as well as proffering considerable cases of counter measures as shown below.

Table 19.3.1 Role of the District and Required Capacity

Area	Required Capacity
a) Updating and maintenance of the road inventory system	• Understand the theory of RAMPS • Practical operational skill to utilize RAMPS • Understand the technical evaluation skills regarding defects such as defect type, cause and its countermeasures
b) Develop the road maintenance plan	• Skills to evaluate the road condition and prepare maintenance plan from the output of RAMPS. • Road planning skills, considering the Labour based technology in particular.
c) Instruct, supervise and evaluate the private consultants performance	• Basic knowledge of road & structure design and cost estimation. • Basic knowledge of construction • Management of the provided machinery

Source: JICA Study Team

To achieve the above capacity, the following sustainable programs would be necessary.

- Capacity Development
  a. Training at MELTC
  b. Training in neighbouring institute
  c. Training in Japan
- Development of technical Manual/Guidelines for road defects
- Development of road inventory map in accord with the new districts
- Capacity strengthening for the institute /university so that they can establish practical engineering courses on roads and structures
- Introduction of new technology for low traffic volume roads

19.4 Technical Transfer on Traffic Surveys and Demand Forecasts

Extended technical transfer on traffic surveys and demand forecasts was conducted after the session on Rural Road Maintenance Planning. The overall goal of the technical transfer was to increase their capacity to develop and update the "Rural Road Master Plan" using socio-economic and traffic information. This workshop aimed to impart understanding of traffic survey and demand forecast modelling to District Engineers, Senior Engineers, Road Inspectors and District Planners in Acholi Sub-region.

Traffic data and information is an essential input for planning the road network and for testing the validity of the projects. Besides, the traffic demand forecast model is developed based on the traffic survey and future socio-economic framework. In terms of Capacity Development, public officers needed to increase their capacity as described below:

- Ability to draft the TOR and contract for Traffic Survey.
- Ability to monitor the progress and verify the results of the survey.
- Ability to utilize the traffic data for planning purposes.

The workshop thus explained the methodology of (1) traffic count surveys, (2) household interview surveys and (3) traffic demand forecasts, using samples from the surveys conducted by the JICA Study Team in Acholi Sub-region.

19.5 Technical Transfer on Utilization of GIS Maps

The Technical transfer on utilization of GIS maps was conducted following the schedule shown below:

Table 19.5.1 Schedule of GIS Technical Transfer

Date	Contents	Venue	Participants
1st July	Explanation of GIS system	Acholi Inn, Gulu	18
28th July	• To enable the participants to use their Garmin GPS for capturing the road centrelines • To enable the participants to download the data using Garmin Map Source and edit using AutoCAD	JICA Study Team Office	3
3rd August	• Introduce GIS Concepts • To enable the participants to appreciate the usefulness of GIS and how it can help them in their Planning • To enable the participants to prepare Simple Thematic Maps	JICA Study Team Office	2

Source: JICA Study Team

A Geographic Information System (GIS) is any system that captures, stores, analyzes, manages and presents data that are linked to location. GIS is the merging of cartography and is used for statistical analysis and visualization of information/data. Although the Ministry of Works and Transport (MoWT) introduced a GIS system, namely RAMPS, for road network planning and road maintenance planning several years ago, the system has not been operated because it was not completely established, which prompted the RAMPS project to be stopped. On the other hand, cartography of National Roads, District Roads and Community Access Roads in Acholi Sub-region has not progressed such that it is difficult for districts to express the necessity of road improvement or rehabilitation to the central government or donors.

In response to such a situation, the technical transfer workshop aimed to elucidate on the methodology of effective utilization of GIS software (RAMPS) to MoWT and district engineers from Amuru and Nwoya Districts in order to establish a foundation in MoWT and Amuru/Nwoya Districts that can effectively carry out sustainable road network planning and maintenance planning.

General Objectives of the Technical Transfer Activities were

- Increase their technical capability in carrying out Road Inventory Surveys
- Increase their technical capability in preparing maps to be used for planning purposes

The first workshop consisted of an explanation of the basics of GIS systems and sample maps that were prepared by GIS and a discussion on how GIS could be used for road planning and maintenance planning.


Source: JICA Study Team

Photo 19.5.1 Explanation of GIS System

Table 19.5.2 Number of Participants for First GIS Workshop

District	Number of Participants
Amuru	2
Nwoya	0
Gulu	5
Kitgum	1
Lamwo	2
Pader	0
Agago	0
MoWT (Entebbe)	4
UNOCHA	1
USAID NUDEIL	1
JICA Gulu Field Office	2
TOTAL	**18**

Source: JICA Study Team

The second workshop focused on showing how GPS was used in the field to capture the road centrelines, data importing from GPS to computer and editing of data by using CAD.


Source: JICA Study Team

Photo 19.5.2 Lecture and Demonstration of GPS

Table 19.5.3 Number of Participants for Second GIS Workshop

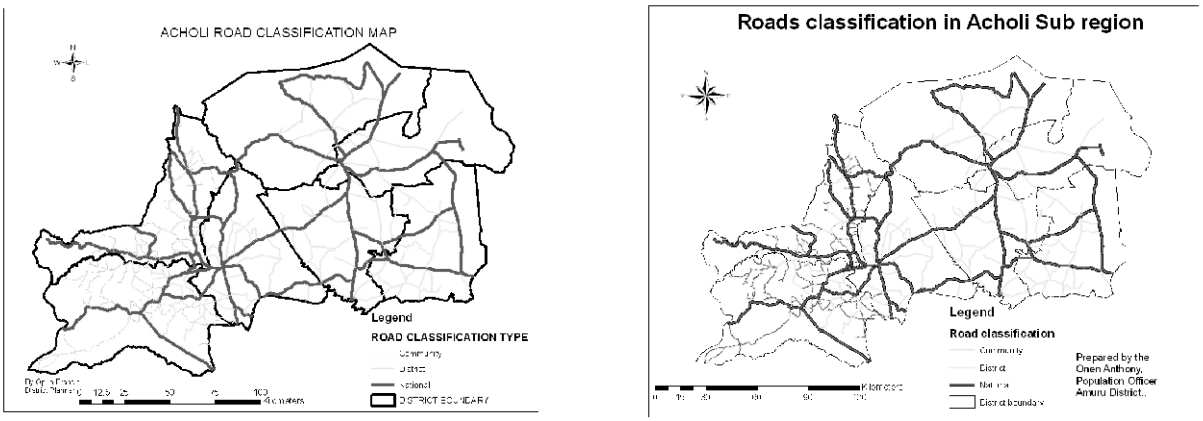
District	Number of Participants
Amuru	2
Nwoya	1
TOTAL	**3**

Source: JICA Study Team

The third workshop involved elucidation on GIS Concepts as well as introductory exercises on ArcGIS (GIS software) through preparation of thematic maps such as road classification maps and population density maps.

Source: JICA Study Team

Photo 19.5.3 Introduction and Exercise on ArcGIS



Source: JICA Study Team

Figure 19.5.1 Outputs of third GIS Workshop

Table 19.5.4 Number of Participants in Third GIS Workshop

District	Number of Participants
Amuru	1
Nwoya	1
TOTAL	**2**

Source: JICA Study Team