

21.3 RIVER CONDITION AND FLOOD DISCHARGE

Preliminary investigations are carried-out for flood discharges at the proposed bridge and culvert sites to determine the necessary range of bridge/culvert openings. Basically, bridges are designed for a 50-year return flood but the amount of rainfall information is very limited for the case of Juba. In this case, the calculation for flood discharge is done as a reference and compared to the flood level experienced by residents near the bridge site. The following assumptions and conditions are used:

- an 80mm/day daily rainfall is assumed to determine the rainfall intensity since longer rainfall data series is unavailable, and
- the topography of the area is based on the 1:10,000 scale map prepared by JICA during the emergency study in 2006,

Figure 21.3-1 shows the rivers and the river basins of the proposed bridge sites. The river flood discharges, on the other hand, as shown in Figure 21.3-2 are used as a reference in planning the preliminary bridge openings. However, reference is also made to the existing bridge and culvert openings and the experienced flood levels at bridge and culvert sites to plan for the required bridge opening for bridge reconstruction.

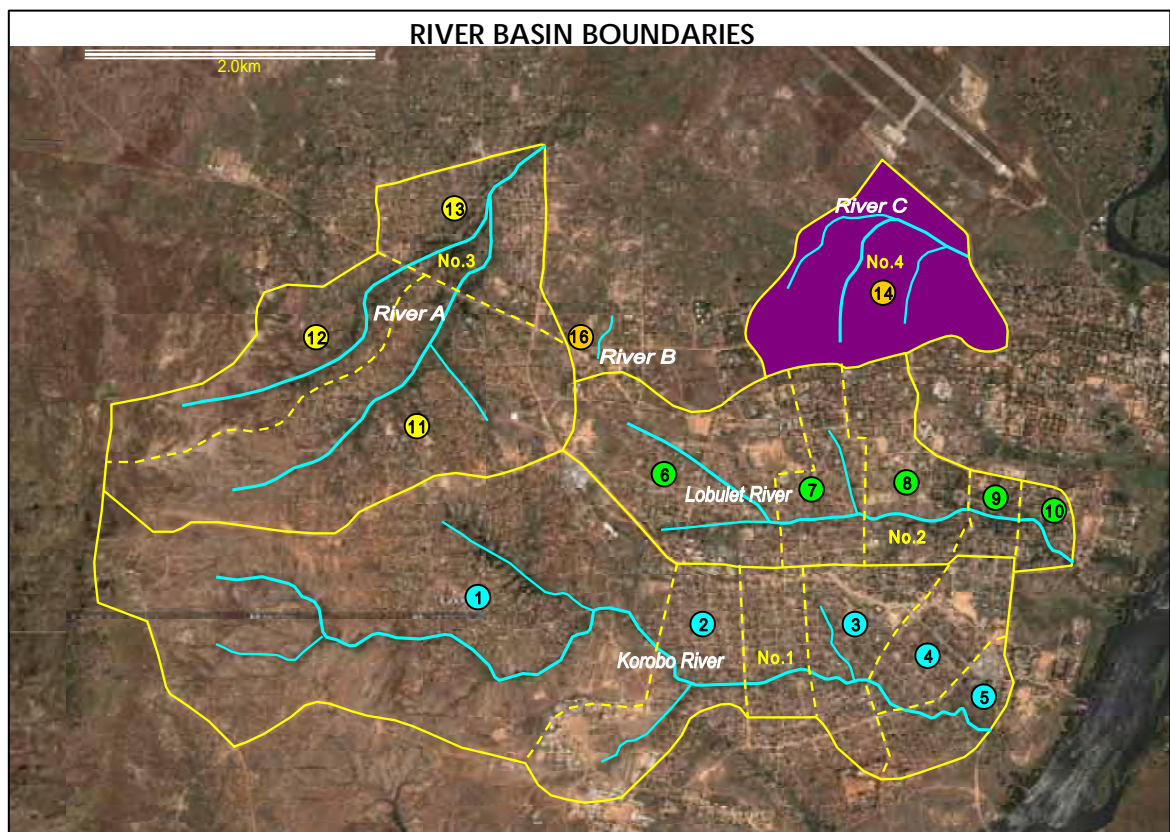


Figure 21.3-1 River Basin and Flood Discharges

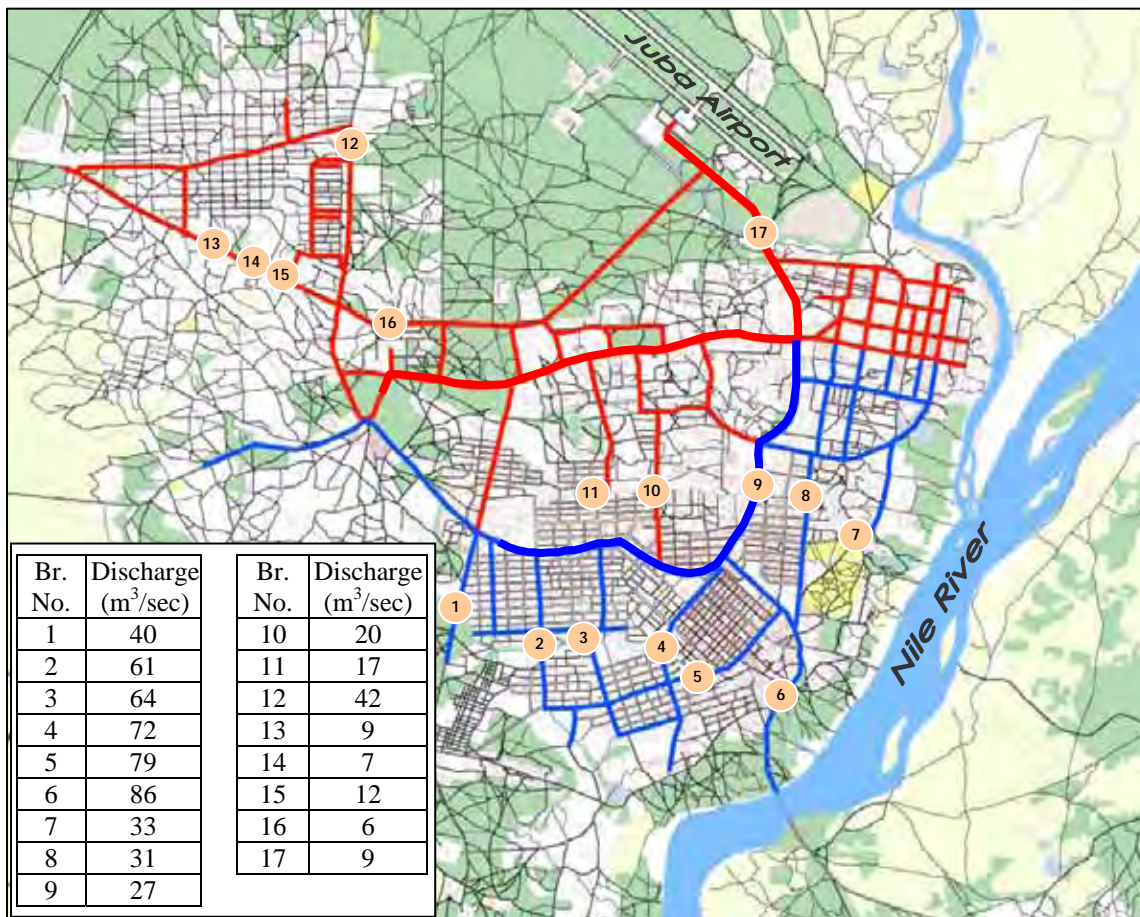


Figure 21.3-2 Estimated Flood Discharges

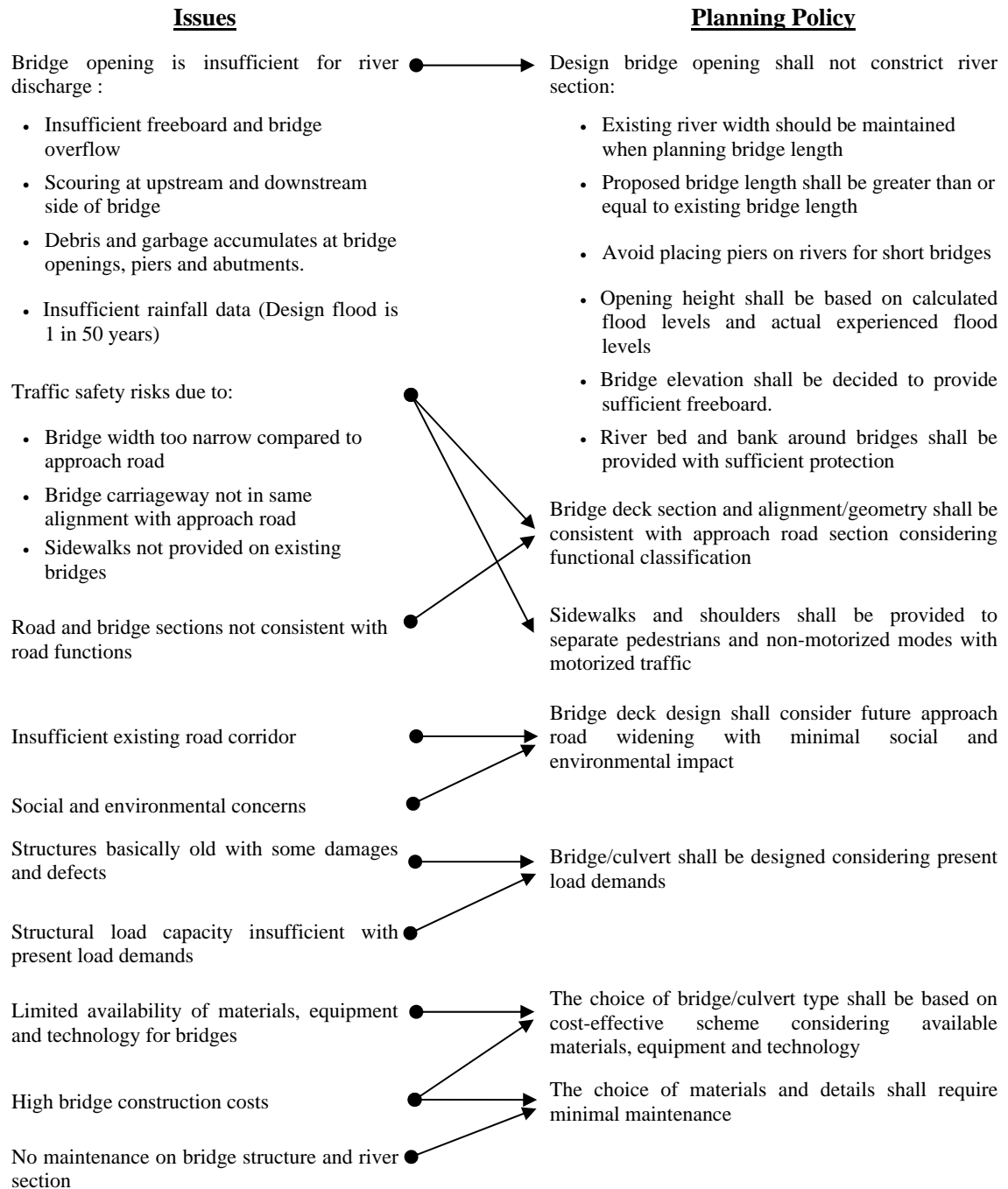
CHAPTER 22

PRELIMINARY PLAN AND DESIGN

CHAPTER 22 PRELIMINARY PLAN AND DESIGN

22.1 CONSIDERATIONS FOR BRIDGE PLANNING

Based on the existing conditions of the proposed sites for bridge and culvert reconstruction project discussed in Chapter 20 of Part IV, the following issues and proposed policies are identified for bridge planning:



22.2 BRIDGE/CULVERT OPENING, SPAN LENGTH AND BRIDGE LENGTH

The span length, bridge length and bridge/culvert openings (see Figure 22.2-1 for illustration) are decided based on the following aspects:

- Since the available rainfall data covers only a period of about 6 years, the anticipated design flood level is decided based on calculated discharge supplemented with interview of the nearby residents and flood marks on the maximum experienced flood level. Insufficient freeboard from design flood and maximum experienced flood level and scouring at upstream and downstream sides of the bridge indicates a need to increase the bridge opening.
- Proposed bridge openings should maintain the existing river width and not constrict the river.
- The following freeboard heights are adopted:

<u>Structure</u>		<u>Minimum Freeboard Height (m)</u>
Bridge	-	0.90-1.00
Culvert	-	0.60

- The proposed bridge lengths are decided based on the required openings discussed above and should be equal to or greater than existing bridge opening lengths.
- Since debris and garbage are observed to block bridge openings, piers are avoided on bridges with openings of 18m or less and a one-span bridge is proposed.

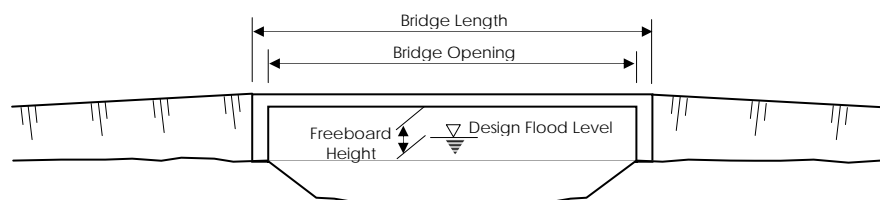


Figure 22.2-1 Bridge Opening and Bridge Length

22.3 BRIDGE CROSS-SECTION

The bridge cross-sections are decided by the following factors:

- The ultimate bridge deck section width shall be based on the road functional classification without constricting the traveled way. Since the bridges are short in length, the curb to curb distance of the approach road shall be maintained on bridge decks.
- Moreover, since the on-going road rehabilitation project is immediate and does not reflect the road functional class, the bridge deck section shall be greater than the approach road section and shall consider the functional class of the approach road.
- Where parking lanes are provided in the approach road of the on-going road rehabilitation, the bridge deck section shall be provided with additional lane to consider future road widening.

- In areas where the existing road corridor is insufficient to provide bridge deck width as required by the road functional class, the bridge section shall be provided with number of lanes similar to the on-going road rehabilitation project to minimize social impact due to right of way take and relocation. Provisions for future widening shall be considered for bridges in arterial class.

Figure 22.3-1 illustrates the proposed cross-sections for the 17 bridges.

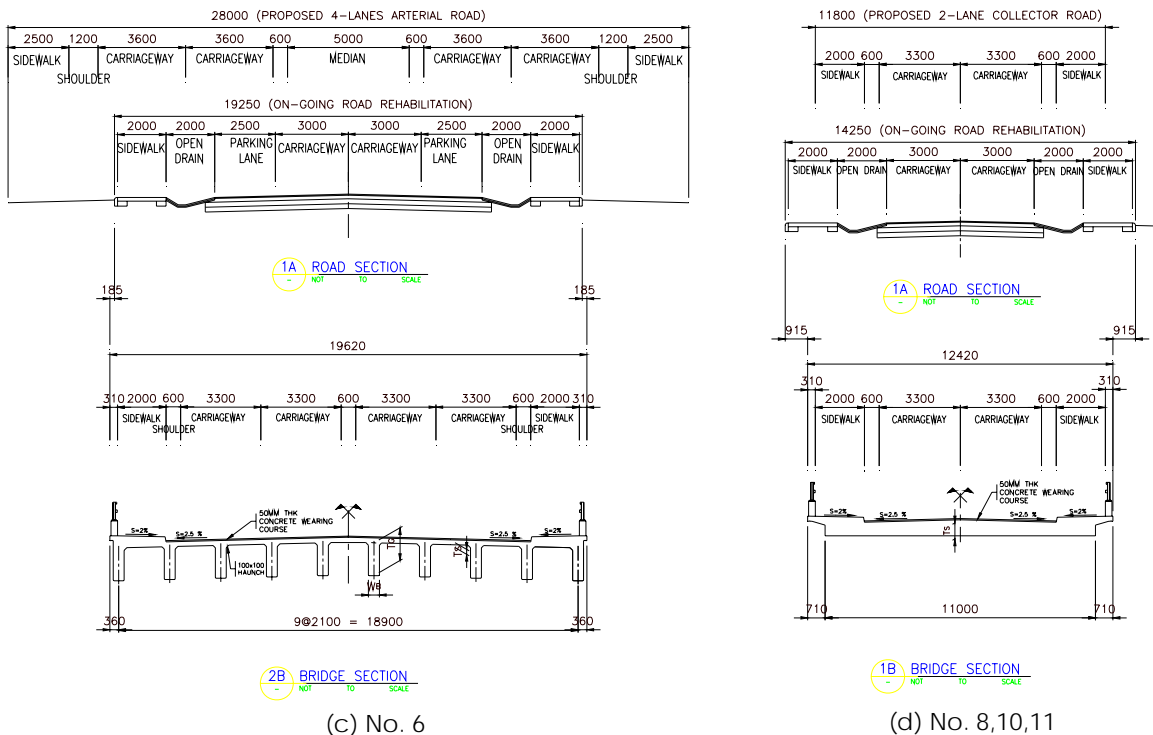
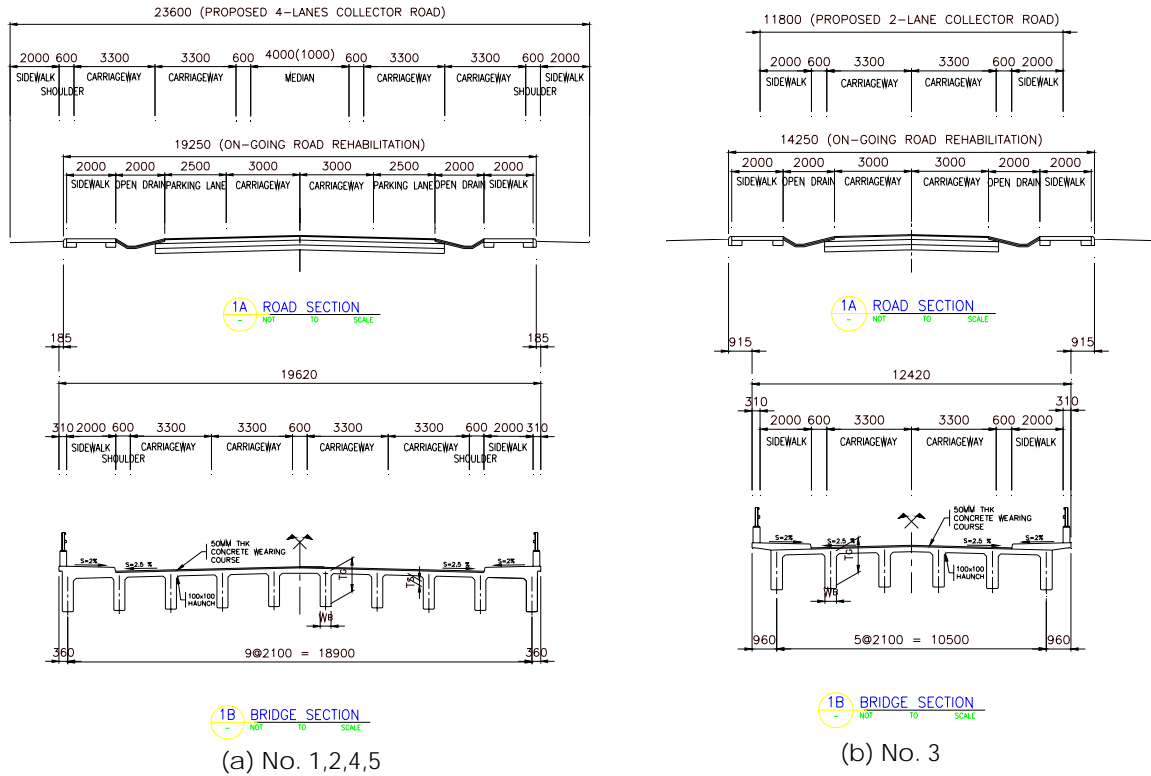
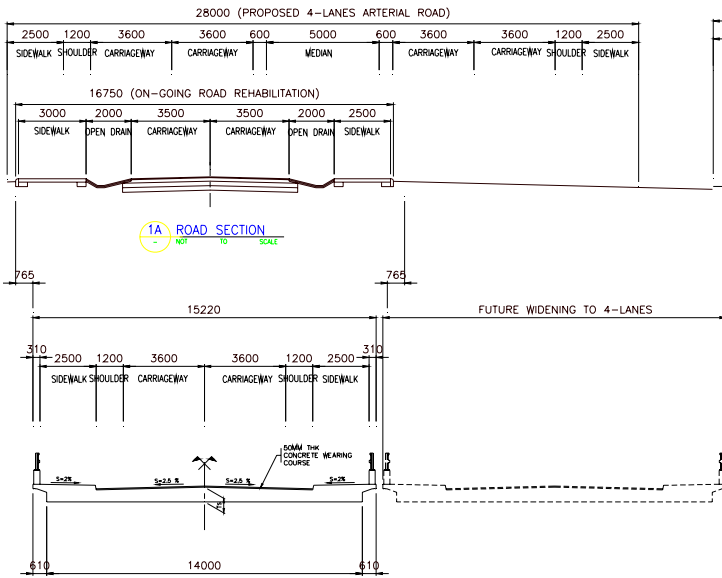
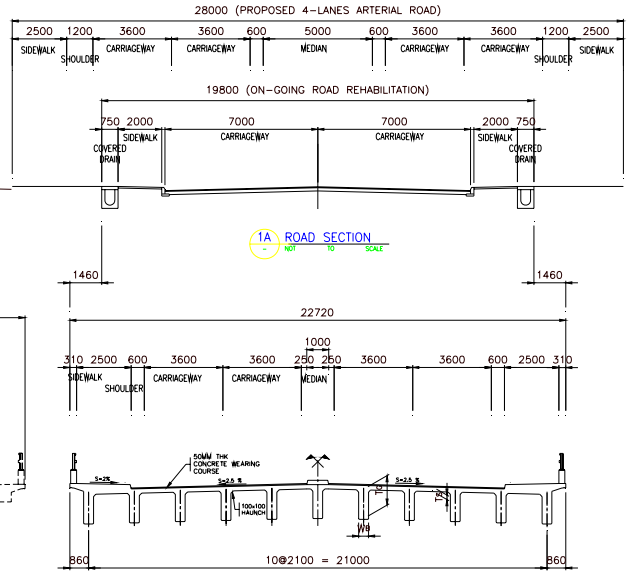


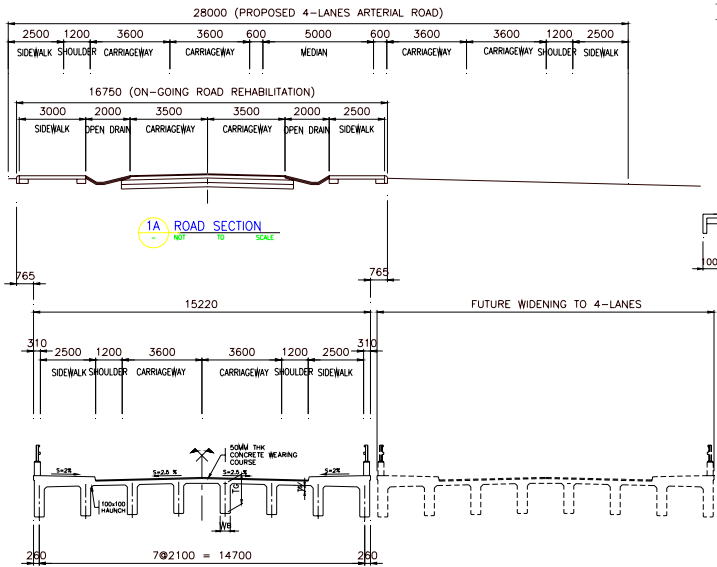
Figure 22.3-1(a) Proposed Bridge Cross-Sections



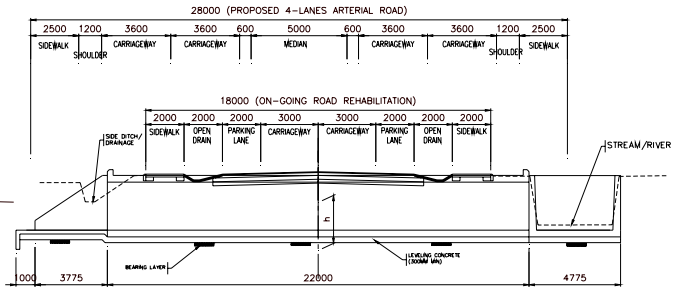
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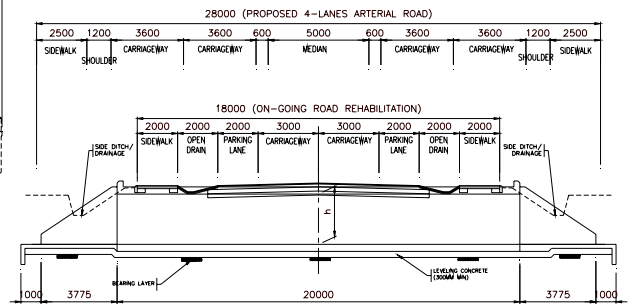
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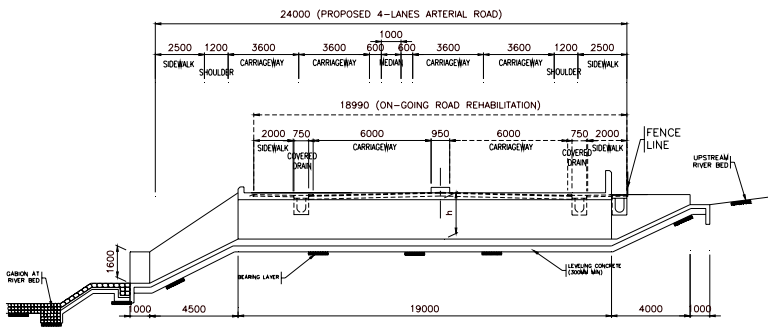
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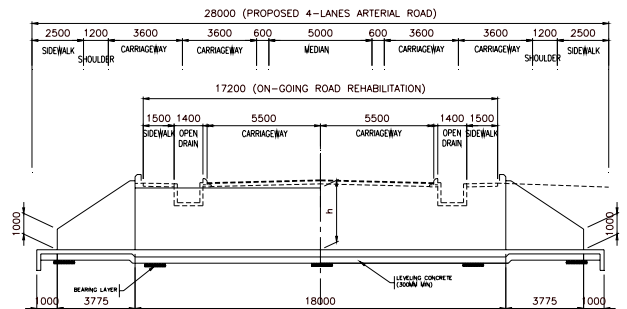
(h) No. 13



(i) No. 14, 15



(j) No. 16



(j) No. 17

Figure 22.3-1(b) Proposed Bridge Cross-Sections

22.4 BRIDGE TYPE

The choice of structural type and system for the bridges and culverts is based on the following conditions:

(1) Material Type

- Cast-in-place Reinforced Concrete (RC) as the basic bridge construction material is recommended. The choice of material type is basically governed by the locally available materials, equipment and technology. Basically, the construction materials and equipment for bridges are imported from Uganda and Kenya, except for gravel and sand. Therefore, materials readily available from these neighboring countries are preferable. Moreover, the equipment that will be used to construct the bridge should be light and not heavy since such equipment will also be transported from the neighboring countries.
- Since the bridge spans are in the range of 10m to 18m, RC is most applicable and cost-effective.
- Reinforced concrete is preferred over Prestressed concrete since prestressing technology is not yet available in South Sudan.
- Concrete is chosen over steel since it requires minimal maintenance compared to steel structures.

(2) Structure Type.

- The choice of structure type for the proposed bridges is based on the bridge opening and span lengths as follows:

<u>Bridge/Culvert Length</u>	<u>Span/Opening</u>	<u>Structure Type</u>
<10m	≤ 4m	RC Box Culvert
10	< 10m	RC Portal Bridge
≥ 12m	≥ 10m	RC Girder Bridge

*RC Girder bridges have bearing pads and expansion joints at the abutments but RC Portal bridges are basically slab bridges continuous over the abutment.

- Since bridges are in urban areas, the depths of superstructures are minimized to provide access to abutting roads and properties.
- In bridge/culvert sites where the bearing layer is shallow, as evidenced by rock outcrops in the area, spread footing (direct bearing foundation) is recommended. In areas where the bearing layers are deeper, pile foundation is recommended.

22.5 PROPOSED BRIDGES AND CULVERTS

The proposed bridges and culverts are presented in Table 22.5-1. There are 8 sites with RC Gider bridges (bridge lengths from 12m to 24m), 4 sites with RC Portal bridges (bridge length of 10m), and 5 sites with RC box culverts.

Table 22.5-1 Proposed Bridges and Culverts

No.	Bridge/ Culvert Name	Road Name	River	Road Class	River Width (m)	Proposed Bridge/Culvert								Approach Width (Length)	Rehab. Project Status
						Type	Length (m)	Opening	Corridor Width				Found'n Type		
									Road Width by Class (No. of Lanes)	Road Width by Rehab. Project (No. Lanes)	Proposed Bridge Width (No. Lanes)	Available ROW (Fence to Fence)			
1	Shuhada	Mayo	Korobo	C	10	RCG	12	10	23.6 (4)	19.25 (2+PL)	19.62 (4)	31	Spread	20.6 (60)	
2	Tombror	Tombror	Korobo	C	10	RCG	12	10	23.6 (4)	19.25 (2+PL)	19.62 (4)	33/22.8	Spread	20.6 (60)	
3	Salam	Salam	Korobo	C	12	RCG	12	10	11.8 (2)	14.25 (2)	12.42 (2)	16	Spread	11.8 (60)	
4	Albino	Albino	Korobo	C	12	RCG	12	10	23.6 (4)	19.25 (2+PL)	19.62 (4)	26.5	Spread	20.6 (60)	
5	Lilasmafi	Tombror	Korobo	C	13	RCG	18	14	23.6 (4)	19.25 (2+PL)	19.62 (4)	20	Spread	20.6 (60)	
6	Madra	Nglilo	Korobo	A	20	RCG	24	22	28 (4)	19.25 (2+PL)	19.62 (4)	21/16	Pile	19.6 (60)	
7	Salakana	Salakana	Lobulet	A	14	Portal	10	8	28 (4)	19.25 (2+PL)	15.22 (2)	12.7/10	Pile	10.8 (60)	
8	Hai Malakar	Cinema	Lobulet	C	13	Portal	10	8	11.8 (2)	14.25 (2)	12.42 (2)	22	Pile	11.8 (60)	
9	Korobo	Unity	Lobulet	A	12.5	RCG	12	10	28 (4)	19.8 (4)	22.72 (4)	25/33	Pile	24 (60)	Road Paved
10	Kokora	Kokora	Lobulet	C	12	Portal	10	8	11.8 (2)	14.25 (2)	12.42 (2)	25	Spread	11.8 (60)	
11	Lukabadi	Lukabadi	Lobulet	C	12	Portal	10	8	11.8 (2)	14.25 (2)	12.42 (2)	19/17	Spread	11.8 (60)	
12	Terekeka	Terekeka	A	A	14	RCG	18	16	28 (4)	16.75 (2)	15.22 (2)	40	Spread	14.6 (60)	
13	Munuki 1	Salvation	A	A	4	RCBC	22	4	28 (4)	18.00 (2 + PL)	22.00 (2 + PL)	24	Spread	18 (60)	
14	Munuki 2	Salvation	A	A	3.5	RCBC	20	3.5	28 (4)	18.00 (2 + PL)	20.00 (2 + PL)	25	Spread	18 (60)	
15	Munuki 3	Salvation	A	A	6	RCBC	20	7	28 (4)	18.00 (2 + PL)	20.00 (2 + PL)	25	Spread	18 (60)	
16	Deleted from Bridge Reconstruction Project due to Inclusion with Emergency Road Rehabilitation Project*														
17	Lodoro	Lay	C	A	8	RCBC	18	7	28 (4)	17.2 (2 + PL)	17.2 (2 + PL)	38/18	Spread	17.2 (60)	Road Paved

* Bridge No.16 construction is completed under the Lot 1 Contract of the Emergency Road Rehabilitation Project for the Old Airport Road.

Notes:

1. A : Urban Arterial
2. C : Urban Collector
3. RCG : Reinforced Concrete Girder Bridge
4. RCSB : Reinforced Concrete Slab Box Bridge
5. RCBC : Reinforced Concrete Box Culvert
6. PL : Parking Lanes
7. Spread : Spread Footing/Direct Bearing
8. Pile : Pile Foundation

22.6 BRIDGE AND CULVERT PRIORITIZATION

In order to determine the ranking of bridge construction priority and importance, bridges/culverts are categorized based on the following 8 criteria:

Table 22.6-1 Prioritization Criteria

Criteria	Assigned Points
1) Road Class based on Study Team's Functional Classification	Arterial Road : 10 Collector Road : 5
2) Structural Stability (Risk of Bridge Collapse)	High (Span length over 6m) : 10 Medium (Span length less than 6m) : 5
3) Traffic Functionality	a) Traffic Disrupted, No structure : 50 Overflow : 30 b) Traffic Volume , Heavy : 20 Medium : 10 Light : 5
4) Traffic Safety (Risk of Traffic Accidents)	High (Narrow bridge with heavy traffic) : 20 Medium (Narrow bridge with medium traffic) : 10 Low (Narrow bridge with light traffic) : 5
5) Hydraulic Risk (River Discharge)	High (Flowing Full/Overflow) : 20 Medium (Freeboard less than 1.0m) : 10 Low (Freeboard more than 1.0m) : 5
6) Environmental/Social Impact	Low Impact (No Land Acquisition) : 10 Medium Impact (Land Acquisition Required) : 5 High Impact (Land Acquisition and Resettlement Required) : 0
7) Harmony of Construction Schedule with Urgent Road Rehabilitation Project (Easiness of Adjustment of Road Profile and Less Duplication of Work)	Easy (Road and proposed bridge elevation difference is less than 2m) : 20 Slightly Difficult (Road and proposed bridge elevation difference is more than 2m) : 10 Many duplication work : 0
8) Impact to Society and Economy in case of Bridge Collapse	Very Big Impact : 30 Big Impact : 15 Small Impact : 5 No Bridge : 0

Basically, all 17 bridges and culverts are located in roads classified as urban arterial and urban collector roads. The first criteria then places emphasis on the road importance and functional class, with arterial roads given higher equivalent point than collector roads.

In cases where no structure exists, 50 points is assigned under traffic functionality since the road is not passable during rainy days. However, to give an equal rating for sites with structures, an equivalent point system is assigned by giving a total of 50 points for structural stability (10), traffic safety (20) and hydraulic risk (20).

In terms of Environmental/Social Impact, sites with land acquisition and resettlement problems are given low priority points. Although the ROW of the roads in Juba are considered sufficient for the proposed bridges, structures (including fences) are observed to be quite near to the bridge sites and will need readjustment/relocation.

The relation of the proposed bridges and culverts with the on-going road rehabilitation project is taken into consideration giving higher priority points for bridges/culverts with less impact on the completed section of the on-going road rehabilitation project.

Lastly, emphasis is given to impact to society and economy in case of bridge collapse. Under this criteria very big impact are assigned to arterial roads and major routes for movement of people and goods. Other minor routes have lesser impact to society and economy while sites without bridges have no impact.

Using the above criteria (Table 22.6-1), the priority rankings are decided as indicated in Table 22.6-2.

Table 22.6-2 Results of Bridge and Culvert Prioritization

Br. No.	1) Road Class	2) Risk of Bridge Collapse	3) Traffic Functionality		4) Traffic Safety	5) Hydraulic Risk	6) Environmental/Social Impact	7) Relation with Urgent Rehab. Project	8) Impact to Society and Economy in case of Collapse	Total Score	Priority Ranking
			Traffic Disruption	Traffic Volume							
1	5	10	-	20	20	5	10	20	15	105	B
2	5	5	-	5	5	10	10	20	5	65	C
3	5	-	50	5	-	-	10	10	0	80	C
4	5	5	-	5	10	10	10	20	5	70	C
5	5	-	50	5	-	-	10	10	0	80	C
6	10	10	-	20	20	10	5	10	30	115	A
7	10	10	-	10	10	10	5	20	15	90	C
8	5	5	-	5	10	10	10	20	5	70	C
9	10	10	-	20	20	10	10	10	30	120	A
10	5	10	-	5	10	10	10	20	5	75	C
11	5	10	-	5	10	5	10	20	5	70	C
12	10	5	30	20	10	20	10	10	5	120	A
13	10	-	50	20	-	-	10	20	0	110	B
14	10	-	50	20	-	-	10	20	0	110	B
15	10	-	50	20	-	-	10	20	0	110	B
16	Deleted from Bridge Reconstruction Project due to Inclusion with Emergency Road Rehabilitation Project										
17	10	5	-	20	5	10	10	0	30	90	C

Ranking Points and Priority Rank

Point Score	Priority Rank
115-120	A
100-114	B
< 100	C

22.7 CONSTRUCTION COST ESTIMATE

22.7.1 Concept of Cost Estimate

To determine the costs of the bridges and culverts for budgetary purposes, the construction cost is estimated based on the following conditions:

- (1) **The components of Construction Cost consist of:**
 - Direct Costs of Materials, Labor and Equipment,
 - Transportation, Mobilization and Demobilization,
 - Site Operation and Administration Cost, and
 - Contractor's General Expenses
- (2) **The estimated construction cost does not include Physical Contingency, Engineering and Supervision Cost and Administrative Costs.**

22.7.2 Basic Flow of Cost Estimate

Since the construction cost of road infrastructure project in Juba is not yet established, the procedure of estimating the costs of bridges and culverts for this project is simplified in this section. The basic procedural flow of construction cost estimate is as shown in Figure 22.7-1.

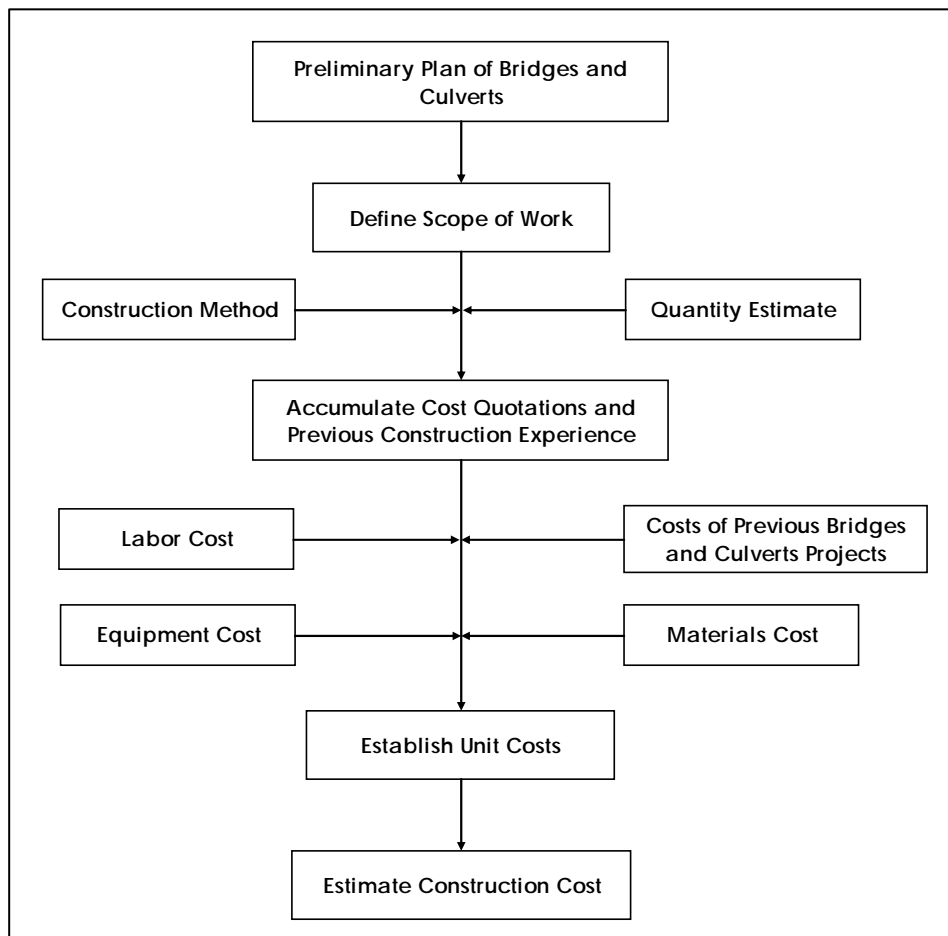


Figure 22.7-1 Basic Flow of Cost Estimate Procedure

(1) Preliminary Plan of Bridges and Culverts

A preliminary design for the scheme of bridges and culverts is conducted to determine the scope and scale of the structures necessary for the streams and river crossings. The level of plans is at the project formulation stage and not the detailed design stage.

(2) Define Scope of Work

Based on the preliminary plans for bridges and culverts, the scope of work is defined considering the proposed structural type and construction method for the structures. Quantities of major work items are established and used to define the scope of work.

(3) Accumulate Cost Quotations and Previous Construction Experience

The construction cost for road infrastructure is not yet established in Southern Sudan so that data availability regarding costs is very scarce. Moreover, on-going projects are basically administered on a lump sum based contract.

Using the major work item quantities, cost quotations are solicited from contractors working on similar projects in Juba and Southern Sudan. Moreover, quotations for major materials are requested from various suppliers in Juba. It should be noted that most construction materials, except aggregates, are imported from Uganda or Kenya which brings the basic costs at very high rates.

(4) Establish Unit Cost

The unit costs are then established from the costs quotations above and used to determine the costs of major work items for each bridge or culvert.

(5) Estimate Construction Cost

The cost of each bridge and culvert is the calculated from the scope and established unit costs.

22.7.3 Estimated Costs of Bridges and Culverts

Table 22.7-1 summarizes the budgetary construction costs of the proposed bridges and culverts.

Table 22.7-1(a) Budgetary Construction Costs of Bridges and Culverts

Structure No.	Unit	1	2	3	4	5	6	7	8
Structure Type	-	Bridge RCG	Bridge RCG	Bridge RCG	Bridge RCG	Bridge RCG	Bridge RCG	Bridge Portal	Bridge Portal
Bridge/ Structure Length	m	12.0	12.0	12.0	12.0	18.0	24.0	10.0	10.0
Bridge/ Structure Width	m	19.62 4-lane	19.62 4-lane	12.42 2-lane	19.62 4-lane	19.62 4-lane	19.62 4-lane	15.22 2-lane	12.42 2-lane
Foundation Type	-	Spread Footing	Spread Footing	Spread Footing	Spread Footing	Spread Footing	Pile	Pile	Pile
Cost	Million US\$	2.449	2.512	1.947	2.754	3.493	4.038	2.289	1.717

Table 22.7-1(b) Budgetary Construction Costs of Bridges and Culverts

Structure No.	Unit	9	10	11	12	13	14	15	17
Structure Type	-	Bridge RCG	Bridge Portal	Bridge Portal	Bridge RCG	Culvert BOX	Culvert BOX	Culvert BOX	Culvert BOX
Bridge/ Structure Length	m	12.0	10.0	10.0	18.0	1 cell 22.0 4.0x2.5 m	1 cell 20.0 3.5x2.5 m	2 cells 20.0 3.5x2.5 m	2 cells 18.0 3.5x3.0 m
Bridge/ Structure Width	m	22.72 4-lane	12.42 2-lane	12.42 2-lane	15.22 2-lane	18.00 2-lane	18.00 2-lane	18.00 2-lane	17.20 2-lane
Foundation Type	-	Pile	Spread Footing	Spread Footing	Spread Footing	-	-	-	-
Cost	Million US\$	3.038	1.508	1.505	2.938	0.780	0.662	0.813	0.786

CHAPTER 23

INITIAL ENVIRONMENTAL EXAMINATION (IEE) FOR BRIDGE AND CULVERT RECONSTRUCTION PROJECT

CHAPTER 23 INITIAL ENVIRONMENTAL EXAMINATION (IEE) FOR BRIDGE AND CULVERT RECONSTRUCTION PROJECT

23.1 GENERAL

(1) Locations of Bridges and Culverts

The project covers Bridges/Culverts Reconstruction Project in the arterial roads and collector roads at the center of Juba for crossing tributary rivers of the River Nile.

The locations are as follows:

Table 23.1-1 Locations of Bridges

Road function at the center of Juba		Road		Number
Arterial roads	East & West roads	• Access road for airport		2
		• Unity Avenue		1
	South & North roads	• Access roads for National Stadium		1
	Radial roads	North region (via Munuki)	• Munduri Road	3
			• Terakera Road	1
		South region (via River Nile)	• Torit Road	1
Subtotal				9
Collector Roads		• Bulluk district		2
		• Malakal district		2
		• Kator district		4
Subtotal				8
Total				17

(2) Role

The proposed bridges/culverts are located on the arterial and collector roads at the center of Juba. Bridges have been playing a vital role as transport structure for valley, river, sea, swamps, and roads or railways. The object of the concerned project is bridges/culverts crossing tributary rivers of the River Nile. These bridges/culverts will play an important role as transport structures that support the daily social and commercial life of Juba's population in South Sudan.

At present, these bridges/culverts have defects/damages besides being of narrow width. Therefore, it is not fully playing its role in supporting the people's life. The Bridges/Culverts Reconstruction Project will then enable the structures to fully play its vital role in supporting people's life when improved. Moreover, it will be able to contribute to:

- enhance safe movement of people and goods,
- reduce traffic accident, and
- provide efficient access to education, medical service and social activities.

Besides, it will contribute to support the lack in lifeline facilities and utilities (electric, water system, disaster etc.) in Juba.

Bridges also have a role to connect places and people for a long time and stand as a symbol of linkage of the community. Therefore, the Bridges/Culverts Reconstruction Project will contribute to activating and enhancing the community life in Juba.

Table 23.1-2 Conditions of Surrounding Areas for Bridges/Culverts

No	Bridge/Culvert Name	Name of Road	Conditions of Surrounding Area
1	Shuhada	Junction of Yei Road – Juba Univ.	A residential area extends out from the road, with a wide access road leading to the bridge. There is open space within a 20-meter radius from the center of the bridge.
2	Tombror	Collector Street in Kator	An access road is wide and lined with houses. Electric poles with electric cables are placed on one side of the road.
3	Salam		There is no bridge layout or culvert, and it is like the bottom of a pan. There is nothing nearby along the road.
4	Albino		An access road is wide and lined with houses near the bridge. Electric poles with electric cables are placed on one side of the road.
5	Lilasmafi		An access road is wide and lined with houses. Electric poles with electric cables are placed on one side of the road.
	Madra		Nyigilo Street
	Salakana	Football stadium	An access road is narrow, with a restaurant, small sheep and goat ranch, and stores located near the bridge. Electric poles with electric cables are placed, and cross the road near the bridge.
8	Hai Malakar	Collector Street in Malakal	An access road is wide, with a residential area extending beyond it. There is open space around the bridge.
	Korobo	Unity Avenue	A residential area extends out from the road, with streets lined with trees of low to medium height and stores within a 10- to 15-meter radius from the bridge.
10	Kokora	Collector Street in Bulluk	A residential area extends out from the road, with buildings located along it several meters from the bridge.
11	Lukabadi		A residential area extends out from the road, with buildings located along it several meters from the bridge.

No	Bridge/Culvert Name	Name of Road	Conditions of Surrounding Area
	Terekera	Custom Market – Terekera	There is a gas station and stores found in the area, but houses are mainly located near the bridge. Water supply pipes are laid almost parallel to one side of the bridge. An access road is wide, with electric poles with electric cables placed on one side of the road.
	Munuki 1	Junction of 7 days Adrertist – Gudele	There is no bridge or culvert, but water service pipes of large diameter cross under the road. The road is wide and runs through a residential area. Electric poles with electric cables are placed on one side of the road.
	Munuki 2		
	Munuki 3		
	Gonya	Old Airport Road	Construction of the entire road (including the bridge) is now underway. Electric poles with electric cables are placed on one side of the road.
	Lodoro	Airport Road	There was a road with sidewalks on the north side (the airport side) of an access road. South of the access road, there was a road lined with ditches on both sides, and small stores. However, the stores were forcibly removed by the army at the end of last January. Electric poles with electric cables are placed on one side of the road.

* No. , , , - : Arterial Street

No.1 – 5,8,10,11 : Collector Street

* Bridge/Culvert Name is with Table 20.2-1(Summary of Existing Bridge and Culvert Conditions)

23.2 EVALUATION RESULTS FOR ENVIRONMENTAL ELEMENTS

Table 23.2-1 Evaluation Results for Environmental Elements

Environmental Elements	Evaluation Results	Remarks
Social Environment		
1. Involuntary resettlement	D	Migration of people and involuntary resettlement will not occur around the project area. However, although the right of way is about 60m, part of the area in No.6 & No.7 may need possible adjustment since some fences and properties encroach the right of way.
2. Local economy, employment and livelihood	E	The rehabilitation project will create employment, and local economy will become active; the community livelihood will be enhanced by smoothing the traffic flow after construction.
3. Land use and local resources utilization	E	Exchange of land use for place of residence, public site and farmland etc. will not occur.
4. Existing social infrastructure and services	E	Traffic infrastructure will be improved by the project, and social service will be enhanced.

Environmental Elements	Evaluation Results	Remarks
5. Local communities	E	IDPs/Refugees & poor people live in many residential quarters. Negative impacts for such local communities by the project will be minimal and the safety and efficiency of transporting people and commodities will be ensured..
6. Benefit and damage misdistribution	D	This will not occur in the project since the distribution of bridges/culverts structures covers the entire Juba road network.
7. Gender	E	Traditionally, women and children perform daily heavy works, including water transport, etc., such work will be improved by the rehabilitation project.
8. Children's rights	E	
9.Cultural heritage	D	There is no world heritage or national monument in Juba Town and surrounding area.
10.Local conflicts of interests	D	Since the project will improve the overall road network in Juba, there will be no local conflict of interest between communities.
11.Public sanitation	E	Traffic volume will generally increase when traffic infrastructure is improved, including increase in CO ₂ emissions, noise, etc. On other hand, dust problem will decrease by paving the road. Moreover, unsanitary and accumulated garbage around area of the bridge/culvert will be removed by the rehabilitation project.
12. Infectious diseases such as HIV/AIDS	D	Prostitution is likely to increase with risks of contacts of HIV/AIDS–infected people but can be minimized thru education carried out by MOH & MTR
13. Water usage and right	E	The rehabilitation project sites are located in the small tributaries of River Nile, hence the problem for water usage and right will not occur.
14. Traffic accidents	D	Traffic volume will increase by implementing of traffic infrastructure, but traffic safety risks will be improved by improving the carriageway width and the structural reliability of bridges.
Natural Environment		
15. Biota and ecosystem (Fauna and flora)	D	Protected conservation areas such as national parks and game reserves etc. are not found in Juba urban and surrounding area. And in the area of concerned rehabilitation project, fauna and flora of endangered species are not found, hence will not be affected negatively.
16. Geographical features	D	There is no particular geographical feature in the area of bridge/culvert rehabilitation project.
17. Soil erosion	D	The project area presents no problem in soil erosion; moreover, river banks and embankment will be protected against scouring using masonry/concrete slope protection.

Environmental Elements	Evaluation Results	Remarks
18. Underground water	D	Underground water maybe affected temporarily during construction of bridges and culverts.
19. Hydrology condition	D	River hydrology condition will be improved by the rehabilitation project.
20. Coastal zone (mangroves etc)	D	The bridges/culverts project is far from coastal zone (no mangrove areas exist) but ecotone exists in the River Nile and some small rivers. However, within the project area, such condition will not be affected.
21. Landscape	E	Landscape around bridge project will be improved
22. Climate change	D	No activities that will cause adverse impacts are observed.
23. Global warming	D	Power generators running on diesel oil will be used as power sources and will discharge emissions together with the equipment used during construction. But it is predicted that the impact will be negative. Moreover traffic volume will increase by implementing the traffic infrastructure project, and will cause some effect in global warming. However, in case of the proposed rehabilitation project, the effect will not be serious.
Pollution		
24. Air pollution	E	The generation of soil dust can be reduced substantially after pavements are provided, positive effects are expected relative to health problems.
25. Water pollution	D	The impact is not likely to be considerable.
26. Soil contamination	D	The impact is not likely to be considerable.
27. Bottom sediment in sea and rivers	D	The impact is not likely to be considerable.
28. Waste	D	Waste disposal system in Juba is not yet established and people take out and throw garbage everywhere. However, the surrounding area of the rehabilitation project will improve the living environment slightly.
29. Noise and vibration	D	The impact is not likely to be considerable.
30. Ground subsidence	D	The impact is not likely to be considerable.
31. Offensive odors	D	The impact is not likely to be considerable.

Note: A: serious impacts, B: some impacts, C: degree of impacts is unknown, D: Few impacts, E: Desirable impact

Source: JICA Study Team



Photo 23.2-1 No.6 Bridge



Photo 23.2-2 No.7 Bridge



Photo 23.2-3 No.16 Bridge - It is under construction as of January, 2009



Photo 23.2-4 No.17 Bridge - Dumped and Accumulated Unsanitary Garbage

PART V

**CAPACITY DEVELOPMENT
THRU PILOT PROJECT**

CHAPTER 24

1st PILOT PROJECT IMPLEMENTATION

CHAPTER 24 1st PILOT PROJECT IMPLEMENTATION

24.1 OBJECTIVES AND POLICY OF PILOT PROJECT

(1) Objectives of the 1st Pilot Project and Capacity Development

The objective of the 1st Pilot Project is to reinforce the capacity of the MOPI for road maintenance and administration of local roads in Juba. That is to say, the final goals for capacity development are:

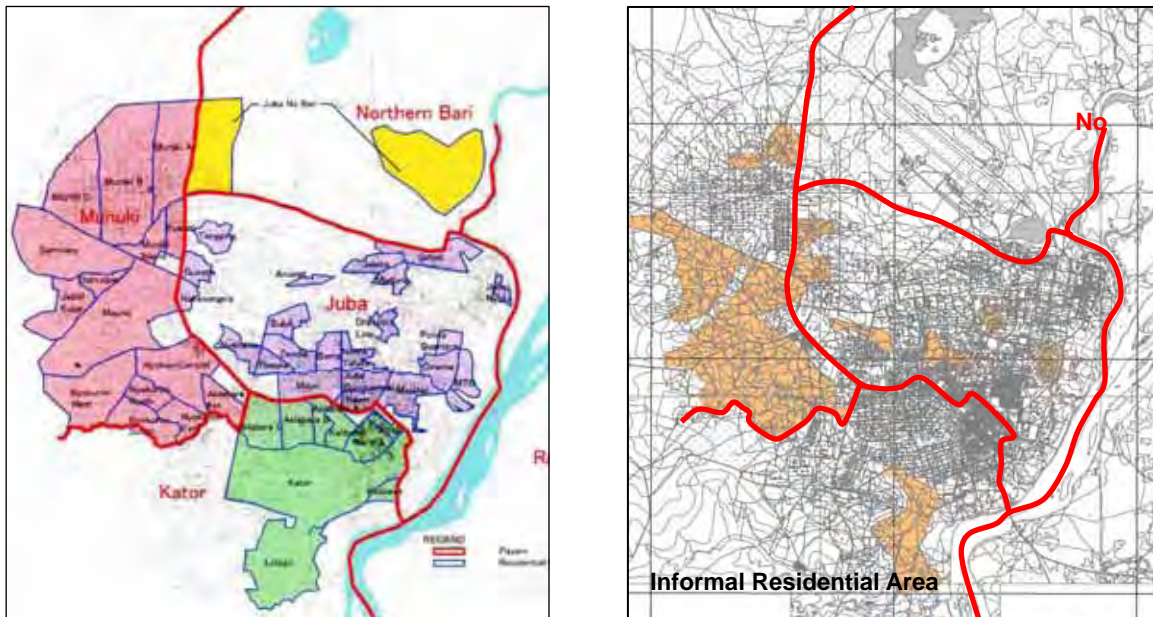
- 1) to make the concerned agency (the MOPI) understand the importance of road maintenance using their own force,
- 2) to realize and improve the series of skills which consist of monitoring, planning, implementation, evaluation and maintenance for road infrastructures, and
- 3) to master the capacity to implement road projects efficiently within a limited budget.
- 4) It is most effective to carry out a collaborative project with the stakeholders during actual project implementation to attain the project objectives. In this regard, economic assistance to the local people by providing employment of labor force from the community is also one of the purposes for this pilot project.

(2) Scope of Pilot Project (P/P)

According to the assessment results for staffs of road department of the MTR and the MOPI, there is large capability gap between the MTR and the MOPI staff since capacity development under the USAID is mainly for the MTR. In such condition, many of the feeder roads and community roads which are maintained by the MOPI are in ruin compared with the roads maintained by the MTR. As mentioned in the above situation, the capacity development for the low capacity roads shall focus on the MOPI staffs. The target road for the pilot project also shall be selected from among these roads. The site policy is to meet the problems for current road conditions in Juba where many of the feeder and community roads are not maintained for sometime due to strict limitation of the budget for roads.

The Munuki Payam is targeted for pilot project in this study because Munuki Payam is known as an area in which many returnees reside and the population of the Payam is currently increasing rapidly. Moreover, there is hardly any conflict about land properties or land rights owing to many of the returnees used to live in the same section of the town, so that it is convenient as a pilot project site which should be carried out in a short period.

It is said that blocks A, B, and C of Munuki Payam are residential areas for government staffs, office workers and farmers, who were assigned by the government in the 1980s. On the other hand, the south area of Block A, B and C would be considered as informal area where returnees are increasing rapidly. Therefore, the site of the pilot project should be selected among the formal area.



Source: Emergency Study on the Planning and Support for Basic Physical and Social Infrastructure in Juba Town and the Surrounding Areas in the Southern Sudan

Figure 24.1-1 Area Division and Informal Areas

(3) Policy of Pilot Project

Following the objectives of the pilot project above, the policies shall be as follows:

- Maximum effects for low budget (Section and Spot improvement)
- Replicable and sustainable project (Small maintenance work for local street)
- Direct management capacity developments of road maintenance for MOPI
- Community participation (Labor-intensive Project)
- Working Group oriented
- Small scaled project for capacity development
- Target roads in Munuki area

24.2 WORKING GROUP ACTIVITIES

24.2.1 The Working Group (W/G)

(1) Establishment for Working Group

Successful implementation of road projects usually needs the close coordination between implementing body and the stakeholders related to project and planning considering the interest of the stakeholders will allow the project to be completed. This pilot project will be also carried out in coordination with the CES which is expected as project owner, the MTR, the International Organization for Migration and the local community. For this purpose, the Working Group (W/G) for pilot project headed by Mr. Otim Bong, Deputy Director Urban Road Department, MTR. Technical matters related to the project would be discussed in the W/G and also the workshop including local community and approval of pilot project planning would be held at the W/G level. The W/G will be held as a weekly meeting for the pilot project every week to share progress of the project and discuss about various issues.

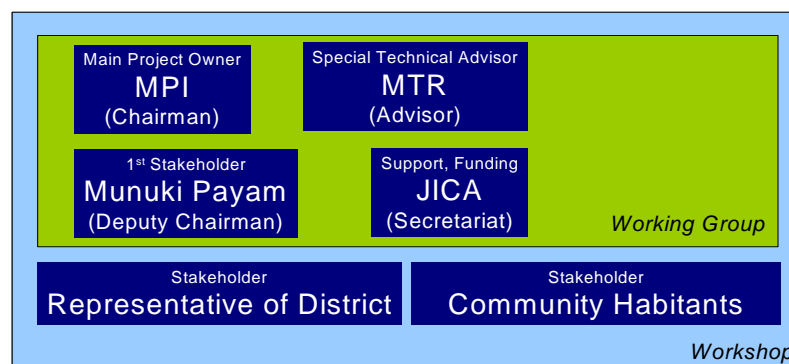


Figure 24.2.1-1 Working Group and Workshop in the 1st Pilot Project

The first W/G meeting for pilot project was held on October 31, 2008 where confirmation about purpose of the W/G establishment and board member, coming activities plan, urgent action plan, etc. were discussed. The W/G was held nine times before starting construction works.

Table 24.2.1-1 Responsibilities of W/G and W/S

Position	Responsible Organization	Remarks
Chairman	Road and Bridges Department Ministry of Physical Infrastructure, CES	
Deputy Chairman	Munuki Payam	
General Advisor	Directorate of Roads and Bridges Ministry of Transport and Roads, GOSS	
Technical Advisor	Laboratory Ministry of Transport and Roads, GOSS	
Community Representative	Munuki Payam	Contractor
Secretariat	JICA	P/P unit

(2) W/G Activities and Schedule of P/P

Major contents made decision in the W/G are as follows. The W/G shall also plan the workshop in the community and labor recruit.

1) Decision Making for Major Concerns of the Pilot Project (P/P)

The importance of road maintenance for every road administrator should be made aware in this meeting and every matter for pilot project such as site selection, project planning and so on will be argued.

2) Approval of Pilot Project Plan

Implementation plan of the P/P will be discussed and finalized in the W/G.

3) Workshop for Community

After the approval of project site and planning in the W/G, the workshop will be provided by the W/G in order to request public comments from local community. It is expected that the CES will take an initiative as a main organization to plan of meeting and explain for local habitants. The opinion from community should be feed back to the planning after summarization and analysis.

4) Labor Recruit and Project Monitoring

It is considered, however, that a part of labor force such as simple labor work will be arranged from the local community and orientation for such is also held at that time. In this regard, it is expected that pilot project management and its supervision will be conducted by the CES, and JICA will support the technical matters in each management stage.

5) Project Evaluation

After completion of the pilot project quantities, qualities, progress, evaluation of road users and so on should be compared with planning stage through the submit of report from the MOPI staffs. The evaluation should be feedback to capacity development plan and road maintenance master plan for Juba.

Table 24.2.1-2 Schedule of Pilot Project

Work items	2008		2009										
	11	12	1	2	3	4	5	6	7	8	9	10	11
Establish for W/G	■												
Study of current situation of roads in Munuki	■	■	■										
P/P Policy			■										
Decision for Project Site				■									
Design and Cost Estimation				■	■	■							
Preparing the P/P Implementation Plan						■	■						
Implementation of P/P (inc. Preparatory works)								■	■	■	■	■	
Inspection and Evaluation for State-Road in Munuki								■	■				
Evaluation for P/P and Feedback to C/D Plan												■	■

W/G: Working Group, P/P: Pilot Project, C/D: Capacity Development

24.2.2 Issues of Road Infrastructure in Munuki

Before the decision of implementation plan of the P/P, problem analysis for roads facilities in Munuki was discussed in the W/G and used as a reference to select the site of the P/P. Major opinions for road infrastructure in Munuki from member through the W/G are as follows.

- a) There exists many of staff in the road department while there is quite a few personnel who are responsible for making decision of road administration. Therefore road development and maintenance projects are actually lagging behind.
- b) There is neither section nor staff in charge of road development in the Payam government under the state government.
- c) Roads budget are almost not distributed in the state governments so that many of the roads condition which are maintained by states are deteriorated.
- d) There is no existence of pavement in Munuki area so that road durability is quite a low.
- e) It is important for Munuki area to improve the road side drainage system because rain flows

- directly from mountainous area into Munuki area due to topography features.
- f) Even if only road surface was rehabilitated, most of road surfaces will be flushed during heavy rain. Therefore road drainage system should be improved first.
 - g) Poor road condition in many of Munuki area causes the low level of service for public transport (bus), and it is serious problem for Munuki Payam to maintain transport service for local habitants.

The site survey was conducted based on opinion of the W/G and the proposed site for the P/P was discussed. Among the area of Munuki, except informal residential area, several flood areas due to defect of road side drain system were surveyed by the W/G. The existing conditions of proposed sites are shown in Figure 24.2.2-1



Figure 24.2.2-1 Proposed Sites in Munuki Payam

After the serious flood area pointed out by the CES was checked through site survey and required project type and scale was estimated, it is judged which area is appropriate for this project from the view of project purpose and scale. The order of priority for six proposed locations mentioned former section from the only urgent aspect is shown in Table 24.2.2-1. High priority reason of Project No.3 and 4 is that these areas are passages of flood flow connecting to swampy area where is located in north of airport due to topographical features in Munuki Payam.

Table 24.2.2-1 Priority Considerations

Original Priority	Remarks	Final Priority
Project 3	Long period for project due to large scale, MTR management site	Project 5
4	Long period for project due to large scale	2
5	Steep slope	1
6	Management comes out of Munuki boundary	6
2	Road surface has been improved recently by UNOPS	3
1	Management under MTR	4



24.3 IMPLEMENTATION PLAN OF PILOT PROJECT

24.3.1 Proposed Site

The project site was selected based on information discussed in the W/G including site survey. As a result 770m section from Munuki market to northern area was selected as proposed site of the P/P.



Figure 24.3.1-1 Project Location in Munuki

The main reasons in choosing the proposed site are as follows:

- Passing through the area designated as formal residential area in Munuki.
- Contribution to spread new residential area along the street.
- Roads with high priority for Munuki in the W/G discussion based on site survey.
- Connecting to projected ring road in the future and formation of major radial road network.
- While there is a small number of illegal buildings inside of ROW of 30m, the width of 20m for the P/P shall be available within ROW without much demolition.
- It is expected that many people shall be affected after completion of the P/P because the project is implemented near the Market.

24.3.2 Implementation Scheme

(1) Organization

The Pilot project was implemented by the Community Construction Group (CCG) consisting of representatives of the MTR, Road and Bridges department of MOPI and the Community. Management staffs of the CCG were basically taken by the W/G member and unskilled workers from community, operators of equipment and surveyor were also members of the CCG. Regarding the roles of the organization, the policy making, technical advise and borrowing equipment were covered by the MTR, the overall supervision of the P/P was covered by the MOPI, the technical support, supervising and fund support (wage, materials, others) were covered by the JICA Team, and laborer and safety management were covered by the community.

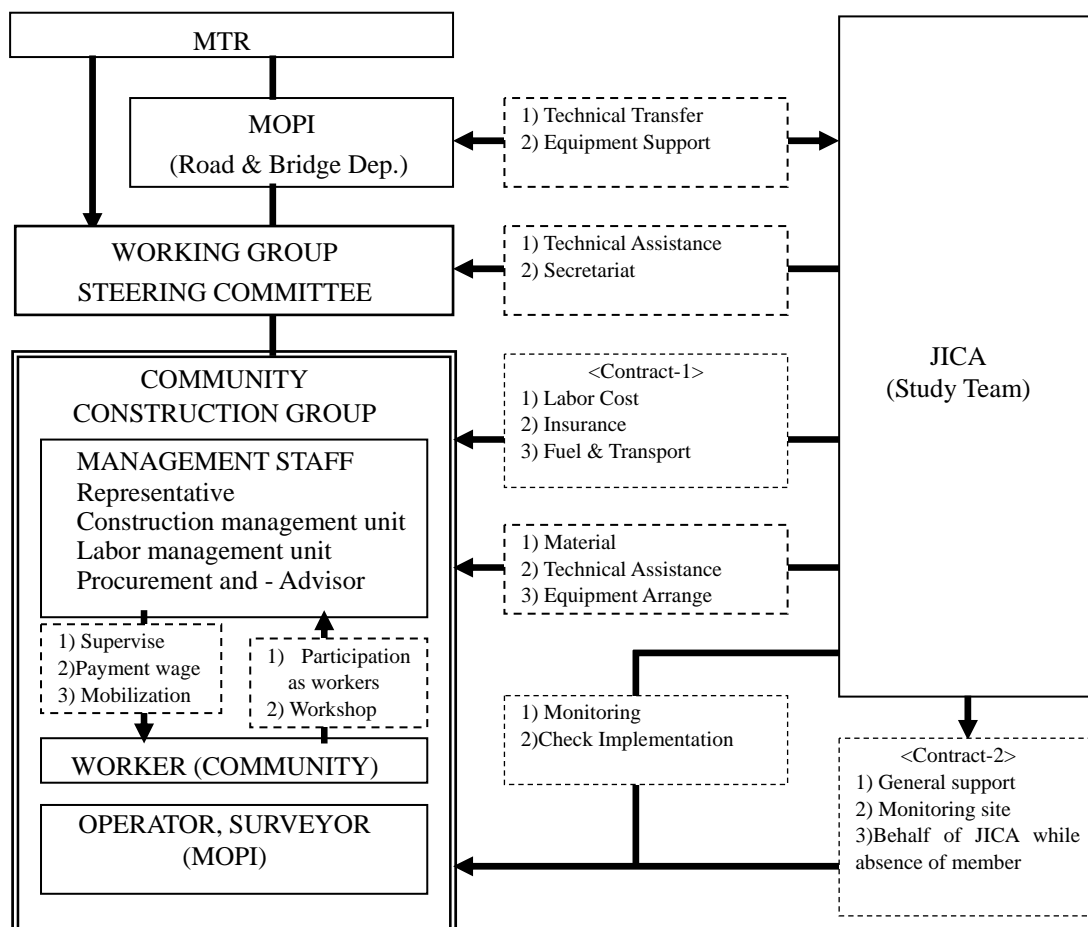


Figure 24.3.2-1 Pilot Project Organization

The CCG members consist of seven staffs from the MTR, the MOPI and the Community. The role of each staff is given in Table 24.3.2-1 below. 20 unskilled workers were recruited from the local community and operators of equipment were hired from MTR and MOPI as skilled workers.

Table 24.3.2-1 Role of Management Staff of Community Construction Group

Unit / Member		Tasks	Organization
Representative		General	MOPI-(1)
Advisor	Technical	Technical general	MTR-(1)
	Equipment	Equipment arrange etc.	MTR-(2)
Construction	Supervisor	Direction of construction works	MOPI-(2)
	Foreman	Direction of construction works, Daily attendance record of CCG, OJT lecture	Community-(1)
Labor	Recruit	Un-skilled workers recruit from community	Munuki-(1)
	Labor Management (Accountant)	Daily attendance record of workers Wage payment for workers Allowance payment for MTR/MOPI staffs	Community-(2)
Procurement (Accountant)		Procurement negotiation Accounting	Community-(2)

Worker from Community (20), Operator from MOPI (4 – 5), Surveyor from MOPI (2 – 3)

(2) Pay Items and Fund

Materials were basically provided by the JICA and heavy equipment was rented from the MTR. Payment for unskilled laborer and other expenses were controlled by the accountant in the CCG.

1) Material

Materials were directly provided by JICA. Gravel and pipe culvert which are major construction material for the P/P were prepared with comparison of quotation among three companies. There was fear, however, that it takes a lot of time to be delivered in case from one supplier, and as a result culverts were produced from three suppliers in parallel in order to take priority for completion within projected duration.

2) Equipment

Equipment like dozer, excavator, grader, roller, water tank and truck were rented from the MTR. The operators were also hired from the MTR and the MOPI according to operation schedule of equipment. Fuel and insurance for equipment were covered by JICA. Small tools such as wheelbarrow, spades, tapes, etc. were provided by JICA.

3) Personnel Cost

Allowance for CCG staffs (MTR, MPOI and Community), wage for workers and labor cost for operators and security were appropriated as personnel cost of the CCG. Moreover project coordinator was hired as a member of JICA study team in case that person in charge of the P/P is out of Juba.

4) Transport

It is assumed that unskilled workers can mobilize to site by walking because they live near the

site. One vehicle was arranged for MOPI to transport staffs to site. Transportation cost of materials should be included in material cost. These transport cost were appropriated as OJT related expenses.

5) Insurance

Insurance was adopted for unskilled laborer, the CCG staffs and heavy equipment from the MTR.

6) Office Supplies

Office supply such as stationary, account book, filing and so on was arranged.

24.3.3 DESIGN AND COST ESTIMATION

(1) Alignment

The 770m section from Munuki market to northern area was selected as the project site. Alignment of the P/P is as follows.



Figure 24.3.3-1 Road Alignment

(2) Typical Cross Section

The road width of 20m with 1m side ditch outside of the shoulder was planned as the typical cross section of the P/P within the 30m of Right-of-way. Both the 5m spaces outside of the side ditch were planned as spaces for utilities and walkway.

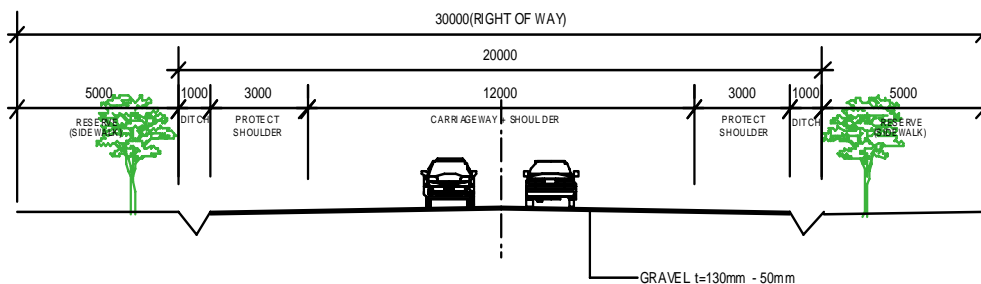


Figure 24.3.3-2 Typical Cross Section

(3) Surface Design

The road surface was planned as a single sub-base course in the market area with 5 inch (130mm) thickness according to Low Traffic Design of AASHTO guideline. However a single layer with 50mm thickness was adopted outside the Market area because of low traffic. The thickness design was taken from the design catalog shown in the guideline based on the information about climate category, specific of base-course and traffic volume.

Table 24.3.3-1 Design Catalog for Gravel Roads

Specification	Traffic Volume	Climate Category					
Very Good	Large	8	10	15	7	9	15
	Medium	6	8	11	5	7	11
	Small	4	4	6	4	4	6
Good	Large	11	12	17	10	11	17
	Medium	8	9	12	7	9	12
	Small	4	5	7	4	5	7
Fair	Large	13	14	17	12	13	17
	Medium	11	11	12	10	10	12
	Small	6	6	7	5	5	7
Bad	Large	-	-	-	-	-	-
	Medium	-	-	-	15	15	-
	Small	9	10	9	8	8	9
Very Bad	Large	-	-	-	-	-	-
	Medium	-	-	-	-	-	-
	Small	11	11	10	8	8	9

Proposed site = Climate Category: (Dry, Non-freeze), Traffic Volume: Small, Unit: inch

(4) Drainage

Reshaping of side ditch was carried out by workers after excavation by machine. The scale of ditch is width of 1.0m and depth of 0.8m. Pipe culverts were installed into side ditch at crossing point of major access roads. Moreover two big culverts to drain from mountainous area were installed under the P/P road and open channel connecting both edge of culverts were excavated. Concerning diameter of culvert, 600mm was set up as typical for access roads and 900mm was set up as typical under project road.

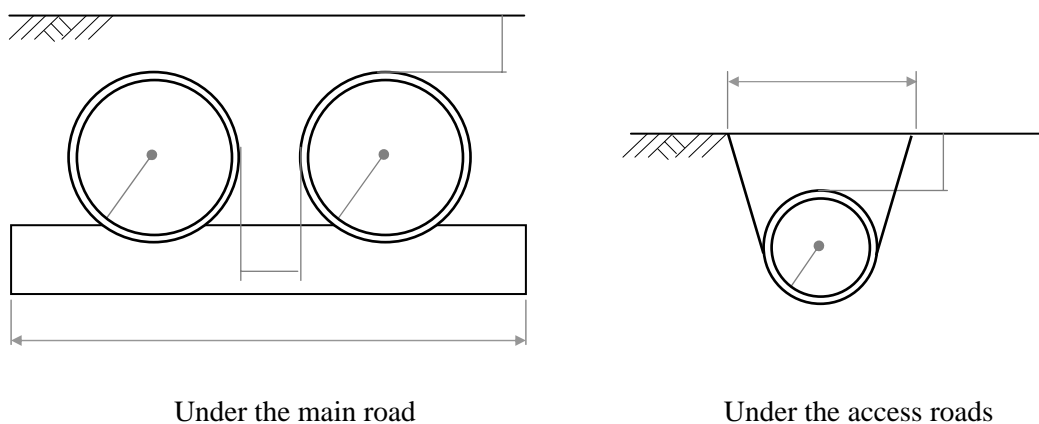


Figure 24.3.3-3 Cross Section of Culvert

(5) Project Cost

The project cost based on above design was estimated to be US\$170,000 and the breakdown is as follows. Total budget of the P/P didn't exceed the estimated cost, and even if project cost was likely to be over, additional budget of the P/P was not permitted and the project should be completed in case of halfway of construction works.

Table 24.3.3-2 Estimated Cost of Pilot Project

Items	Unit	Quantities	Unit Price (USD)	Amount (USD)	Remarks
1. Personnel Cost					
1-1 Foreman	M/M	3	1,500	4,500	
1-2 Procure & labor management	M/M	3	3,000	9,000	
1-3 Allowance for CCG	M/M	12	600	7,200	4persons/month
1-4 Allowance for Operators	M/M	12	600	7,200	US\$30@20days/M, 4persons/month
1-5 Wage for workers	M/M	60	250	15,000	US\$10@25days/M, 20persons/month
1-5 Coordinator	M/M	3	2,500	7,500	
sub total				42,900	
2. Direct Expences					
2-1 Material					
(1) Sub-base course	m3	608	120	72,960	W=11.0*L=770*t=(0.125 or 0.05)
(2) Pipe culvert	m	50	600	30,000	=600mm
2-2 Equipment	LS	1	3,000		for maintenace
2-3 Transportation for CCG	Veh/M	3	3,000	9,000	
2-4 Fuel	lit/Day	5,400	1.5	8,100	60lit.×90days
2-5 Insuranace for workers and stuffs	M/M	84	35	2,940	(20workers + 8staffs)×3monthes
2-6 Insuranace for equipment					
(1) Grader	M/M	3	300	900	
(2) Dozer	M/M	3	300	900	
(3) Excavator	M/M	3	300	900	
(4) Roller	M/M	3	300	900	
2-7 Office supplies	LS	1	500	500	
sub total				127,100	
Total				170,000	

24.3.4 Construction Management and Supervision

The following items were set out as the Capacity Development (C/D) items during the construction period for the MOPI.

Table 24.3.4-1 Items of Management and Supervision

Category	Supervise/management	Contents	Responsible
Supervision	Schedule management	Plan of allover schedule, Plan of weekly schedule, its management	MOPI
	Quality management	Level check, Final inspection	MOPI
	Output management	Output management by completion length	MOPI
	Budget control	Procurement plan, project accountant, Record of account, Receipt keeping	MOPI
Construction management	Labor management	Record of labor attendance (operators, unskilled workers), Wage payment	MOPI Community
	Equipment management	Record of equipment operation, equipment maintenance	MOPI
	Safety management	Peace keeping in site, Safety for laborer, Custody of tools and materials, other safety management	MOPI Community

Workshop and meetings for the community people are planned before the project as part of the community participation.

Table 24.3.4-2 Discussion in Community Workshop

Category	Content	Responsible
Pre-construction Workshop	To explain about P/P plan discussed in W/G for local community and take opinions from there	Community
Labor recruit	To be approved by community for revival plan of P/P which opinion from community or W/G was reflected To explain about labor recruit from community	Community
Post-construction Workshop	To report of project completion and discuss about required maintenance work by community To take opinion about P/P management for laborer from unskilled workers	Community

24.4 CONSTRUCTION WORKS

24.4.1 Contract

Construction materials and equipment were arranged by the JICA study team. On the other hand, implementation of the P/P was contracted out to the CCG including personnel cost for managing staffs, wage for workers, fuel, etc.

The work items of the CCG based on contract document are as follows.

(1) Contract Contents

1) Establish organization system

The organizational system of the CCG such as section, personnel and the role of each shall be confirmed to implement construction work efficiently. Proposed system of management unit in the CCG is discussed in the former Section.

2) Recruit of labor from local community

CCG should recruit unskilled labors for project as CCG staff from local community.

3) Preparing construction schedule

Construction schedule shall be reported from the CCG staffs who are responsible for the construction of the section at every month including project start in order to refer to the schedule management for construction.

4) Arrangement of meeting

CCG shall arrange weekly meeting, workshop meeting for the local community and other required meeting in anytime for pilot project in association with JICA study team.

5) Execution of construction works

a) Overall of construction management

All the required supervision and management of construction works mentioned in the former Section shall be conducted by the CCG in association with the JICA study team.

b) Procurement management

The procurement management for all required materials and equipment except machines for construction works mentioned in the former Section, including planning of purchase, negotiation with material supplier, inquiry of quotation, purchase record, receipt keeping and so on, shall be conducted by the CCG in association with the JICA study team.

c) Labor management

The CCG shall manage all staffs, management staffs, workers, operators and related person for the daily attendance record, payment of labor expenses such as wage, and account these expenses with receipts.

6) Participation for on the job training

The CCG staffs shall participate with lecture from the JICA study team and foreman from community through the construction work in/out of site.

7) Preparing evaluation report

Evaluation report at completion of project shall be submitted by the CCG staffs.

Project coordinator was hired by the JICA study team to support monitoring in case of absence of person in charge of P/P of study team. The Coordinator was independent from the CCG and checks the construction works.

The work items of the coordinator are as follows.

a) Assist the JICA study team members in the pilot project

Overall assistance with JICA study team member in charge of pilot project management

b) Monitoring site and reporting

The coordinator monitors construction work and sees to it that management is appropriately implemented in site through periodic monitoring of the CCG at site and shall reports the results. Pictures as progress record of construction work shall be taken by coordinator at site monitoring.

c) General support for pilot project on behalf of JICA study member

While member in charge of project management will be out of Juba, the coordinator shall support the general works and report it to either other the JICA study team member in Juba or the person in charge of the pilot project management in Japan by e-mail. Working items shall be expected as follows.

- Checking and monitoring for quality management, schedule management, output management and labor management by the CCG.
- Payment and accounting.
- Attend the working group meeting and prepare the minutes of meeting.

d) Preparing final report

Final report based on regular report to JICA study team including the contents of construction work progress, problems in site and so on shall be submitted.

(2) Payment

The 20% of direct expenses, wage for workers and allowance for managing staffs was paid as advance payment to the CCG. Payment after this were done in each month (middle of July, middle of August and completion) and at that time required budget in next month was requested to the JICA study team with account report. Final payment was paid after receiving evaluation report from each organization. On the other hand, payment for coordinator was decided that 10% of total amount for advance payment, 20% of total for second payment, 30% of total for third payment and 40% of total for final payment.

(3) Contract Period

Although the original target completion date of the P/P was 10th September, 2009, the actual construction work was extended to 25th September, 2009 due to factors discussed later. Contract period of CCG and coordinator were as follows.

- Contract period to CCG: 10 June 2009 – 25 September 2009 (original completion 09/10/09)
- Contract period to coordinator: 18 June 2009 – 18 September 2009

24.4.2 Construction

(1) Work progress

The progress of construction works with section of Survey / Site Clearance, Surface Works and Drainage Works are shown in Figure 24.4.3-1.

(2) Completion of Construction Works

Construction work was completed at 25th September 2009. Comparison between before project start and after project completion is shown in Figure 24.4.3-2. Evaluation of P/P shall be explained in the next Section.

24.4.3 Supervision and Construction Management

(1) Schedule Management

Schedule management was implemented by the MOPI based on the overall schedule made before starting of the P/P and the weekly schedule at weekly meeting from foreman. Table 24.4.3-1 shows the difference between planning and actual progress. Construction work was completed with three weeks delay with the following main reasons of delay:

- Delay of equipment release from MTR at the beginning of construction stage
- Interruption by rain
- Delay of pipe culvert delivery
- Unfortunate breakdown of equipment

There were no large gaps between schedule plan of each work item and the actual construction schedule except installation work of big cross-pipe culverts under the main road. It took around two weeks behind of schedule.

1) Survey and Site clearance

	
<p>Site Security</p>	<p>Survey</p>
	
<p>Clearance of market area</p>	<p>Signboard of P/P</p>
	
<p>Compaction for road edges</p>	<p>Excavation of channel</p>
	
<p>Wing wall construction</p>	<p>Side ditch by grader</p>

Figure 24.4.3-1 Construction Progress of Survey and Clearance Works



<Surface condition>



<Water pool section>



<Side ditch condition>



<Open channel>

Figure 24.4.3-2 Comparison Before and After of Construction

Table 24.4.3-1 Schedule Gap Between Plan and Actual

Work items	June			July			August			September		
	10	20	30	10	20	30	10	20	30	10	20	30
All schedule (Plan)	[Black bar from June 10 to Sept 10]											
All schedule (Actual)	[Red bar from June 10 to Sept 30]											
Mobilization and camp set		[Black bar]										
Small demolish and Site clearance		[Black bar]										
Grading and side ditch			[Red bar]									
Open channel excavation			[Black bar]									
Big culvert installation				[Black bar]								
Filling gravel and compaction				[Black bar]								
Culvert for side ditch							[Black bar]					
Final inspection										[Black bar]		
Site cleaning and demobilization											[Black bar]	

■ - Projected schedule ■ - Actual schedule

(2) Quality Management

The main activities for quality management are as follows:

- Material test and check before start of the P/P
- Periodic check of output while construction (level of road surface and drain)
- Final inspection at completion (Camber, Compaction)

Level of surface and drainage was checked a few times during construction work. The material test from three points at site was implemented before start of the P/P and it was confirmed by the MTR that materials are appropriate for sub-base course.

The following table shows the results of cross fall check at completion of the P/P. As mentioned below, most of cross fall were not clear criteria (4%). The reason of short of camber is that most of cross fall have been lost because compaction works have been finished one month before final inspection and many of traffic passed through site and also rainy season. There are many of lost of camber especially near market place.

Table 24.4.3-2 Camber Check at Final Inspection

Station	Left Camber	1	Right Camber	1	Remarks
0+050.000		1.9		1.3	Market Area
0+100.000		1.4		2.3	Market Area
0+150.000		2.3		2.6	Market Area

0+200.000	2.6	2.7	Market Area
0+250.000	2.7	3.0	Market Area
0+300.000	2.7	2.9	
0+350.000	2.4	3.3	
0+400.000	2.7	2.4	
0+450.000	3.6	3.4	
0+500.000	3.3	3.1	
0+550.000	3.3	3.4	
0+600.000	4.0	4.3	
0+650.000	-	-	Not completion 2
0+700.000	2.9	3.3	
0+750.000	3.3	3.3	

1: Toward to North, 2: still drainage works at that time



Figure 24.4.3-3 Camber Check and Material Test

The result of material test is as follows and it shows that compaction of surface is good condition.

Table 24.4.3-3 Compaction Check at Final Inspection

Location	0+150.000	0+300.000	0+550.000
Max compaction	2.143 (kg/m ³)	2.190 (kg/m ³)	2.163 (kg/m ³)
Site compaction	2.103 (kg/m ³)	2.100 (kg/m ³)	2.051(kg/m ³)
Compaction Ratio	98.1 (%)	95.9 (%)	94.8 (%)
Remarks	Left Lane	Center Line	Right Lane

1: Toward to North



Figure 24.4.3-4 Sand Cone Replacement Test at Site

(3) Output Management

Output assessment was basically carried out once a week. Foreman checked the output every Friday and reported in the W/G held on Monday morning. Report on output was submitted to the MOPI and the JICA study team from foreman on next Monday morning. Output management was conducted by completion length of street, however, surface work were independent from drainage work, and it is not enough to check only surface items.

(4) Budget Control

The work items of budget control consist of recording of account, planning of procurement, actual procurement, receipt keeping etc. Accountant in the CCG was responsible for control of the CCG budget and the JICA budget. All of expenses were recorded in account book with receipts.

The serious problem related to budget control was to judge from which budget expenses should be covered. If all of budget were controlled by the CCG accountant, management of fund and procedure shall be simple. However the CCG and the JICA study team are responsible for budget control for this P/P to share the risk of budget. While account situation of P/P was recognized every time, there are few opportunities to release budget situation for the CCG member.

(5) Labor Management

Labor management consists of four types, management for unskilled workers, skilled workers, CCG managing staffs and other staffs. The record of attendance of workers and wage payment were covered by the accountant in the CCG staffs and Munuki Payam. The management of skilled worker such as operators of equipment was covered by foreman with operating record management of equipment mentioned in Item (6) below. The management of the CCG staffs and the allowance payment was covered by the foreman and the JICA study team, and fixed allowance was paid every month. Other labor management such as police, security and so on was covered by the foreman.

(6) Equipment Management

Actual operating hours without idling time of equipment was recorded everyday. Equipments to be checked are dozer, excavator, roller, truck, water tank and small compactor. Total actual working time was 451 hours. All of equipments except small compactor were recorded before August and after this labor-intensive works and small compactor work were the main items of construction. Equipments were maintained by maintenance & equipment section of the MTR. Grader, water tank and truck have broken often while construction, therefore dispatch of technician from the MTR was required each time. It took more than three days to repair even if small repair of equipment, accordingly it also affected construction schedule.

(7) Safety Management

There are two types of safety management. One is safety for laborer and equipment, other is peace keeping in site from outsider. Munuki Payam was responsible for such a safety management. Equipment was stored in police office near site which was watched all day at night

or off-operating hours while construction period. Small tools were kept in Payam office which was watched in 24 hours as well as police office. Moreover Payam staffs kept periodic patrol in site to keep peace of construction site. The following controls were paid attention:

Control of illegal shops on public road space near market place

- Control of bike taxi near market place
- Control of garbage throwing to side ditch
- Control of thief for stocked surface material in site

(8) Weekly Meeting

Regular meeting to report construction progress and discuss various problems in site was held every Monday morning. This meeting was regarded as W/G established before start of the P/P. The W/G meetings were held up to completion as follows:

Table 24.4.3-4 W/G Meeting List

Construction Start		
10 th W/G	13, Jul. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Weekly meeting • Discussion about equipment release delay
11 th W/G	20, Jul. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Progress of P/P • Arrange of surface material
12 th W/G	27, Jul. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Progress of P/P • Discussion about big culvert installation
13 th W/G	03, Aug. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Progress of P/P
14 th W/G	10, Aug. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Progress of P/P
15 th W/G	17, Aug. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Progress of P/P
16 th W/G	24, Aug. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Progress of P/P
17 th W/G	31, Aug. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Progress of P/P • Progress of preparing culverts
18 th W/G	07, Sep. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Extension of P/P • Progress of preparing culverts • Explain of account
Original Completion		
19 th W/G	14, Sep. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Site inspection schedule • Evaluation report submitting • Remaining works
Construction Completion		
20 th W/G	12, Oct. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Silting of drainage • Damage of access road culverts • Remaining works
3 rd W/S	24, Oct. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Summary of P/P study • Worker's opinion for evaluation • Maintenance work by community
21 st W/G	26, Oct. 2009 (Mon) 10:00-12:00	<ul style="list-style-type: none"> • Discussion of evaluation report • Final project cost explain • Notice of stakeholder's meeting
7 th Stakeholder's Meeting (30 th Oct,2009)		

(9) Summary of Project cost

Summary of expenditure for P/P is as follows. The actual cost of P/P is US\$164,156 for projected cost of US\$ 170,000 therefore estimation cost of the P/P was almost relevant.

Table 24.4.3-5 Summary of Actual 1st Pilot Project Cost

Category	Items	Amount (US\$)	Remarks
Sub contract-1	Coordinator	7,500	
Sub contract-2	Community Construction Group	58,200	
Materials	All materials and tools	98,456	
	Gravel	50,000	sub-base
	Culverts	31,602	φ600,φ900
	Mobilization	5,200	Heavy equipment
	Aggregates	4,837	Stone etc.
	Cements	2,043	
	Other materials	195	Timber, etc.
	Small tools	1,858	
	Equipment maintenance	2,426	
	Material test	295	MTR Labo.
Total		164,156	

24.5 EVALUATION OF PILOT PROJECT AND FEEDBACK

24.5.1 Evaluation Method and Matrix Design

The viewpoints of evaluation shall be from the main 2 points. First is the check of accomplishment of capacity development for road administration staffs (MOPI) as main objectives for the P/P. The other is evaluation of effect as road facilities for road users.

Regarding achievement of C/D, recommendation shall be indicated through the cross-check of accomplishment, effectiveness and issues on each stage from planning to completion. For the effects for road users, on the other hand, impacts on life style and business shall be analyzed.

Achievement of C/D was evaluated from the opinion during working group discussion, report submitted from each organization and interview survey, and effect for road users was measured by interview survey for habitants along the street of P/P and opinion in workshop held at completion of P/P.

Table 24.5.1-1 Points for 1st Pilot Project Evaluation

Items	Achievement of C/D	Impact of road development
Targeted Staff	<ul style="list-style-type: none"> • MTR staff • MOPI staff • Munuki Payam staff • Community representative 	<ul style="list-style-type: none"> • Community along P/P street
Method	<ul style="list-style-type: none"> • Discussion on W/G • Evaluation report • Interview 	<ul style="list-style-type: none"> • Comments in W/S • Interview
Evaluation Indices	<ul style="list-style-type: none"> • Work items on planning stage <ul style="list-style-type: none"> - Selection of site - Design/Cost estimate - implementation plan 	<ul style="list-style-type: none"> • Impact on business • Impact on lifestyle

	<ul style="list-style-type: none"> • Work items on supervision <ul style="list-style-type: none"> - Schedule management - Quality management - Output management - Budget control • Work items on construction <ul style="list-style-type: none"> - Labor management - Equipment management - Safety management • Community process <ul style="list-style-type: none"> - Workshop - Labor recruit 	
Judge	<ul style="list-style-type: none"> • Achievement • Effectiveness • Sustainability 	• Degree of impact

Before the evaluation work, the relationship between indices and target organization should be defined and each activity of indices and required level to master should be also set out. Accordingly the achievement, effectiveness, sustainability and impacts of each activity shall be measured. These activities were evaluated by 4 ranks according to acquired level.

- Achievement : Learning condition toward activity contents
- Effectiveness : Degree of effects for organization
- Sustainability : Outlook for next activities
- Impact : Degree of impact for users

Each evaluation indices, Achievement / Effectiveness / Sustainability / Impacts, were scored 4 ranks as follows.

- 4: Enough / Effective
- 3: Almost Enough / Almost Effective
- 2: Little Short / Not so Effective
- 1: Short / Not Effective

Table 24.5.1-2 Evaluation Items and Target Authority

Category	Items	MTR	MOPI	Community	Habitants
Plan	Site selection				-
	Design/Cost est.				-
	Implementation				-
Construction	Schedule manage				-
	Quality manage				-
	Output manage				-
	Budget control				-
	Labor manage				-
	Equip. manage				-
	Safety manage				-
Community process	Workshop				-
	Labor recruit				-
Service	Impact on business	-	-	-	
	Impact on life	-	-	-	

Main target organization, sub target organization

Table 24.5.1-3 Activities for Each C/D Item

Stage	Items	Contents / Activities
Planning	Site Selection	<ul style="list-style-type: none"> • Definition of theoretical priority for site selection • Enough discussion about land acquisition in need • Coordination among the stakeholders
	Design / Cost Estimation	<ul style="list-style-type: none"> • Understanding of gravel thickness design • Cost estimation for design • Alternative analysis for alignment or typical section • Preparing of drawing • Drainage design
	Implementation Plan	<ul style="list-style-type: none"> • Proposing of desirable organization system • Preparing of procurement plan • Comparing & selection of construction method • Plan for supervision & construction management
Construction	Schedule Management	<ul style="list-style-type: none"> • Forecast of appropriate schedule • Clearing factors of delay and adequate action to behind of schedule • Reschedule in halfway of construction as the occasion demand • Preparing of schedule management tools (some kind of entry sheets)
	Quality Management	<ul style="list-style-type: none"> • Pre-test of material and evaluation • Implement procedure of final inspection (camber, compaction) • Implementation or arrangement of final inspection • Check for level of projected surface of roadway and drainage
	Output Management	<ul style="list-style-type: none"> • Periodic assessment and report of output • preparing of output management sheet • Periodic recording of construction progress
	Budget Control	<ul style="list-style-type: none"> • Budget execution according to plan • Regular accountability • Account book to understand easy
	Labor Management	<ul style="list-style-type: none"> • Check for working manner and discipline for laborer • Record of collect working time • Efficient laborer management without idling time • Fair working share for laborer • Periodic payment of wages for laborer
	Equipment Management	<ul style="list-style-type: none"> • Coordination with related organs for equipment rental • Mobilization of equipment on schedule • Record of operation time for equipment • Record of working time for operators • Custody of equipment in night time or while off-operation • Periodic maintenance for equipment • Appropriate repair and site control in case of breakdown
	Safety Management	<ul style="list-style-type: none"> • Completion without human accidents • Prevention of conflict between laborer/laborer and others • Prevention of damage and robbery of equipment or tools • Input of security personnel in case of emergency • Insurance entry
Community Process	Workshop	<ul style="list-style-type: none"> • Arrangement of workshop before/after construction • Appropriate answer for question or request from community • Venue arrangement and announce for community and person in charge • Proceeding of meeting smoothly
	Labor Recruitment	<ul style="list-style-type: none"> • Fair selection of laborer • Notice of labor recruitment for community • Explanation of terms of labor
On service	Impact on Business	<ul style="list-style-type: none"> • Increase of customer (+) • Improvement of transport efficiency (+)

	Impact on Life	<ul style="list-style-type: none"> • Increase of accessibility to facilities (+) • Comfortable of walk spaces (+) • Decrease of illegal building (+) • Decrease of garbage on road (+) • Improvement of drain in case of rain (+) • Increasing of danger of traffic accident • Increase of dust • Increase of illegal shops occupying public spaces
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24.5.2 Evaluation of Capacity Development (C/D) Items and Impact for Users

(1) Achievement of C/D items

According to each achievement of C/D, it seems that the community involvement and construction management are better relatively than the situation of supervision and planning works. Generally, the achievement level is high in ascending order of the MTR, the MOPI, and the Community. Although the reason comes from difference of target level of each organization, the project was for the sake of lower organization, the MOPI and the Community because of few opportunities to meet with such a project so far.

Table 24.5.2-1 Comparison of C/D Items Achievement by Organization

Category		MTR	MOPI	Community
Plan	All	2.3	2.4	3.3
Construction	Supervision	2.1	2.5	-
	Management	2.9	3.0	3.1
Community	All	3.3	3.7	4.0
Total		2.6	2.8	3.5

4: Achieved, 3: Almost Achieved, 2: Little Short, 1: Short

In case of each detailed evaluation index, the planning stage capacity of site selection was mastered by every administrator. However, design, cost estimation and planning of implementation program were not enough for their capacity. Mentioning further on this matters, although the knowledge of each item came to be known or already had, skills such as actual design, theoretical analysis, alternative analysis and so on are not enough for them, and reporting skill is also lack for them as capacity to understand.

Although it becomes well without these skills in case of discussion with community level, it shall be insufficiency on discussion with higher rank organizations, international organizations, budget organization, etc.

On the other hand, concerning execution of construction, management of personnel and objects such as labor management, equipment management and safety management, and other control which will be done in order to implement construction smoothly were likely to be achieved. However, management of construction purposes itself and process such as budget control, output management, quality management and schedule management are still insufficient. About the capacity of community involvement, all organizations suppose that objective was almost clear. When considered according to each organization, achievement of C/D for community was high

level about this P/P. The community played the role of labor management on P/P and it is not difficult that community could manage it smoothly because they have used to treatment of habitants in their community. On the other hand achievement of capacity development of MOPI was not so high since they had to play various fields from technical aspects to personnel and equipment management. While the MTR has supposed to be effective about quality management on material test and its evaluation and final inspection and so on, delay of release of equipment which caused whole construction delay as a result was thought over.

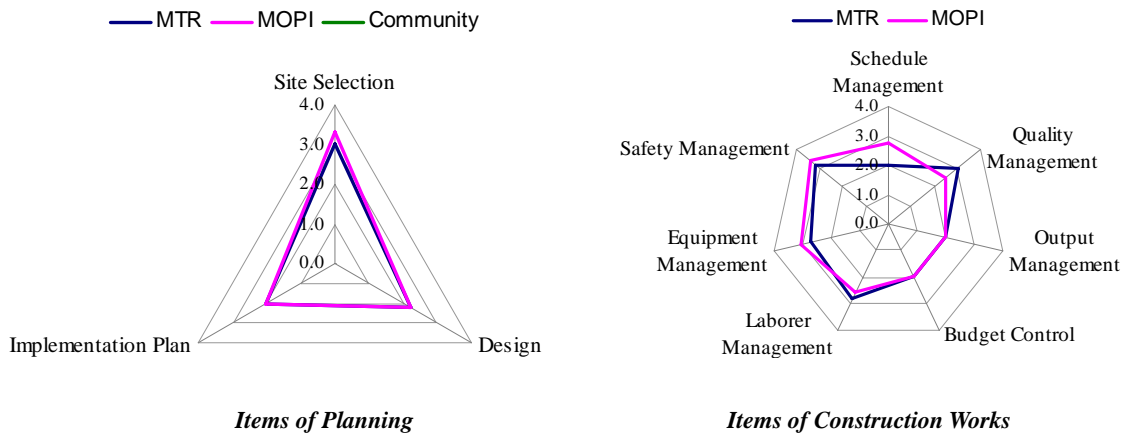


Figure 24.5.2-1 Achievement of Planning and Construction Works

(2) Effectiveness of C/D items

The effectiveness of the C/D was considered for each organization as well as for evaluation of achievement. On the whole, it is replied that all menus were effective in general as a C/D.

Table 24.5.2-2 Comparison of Effectiveness of C/D Items by Organization

Category		MTR	MOPI	Community
Plan	All	3.1	3.3	4.0
Construction	Supervision	3.3	3.3	-
	Management	3.1	3.4	3.8
Community	All	3.0	3.1	4.0
Total		3.2	3.3	3.9

4: Effective, 3: Almost Effective, 2: Little Needed, 1: Not Needed

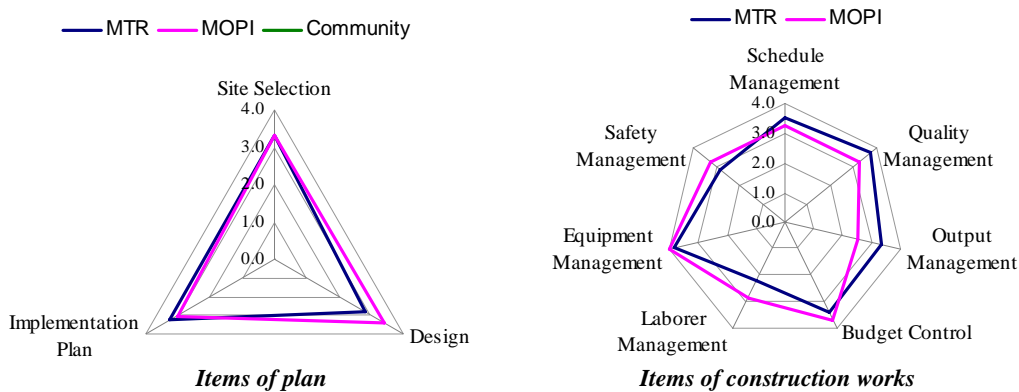


Figure 24.5.2-2 Effectiveness of C/D on Planning and Construction Works

Evaluation of each road administrator is high in descending order, Community, MOPI and MTR. It seems that the reason is same. When checking evaluation items detail, all items about planning were effective for them. Regarding execution of construction works labor management was not so effective for MTR and MOPI because this item was not managed directly by them.

While planning items were effective for both MTR and MOPI, MTR is more interested in schedule management, quality management, output management and supervision among construction works than MOPI, and MOPI was more interested in labor management, equipment management and safety management. However all of C/D items were effective for both of organization.

Gaps between evaluation of achievement mentioned in former Section and evaluation of effectiveness shall be shown in here. Meanwhile C/D items with large gap between achievement and effectiveness should be followed continuously. The following Table shows the results of gap. According to this Table the items of planning stage and supervision have large gaps and it should be followed hereafter.

Table 24.5.2-3 C/D Items with Large Gap Between Achievement and Effectiveness

	MTR	MOPI	Community
1	Schedule manage	Budget control	Labor manage
2	Implementation plan	Design/Cost estimation	-
3	Output manage	Quality manage	-
4	Budget control	Implementation plan	-
5	Equipment manage	Equipment manage	-

More than 1.0 Evaluation Gap

(3) Sustainability of C/D items

The outlook for continuous execution of each C/D activities is evaluated as sustainability on each C/D items. Although many of activities are regarded as sustainable hereafter, C/D item on planning stage and some item of supervision which was relatively lower than standard level are thought as insufficient as sustainability. Sustainability level of community activities is higher than MTR and MOPI, and comparing between MTR and MOPI, MTR is evaluated high in respect of sustainability.

Table 24.5.2-4 Comparison of Sustainability of C/D Items

Categories		MTR	MOPI	Community
Planning	Overall	2.8	2.6	3.3
Construction	General of supervision	2.7	2.6	-
	General of construction management	3.2	3.3	3.7
Community process	Overall	3.8	3.0	3.4
Total		3.0	2.9	3.6

When each evaluation index is studied detail, the capacity of design, cost estimation, plan of implementation, output management and quality management are especially still low.

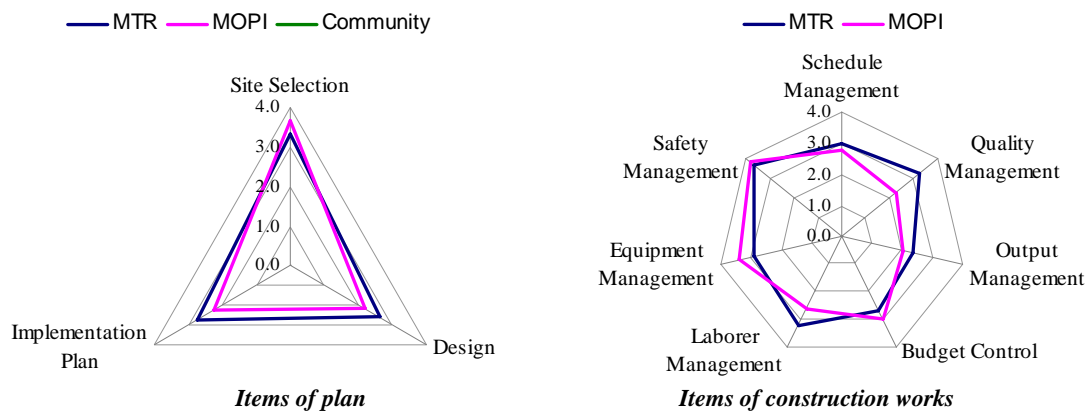


Figure 24.5.2-3 Sustainability of C/D on Planning and Construction Works

Concerning the sustainability mentioned above, the C/D items of low sustainability are basically low because not only evaluation of achievement was low but also there are some physical restrictions on the MOPI. Computer system and software to analyze or stock data are not enough for the MOPI at present. Some tools for daily monitoring are also lacking, therefore it will cost to contract out to other national organizations.

(4) Impact for Users Along Street

Simple interview survey for community habitants along the street was carried out to understand the effects of the P/P. This survey was conducted for 20 households by face-to-face interview by the surveyor. The major opinions from community as pilot project effect are basically as same as items mentioned in earlier Section and the following Table shows the list of opinion with remarks.

Table 24.5.2-5 Impacts for Inhabitants Along the Street

Category	+ / -	Contents	Remarks
On business	Positive	<ul style="list-style-type: none"> • Increase of customer • improvement of transport efficiency 	Increase of pedestrian Motorcycle
On lifestyle	Positive	<ul style="list-style-type: none"> • Accessibility to facilities • Comfortable of walk spaces • Decrease of illegal building • Decrease of garbage on road • Improvement of drain in case of rain 	School, Well, Shops Flat level, Drain Occupy ROW Decrease of garbage Decrease of pool
	Negative	<ul style="list-style-type: none"> • Increasing of danger of traffic accident • Increase of dust • Increase of illegal shops occupying public spaces 	Speed-up of vehicles From high-speed car Occupation of public spaces

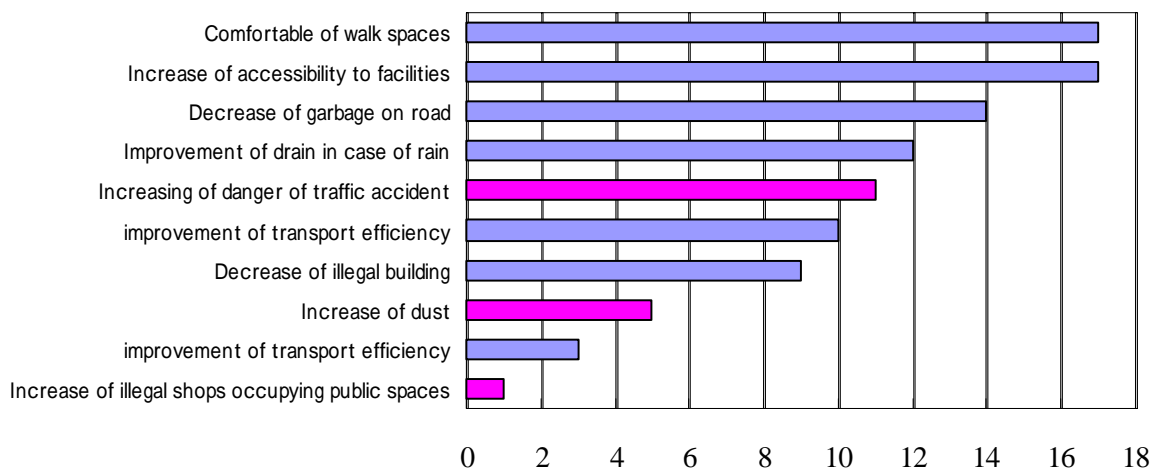


Figure 24.5.2-4 Impacts to Community Along the Street

Table 24.5.2-6 Degree of Impact to Community Along the Street

	Positive effect	Negative effect
Degree of impact	3.4	1.7

4: Large impact 1: Small impact

Rank according to number of answer for each question

According to the general evaluation from the community habitants along the street, the effects of the P/P to the community are recognized and the P/P is considered relevant since positive impacts are more than negative.

Considerations of negative impacts for road users living along the street are as follows:

1) Increasing of danger for traffic accidents

This issue was expected before completion of the P/P. according to plan, spaces for pedestrian was reserved outside of side ditch with 5m width in both sides, however because of many pedestrians using side shoulder including protection shoulder, the risk of traffic accidents between vehicles and pedestrians on the street have been increasing.

Some measurement for this issue was discussed in the W/G and some idea was considered to solve the problem such as reducing section width by putting gravel for maintenance or section with obstruction to reduce the speeds of vehicles passing the street. However result was not identified and the MOPI, the Munuki Payam and the police shall discuss about this issue.

2) Increasing of dust from high-speed car

This matter is also caused by vehicles with high-speed as well as the above Item 1). Therefore, it should be regarded as the same issue mentioned in the above Item 1) and shall depend on future discussion.

3) Increasing of illegal shop occupying public spaces

This issue has been occurring during construction works of the P/P. The shops selling crops or goods,

bike taxi occupying public spaces on street has been increasing at market place. Solution was discussed in the W/G as well as issue of high-speed vehicle and it was concluded that the Munuki Payam should be responsible for controlling illegal shops and taxis. While the Payam tends to organize patrol team for these matters, conclusion shall be shown after discussion with the traffic police.

24.5.3 Evaluation of Construction

(1) Scale and cost

Project scale, fund and resources of the P/P are as follows:

Road: Length $L = 770\text{m}$

Width $W = 20\text{m}$ (ROW=30m)

Area $A=15,400\text{ m}^2$

Side ditch $L = 770\text{m}$ (both side), Length of culvert $L = 112\text{m}$ (600mm)

Channel: Length $L = 180\text{m}$ (including under road section 20m)

Width : $W = 1.0\text{m}$

Depth $D = 0.5 - 1.0\text{m}$

Total project cost was US\$ 164,156 (Refer to former Section).

Table 24.5.3-1 Unit Price of 1st Pilot Project and Terms of Input

Category	Labor/hours	Remarks
Total construction hour	App. 540 hours	3.5 months
Total operating hour of equipment	App. 450 hours App. 42 days	Grader: 1veh. Excavator: 1veh. Dozer: 1veh. Roller: 1veh. Water tank: 1veh. Truck: 1veh. Small compactor: 1veh.
Total working hours	App. 7,850 hours	App. 390 hours/worker App. 50 days/worker

Table 24.5.3-2 Summary of 1st Pilot Project Cost

Category	Sort	Contents	Remarks
Unit	Unit by length	US\$ 213,000 / km	
	Unit by area	US\$ 11 / m^2	
	Unit by time	US\$ 47,000 /month US\$ 1,600 /day US\$ 200 /hour	30 days/month 8 hours/day
Terms of input	Input Ratio	5 : 95	Machine : Laborer

The unit price and terms of input such as labor force calculated by project scale, budget and resources are as follows. Unit price of length and area are approximately US\$213,000 and approximately US\$11 respectively and unit price of working time is shown in below. Although total time of unskilled workers is around 8,000 hours, it seems that this figure was not so

efficient because of including many of idling time for workers especially at beginning stage of construction due to delay of equipment release from MTR. Therefore increasing of productivity shall be expected in next similar projects.

(2) Job Creation in Munuki Community

All unskilled workers for the P/P were recruited from near site and small tools, cements, sand and other materials were provided in Munuki market as many as possible. Therefore some effects on economical aspects were also expected. Following table shows the summary of investment of the P/P to Munuki area.

Table 24.5.3-3 Investment Fund for 1st Pilot Project for Munuki Area

Category	Sort	Contents	Remarks
Invest	Wages for workers	App. US\$ 11,000	20 workers from Munuki
	Allowance for Payam	App. US\$ 2,100	
	Payment for material and tools	App. US\$10,000	Purchased in Munuki market area
Total		App. US\$23,100	

(3) Estimation of Maintenance project cost

The P/P is supposed to be road rehabilitation among road maintenance activities mentioned below. Assuming some terms of construction works to this P/P, various simple unit prices such as in case of rehabilitation maintenance for 2-lane road, in case of periodic maintenance, routine maintenance, etc. could be calculated. Through these unit prices required amount of maintenance cost administrated by the MOPI shall be recognized, and it will be useful for providing annual maintenance plan or refer for another road projects.

Table 24.5.3-4 Road Maintenance Works

Maintenance category	Contents	Frequency	Cost
Routine Maintenance (RM)	<ul style="list-style-type: none"> • Daily inspection and patrol • Easy maintenance works 	Every year Every day	Small
Periodic Maintenance (PM)	<ul style="list-style-type: none"> • Partial surface repair • Partial drainage repair etc. 	Every 5-10 years	Medium
Road Rehabilitation (RR)	<ul style="list-style-type: none"> • Whole improvement (Pavement work) • including replace of base course or whole drain works 	Every 10-20years	Large
Emergency Repair (ER)	<ul style="list-style-type: none"> • emergency works in case of disaster • depends on each disaster 	Each time	Mid-Lag

Table 24.5.3-5 Estimated Cost Based on 1st Pilot Project Results

(Unit: US\$/km)

Maintenance categories	Terms of construction	Width of Roadway		
		~ 9.0 Local Street Class	9.0 ~ 18.0 Collector Street Class	18.0 ~ Arterial Street Class
Routine Maintenance Class	<ul style="list-style-type: none"> • Surface repair • Labor intensive 	5,000	11,000	22,000

Periodic Maintenance Class	<ul style="list-style-type: none"> • Surface repair (single layer) • Repair of drain • Machine + Laborer 	30,000	49,000	83,000
Road Rehabilitation Class (P/P Case)	<ul style="list-style-type: none"> • Surface repair (single layer) • Improve of drain • Culvert under road • Machine + Laborer 	84,000	130,000	213,000

Each unit price is calculated based on P/P case

Delete cost of operators and equipment maintenance from actual P/P cost in case of labor intensive work

24.5.4 Recommendation for Capacity Development

(1) Capacity Development Plan

- To support technical lecture on design and cost estimation at planning stage for technician of the MOPI
- To support skills and advise for inspection, monitoring and providing database of roads for the MTR and the MOPI
- To advise daily check of construction market and to support monitoring and data stock of latest technology of construction and price market
- To support planning of implementation including skills of construction methods compare, supervision procedure, construction management, etc. for technician of the MOPI
- To raise capacity as foreman of road construction works for senior technician of local contractors
- To prepare guideline of supervision of road construction in Juba under the supervision of the MTR and to make use of it through the actual road project
- To arrange series of lecture for minimum required skills of computer for junior and senior technician of the MOPI, or to support fund to attend lectures of computer skills held by private company
- To do lecture routine maintenance works for local streets through the pilot project for the community, and to arrange seminar in order to be aware of importance of daily maintenance works.

(2) Proposal for Efficient Capacity Development Implementation

- To provide minimum office supply (electricity, copy machine, PC, printer, software, etc.) and minimum construction tools (survey level, equipment, etc.), and to lecture operation for the MOPI
- To accelerate permission of holding own minimum equipment (grader, excavator, roller, water tank, truck, patrol car, etc.) of road projects for Road and Bridges, MOPI , and to lecture operating skills of equipment for MOPI staffs
- To arrange minimum budget to maintain equipment well, and to transfer knowledge of equipment maintenance from MTR
- To arrange system for sharing laboratory of material with the MTR, and to lecture skills of material test

- To reinforce classified staffs for planning and maintenance section of Road and Bridges, MOPI

24.5.5 Recommendation for Road Maintenance Plan

(1) Optimum road maintenance system

The desirable maintenance system with force account/contract out system and construction method in Juba is shown in the Table below. The kind of road rehabilitation projects with labor intensive as P/P in Munuki was implemented by direct management system of MOPI. As a result MOPI was supposed to have the capacity to implement road project by direct management, and therefore from the view of economical aspect and so on, it is desirable that road maintenance work administrated by MOPI should be maintained by them for the present.

Table 24.5.5-1 Desired Maintenance Works

Maintenance categories	Main Works	Frequency	Force Account / Contract	Construction
Routine Maintenance (RM)	<ul style="list-style-type: none"> • Patrol and inspection • Surface/ditch cleaning • Pothole repair (spot) • Small damage repair for road facilities • Litter removal etc. 	Every year Every day	Force Account	Labor intensive
Periodic Maintenance (PM)	<ul style="list-style-type: none"> • Earth/gravel surfacing • Pothole repair (section) • Repaint/reseal for road facilities • Ditch repair, etc 	Every 5-10 years	Force Account	Machine + Laborer
Road Rehabilitation (RR)	<ul style="list-style-type: none"> • Rehabilitation activities including such as base course replace • Structure replacement, etc 	Every 10-20years	Force Account	Machine + Laborer
Emergency Repair (ER)	<ul style="list-style-type: none"> • All of maintenance 	Each case	Force Account	Machine + Laborer

(2) Road maintenance system MOPI should implement

- It is confirmed that the MOPI is able to implement road maintenance work by force account system through the P/P. Force account system by the MOPI includes procurement equipment and materials besides supervision or construction management. Therefore routine, periodic and rehabilitation works for roads should be implemented by the MOPI directly according to desirable maintenance activities as mentioned in earlier Section.
- Road maintenance works in labor intensive or machine – labor mixed system should be adopted as construction method by MOPI because of economical reason.
- While road maintenance works should be shifted to contract out system in the future, it should be shifted step by step according to contents of maintenance works and road hierarchy. In case of road maintenance projects covered by international contractors at first, it should be shifted to local contractor in the future and contract out, in order to raise the capacity of local contractor, shall be required in relation with the MTR policy on this matter.
- For the routine maintenance of local street, community based maintenance system is desirable. The maintenance task team should be established in each County or Payam level as well as this P/P, and technical assistance by MOPI and budget arrangement should be

taken into consideration.

Table 24.5.5-2 Scheme of Maintenance Work of MOPI from Force Account to Contract Out

	Arterial Street	Collector Street	Local Street
Routine Maintenance	F F Local C	F F Local C	F Community
Periodic Maintenance	F Local C	F Local C	F Local C
Road Rehabilitation	F Major C Local C	F Major C Local C	F Local C

F: Force Account, Major C : Contract out to Major contractors, Contract out to Local Contractors

(3) Propose for Arrangement of Equipment, Materials and Operators

- Regarding equipment arrangement for the MOPI, study for own equipment arrangement of the MOPI has been on-going, however it is not clear when the ownership of equipment shall be permitted. Therefore there is no good alternative without hiring them from the MTR for the present case.
- Although sub-base material could be collected in Northern Bari Payam in Juba since the army has control of the whole area. If material collection shall be permitted by army for road projects, sub-base material shall be arranged in low price (around one-third – one- fifth of market price).
- In order to do that it is desirable that some kind of contract for using materials should be made under discussion between stakeholders. However unless project owner arrange own transport to bring material from site, it shall cost the same as market price.
- While machine operators are in MOPI, they cannot operate equipment by themselves in case of hiring from MTR or private contractor because equipment shall be rent with operators.

24.6 PROPOSED MAINTENANCE PLAN FOR MUNUKI

24.6.1 Existing Road Conditions

The present road condition in Munuki is shown in this Chapter based on the information from database by road inventory survey.

Result data of inventory survey was entered in the GIS software, and all data of roads and location are managed uniformly. The main features of database are as follows:

- One section of street is divided from junction to junction
- Attributes of section is entered as typical data of section
- Date of un-checked section is entered as neighboring section
- Data stock in GIS software and possible to confirm data and location
- Possible to check the site condition by photo (only several typical section)
- Available for sum up or edit in wide use software EXCEL

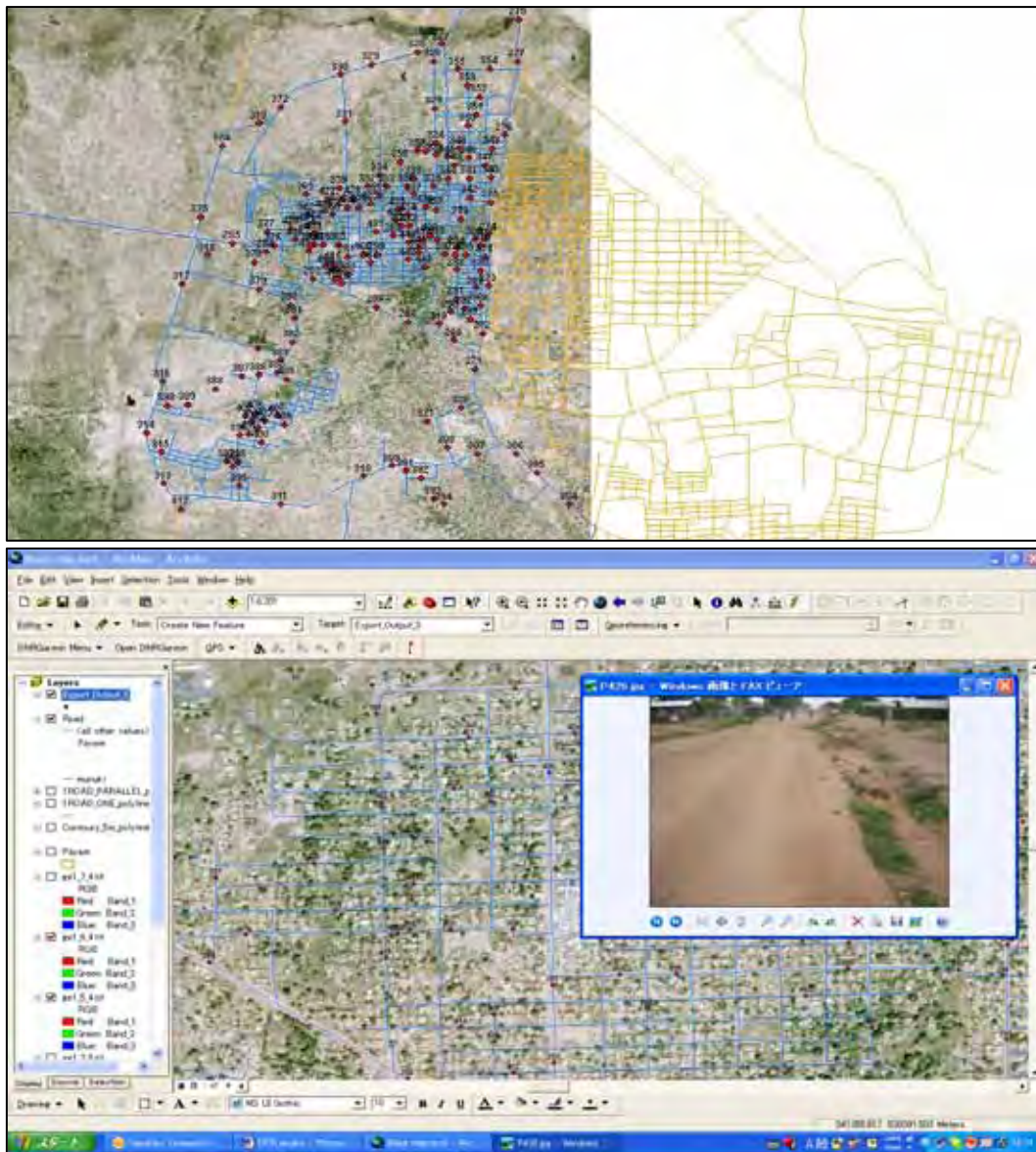


Figure 24.6.1-1 Roads in Munuki Area

(1) Length by road classification

Total length of roads in Munuki is approximately 88km of which 14.4km (16.1%) is arterial street, 4.0km (4.4%) is collector street and 71.1km (79.5%) is local street.

Table 24.6.1-1 Road Length by Classification in Munuki

Classification	Road length (km)	Share
Arterial	12.6	14.4 %
Collector	4.0	4.6 %
Local	71.1	81.0 %
Total	87.7	100.0 %

Source: Summary of road inventory survey, JICA study team

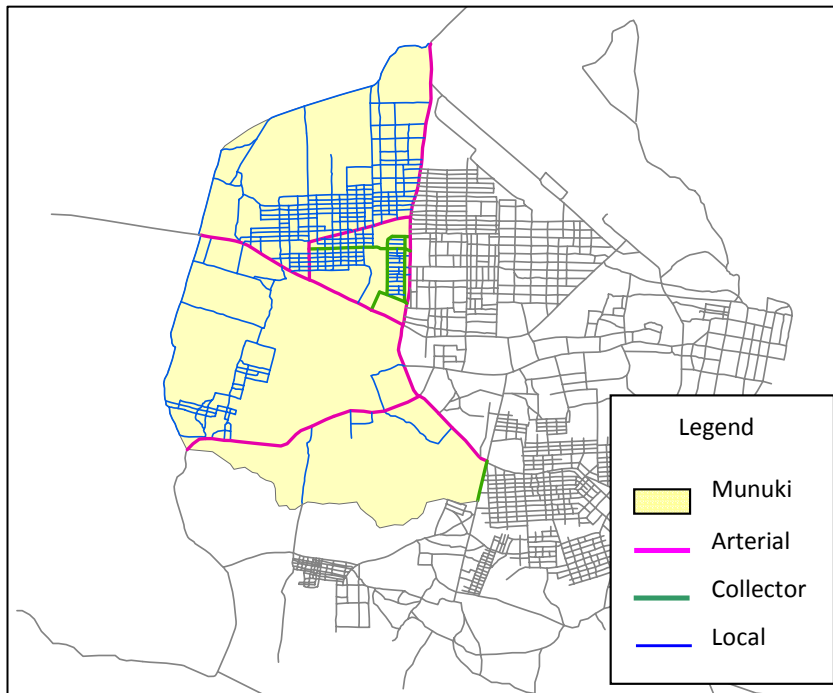


Figure 24.6.1-2 Target Road Network for Database

(2) Drainage system

While development ratio of side ditch is 18.1% of total length, the ratio of ditch work available is only 5.9%. The ratio of arterial street is highest and it is 47.6% for all arterial street (available ditch is 16.7% for all), collector street and local street follow arterial. However ratios of available ditch of both are less than 5%.

Table 24.6.1-2 Drainage Length by Classification and Damage in Munuki

Classification	Road length (km)	Drainage length				Available Ratio
		(km)	(%)	Good/Damaged	Clogged	
Arterial	12.6	6.0	47.6	2.1	3.9	16.7 %
Collector	4.0	1.4	35.0	0.0	1.4	0.0 %
Local	71.1	8.5	12.0	3.1	5.4	4.4 %
All	87.7	15.9	18.1	5.2	10.7	5.9 %

Available condition of ditch is Good or Damaged

Source: Summary of road inventory survey, JICA study team

(3) Sidewalk

Development ratio of sidewalk is approximately 8.8% of total length. The ratio of arterial streets is highest among all of streets, 44.4% and fair or poor condition. Ratio of collector and local streets are very few and almost all conditions are bad.

Table 24.6.1-3 Sidewalk Length by Classification and Damage in Munuki

Classification	Road length (km)	Walkway length				Available ratio
		(km)	(%)	Fair/Poor	Bad	
Arterial	12.6	5.6	44.4	5.6	0.0	44.4 %
Collector	4.0	0.0	0.0	0.0	0.0	0.0 %
Local	71.1	2.1	3.0	0.8	1.2	1.1 %
All	87.7	7.7	8.8	6.4	1.2	7.3 %

Source: Summary of road inventory survey, JICA study team

(4) Surface Condition

Almost all road surfaces are low condition and more than 90% of total section is poor or bad. Although surface condition of arterial streets is slightly better than other streets, only 20% of arterial streets and 10% of collector streets are good or fair. On the other hand, 97% of surface condition of local streets is poor or bad.

Table 24.6.1-4 Summary of Surface Condition in Munuki

Classification	Road length (km)	By surface condition			
		Good	Fair	Poor	Bad
Arterial	12.6	1.0 (7.9)	1.6 (12.7)	7.0 (55.6)	3.0 (23.8)
Collector	4.0	0.0 (0.0)	0.5 (12.5)	1.5 (37.5)	2.0 (50.0)
Local	71.1	0.0 (0.0)	2.3 (3.2)	34.8 (48.9)	34.0 (47.9)
All	87.7	1.0 (1.1)	4.4 (5.0)	43.3 (49.4)	40.8 (44.5)

() share of length

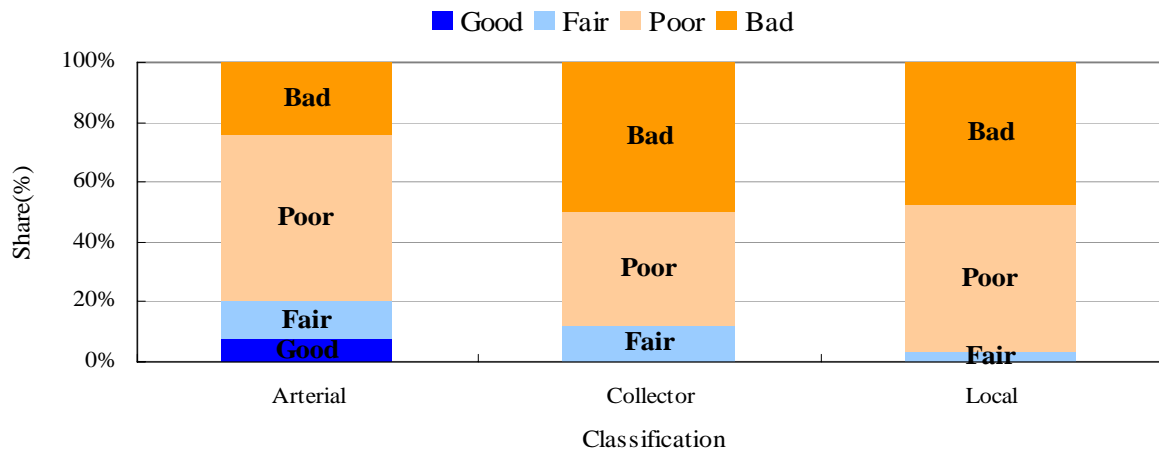


Figure 24.6.1-3 Share of Length by Road Surface Condition in Munuki

(5) Width of road

The widths of arterial streets are more than 11.0m and shoulder or sidewalk is sufficiently reserved. On the other hand, widths of collector and local streets are generally narrow and it is less than 11.0m, therefore there is insufficient shoulder and no sidewalk in collector and local streets. About 10% of both streets are 1 lane road.

Table 24.6.1-5 Range of Width for Roads in Munuki

Category	Arterial	Collector	Local	All
- 6.0m	0.0 (0.0)	0.3 (8.2)	10.5 (14.7)	10.8 (12.3)
6.0 - 11.0	0.0 (0.0)	2.4 (60.7)	53.5 (75.2)	55.9 (63.7)
11.0 - 18.0	5.2 (41.3)	0.8 (19.0)	5.6 (7.9)	11.6 (13.2)
18.0 -	7.4 (58.7)	0.5 (12.1)	1.5 (2.1)	9.4 (10.8)
Total	12.6 (100.0)	4.0 (100.0)	71.1 (100.0)	87.7 (100.0)

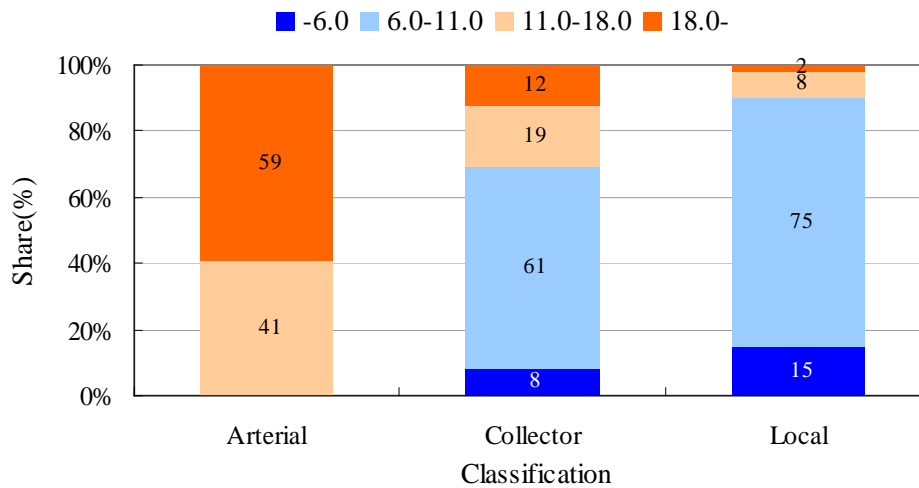


Figure 24.6.1-4 Range of Width for Roads in Munuki

(6) Available Right of Way (ROW)

More than half of the total number of streets is beyond the 10m right-of- way. While the ROW of the arterial streets is more than 20m, the one of collector streets is around 15% and also 0.2% of local streets. Maximum ranges of the ROW of collector streets are 10 – 20m with share of 60%. Majority of local streets have less than 10m of ROW.

Table 24.6.1-6 Range of ROW in Munuki

Category	Arterial	Collector	Local	All
- 10.0m	0.0 (0.0)	1.0 (25.0)	46.6 (65.5)	47.6 (54.3)
10.0 - 20.0	2.2 (17.5)	2.4 (60.0)	24.4 (34.3)	29.0 (33.1)
20.0 - 30.0	9.9 (78.6)	0.6 (15.0)	0.5 (0.2)	11.0 (12.5)
30.0 -	0.5 (3.9)	0.0 (0.0)	0.0 (0.0)	11.2 (12.4)
Total	12.6 (100.0)	4.0 (100.0)	71.1 (100.0)	87.7 (100.0)

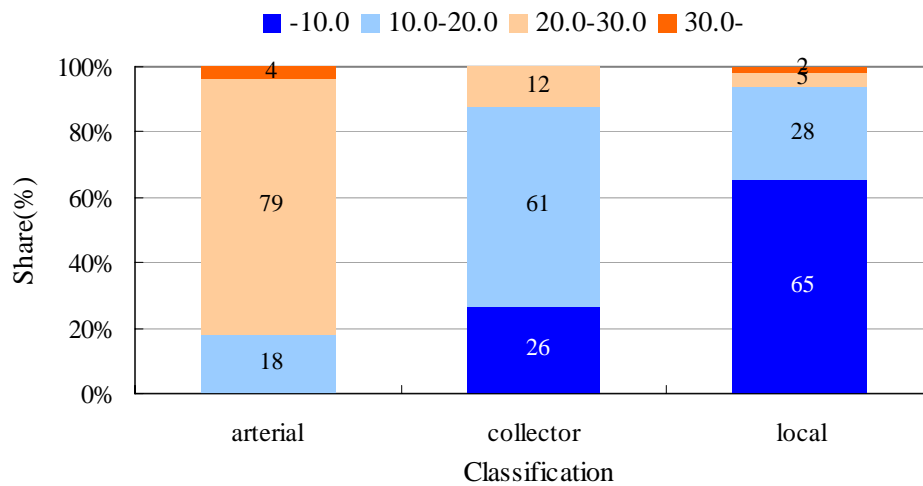


Figure 24.6.1-5 Range of ROW in Munuki

24.6.2 Estimation of Road Maintenance Cost

The length by surface condition level was calculated from database made by inventory survey and policy of required maintenance for Munuki area is shown below:

Table 24.6.2-1 Maintenance Policy Based on Surface Condition and Road Classification

Administration	Road Classification	Surface Condition (km)			
		Good	Fair	Poor	Bad
MTR	Arterial	1.0	1.6	7.0	3.0
MOPI	Collector	0.0	0.5	1.6	1.9
	Local	0.0	2.4	34.8	33.9

: 1st Priority (AC), : 2nd Priority (AC), : 2nd Priority (Routine), : 3rd Priority (Routine)

- Arterial street (Interstate/International) should be maintained by MTR and the rest by MOPI.
- All arterial streets should be upgraded to asphalt pavement with priority by MTR.
- All collector streets should be upgraded to asphalt pavement with priority by MOPI.
- All local streets shall be left as it is for the present and maintained by routine maintenance.
- Roads upgraded to asphalt should be maintained by periodic maintenance and rehabilitation with cycle 10 or 20 years interval as well as routine maintenance.
- All local streets should be maintained by routine maintenance work.

Table 24.6.2-2 Summary of Road Maintenance Volume

Administration	Maintenance	Work contents	Remarks
MTR	Arterial	RR(AC): 12.6km (1 st 10.0km, 2 nd 2.6km) PM(AC): 12.6km RM(AC): 12.6km	E/G → AC 10 th year after rehabilitation After rehabilitation soon
MOPI	Collector	RR(AC): 4.0km (1 st 4.0km) PM(AC): 4.0km RM(AC): 4.0km	E/G → AC 10 th year after rehabilitation After rehabilitation soon
	Local	RM(E/G): 71.1km	All local streets

RM: Routine Maintenance, PM: Periodic Maintenance, RR: Road Rehabilitation
AC: Asphalt Concrete, E/G: Earth or Gravel road

24.6.3 Annual Road Maintenance Plan

The required annual maintenance volume for roads in Munuki for MTR and MOPI was estimated below based on volume of road stocks (12.6km for MTR and 75.1km for MOPI) and maintenance cycle.

Table 24.6.3-1 Annual Required Length for Maintenance of MTR and MOPI

Administration	Maintenance	Required Amount	Remarks
MTR	Routine maintenance	12.6km/year (AC)	After rehabilitation
	Periodic maintenance	1.3km/year (AC)	12.6 km/10year
	Rehabilitation	0.6km/year (AC)	12.6 km/20year
MOPI	Routine maintenance	4.0km/year (AC)	After rehabilitation
		71.1km/year(E/G)	All local street
	Periodic maintenance	0.4km/year (AC)	4.0km/10year
	Rehabilitation	0.2km/year (AC)	4.0km/20year

AC: Asphalt Concrete, E/G: Earth or Gravel road

Annual required maintenance cost in Munuki area was calculated based on required volume and unit price by each maintenance activity. The results of calculation are as follows. This results shows only annual average of required maintenance cost, and actual annual cost for maintenance shall be variable. Total amount of annual maintenance cost in Munuki area was estimated to US\$ 6.07 million, of which US\$ 1.84 million is for section administrated by the MTR and US\$ 4.23 million is under the MOPI.

Table 24.6.3-2 Summary of Annual Required Cost for Maintenance of MTR and MOPI

Administration	Maintenance	Quantities (km)	Unit (US&)	Amount (US\$)
MTR	Routine maintenance (AC)	12.6	8,420	106,092
	Periodic maintenance (AC)	1.3	239,000	310,700
	Rehabilitation (AC)	0.6	2,367,000	1,420,200
	Sub total	14.5	-	1,836,992
MOPI	Routine maintenance (AC)	4.0	4,750	19,000
	Routine maintenance (E/G)	71.1	56,080	3,987,288
	Periodic maintenance (AC)	0.4	97,000	38,800
	Rehabilitation (AC)	0.2	944,000	188,800
	Sub total	75.7	-	4,233,888
Grand total		90.2	-	6,070,880

AC: Asphalt Concrete, E/G: Earth or Gravel road

Simulations of maintenance model cases for 20 years are calculated under the terms as follows:

- Arterial and collector streets are upgraded as rehabilitation works to asphalt pavement with top priority in maintenance program, and 12.6km of total target section should be paved for 5 years at the first stage and 4.0km of remaining section shall follow.
- Target streets for asphalt pavement shall not be maintained for routine works, and it should be covered after completion of rehabilitation works.
- Regarding routine maintenance of local streets, it should depend on the current situation of

surface and drainage condition for the first 7 years in which rehabilitation work for arterial and collector road shall be upgraded, and all of local streets shall be maintained for same routine maintenance works from the 8th years.

Required maintenance volume and cost for model case calculated as terms mentioned above are as follows:

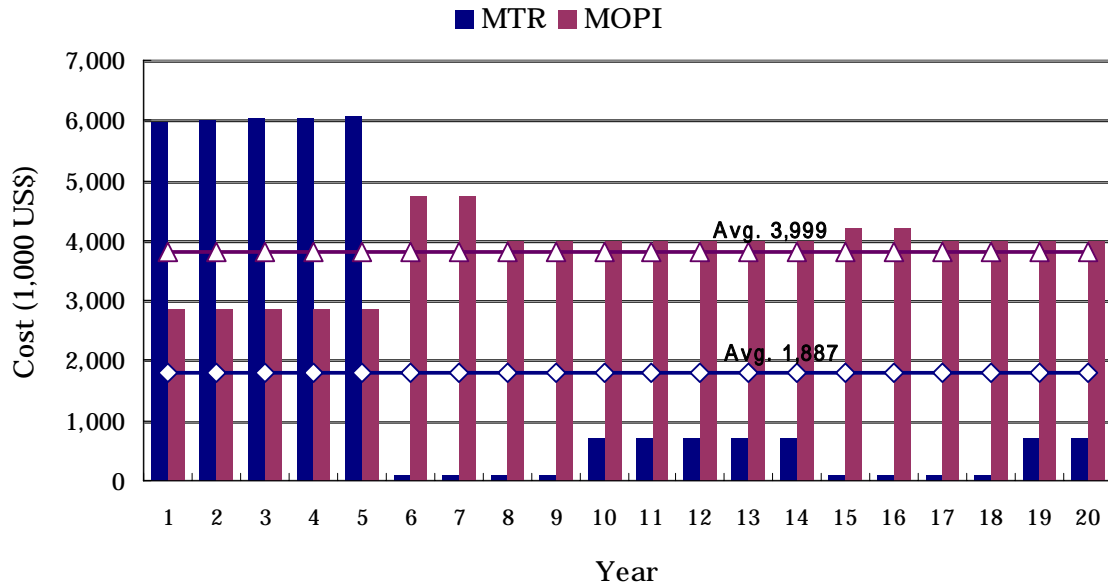


Figure 24.6.3-1 Model Case of Maintenance Cost of MTR and MOPI

CHAPTER 25

2nd PILOT PROJECT IMPLEMENTATION

CHAPTER 25 2nd PILOT PROJECT IMPLEMENTATION

25.1 OBJECTIVES AND APPROACH OF 2nd PILOT PROJECT

25.1.1 Background of 2nd Pilot Project

Chapter 14 of this Study discusses the demarcation of road improvement and maintenance work between the Ministry of Transport and Roads (MTR, GOSS) and the Ministry of Physical Infrastructure (MOPI, CES) where the higher class arterial roads are considered under the responsibility of MTR and the lower class urban roads such as collector and local roads in Juba are designated to be under the responsibility of MOPI.

Considering the present state and poor condition of collector and local roads in Juba, the 1st Pilot Project (1st P/P) for road maintenance was conducted during the course of the Study from November 2008 to November 2009 at Munuki area, west of Juba urban area to develop the Ministry of Physical Infrastructure's (MOPI) capability in planning and implementing *resurfacing type* of road maintenance for collector and local streets.

The project focused on improving the capability of MOPI thru implementing resurfacing improvement of a 770m long local street in Munuki with side ditches and cross-pipes for drainage. The proceedings and results of the 1st Pilot Project are discussed in the previous Chapter 24.

However in Chapter 16, the Study identified 4 types of improvement works for road maintenance as follows:

1. Leveling – to level the road surface temporarily on the corrugation, deep rut, loss of camber and erosion with minimum materials,
2. Re-surfacing – to secure the smoothness of corrugated road surfaces with suitable material such as a mixture of thin gravel (about 5cm),
3. Gravel Pavement – to secure the smoothness of corrugated road surface with a mixture of gravel (about 15cm),
4. Asphalt Pavement – to secure the smoothness of corrugated road surface with an asphalt concrete pavement.

Since the MOPI is recommended to undertake both *resurfacing* and *gravel pavement* maintenance works by force account system until such time when road maintenance is shifted to contract-out type, the MOPI should then be capable to carry-out road maintenance of the above pavement types by its own force.

The 2nd Pilot Project under this Study is thus focused in performing the third type of road maintenance work which is gravel pavement type. Figure 25.1.1-1 illustrates the basic difference between the road structures for the 1st and the 2nd Pilot Projects.

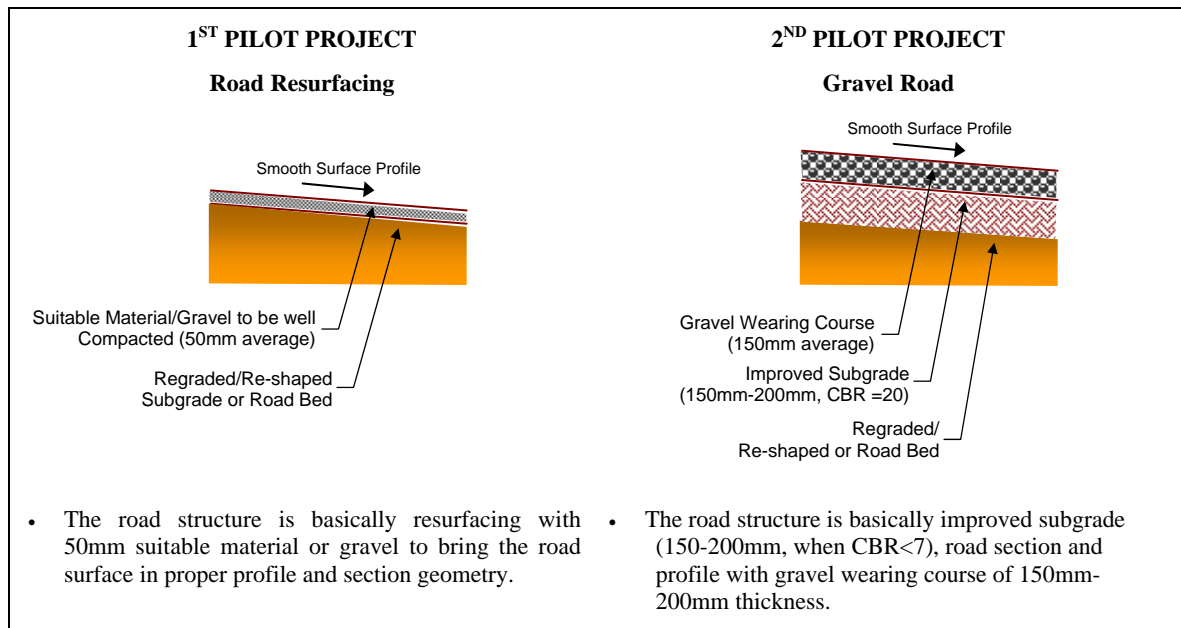


Figure 25.1.1-1 Road Structures for the Pilot Projects

25.1.2 Project Objectives

The 2nd Pilot Project, which aims at reinforcing the capacity of the MOPI in road administration and maintenance, is a continuation of the 1st Pilot Project and will execute maintenance on a limited length of gravel road pavement project with the following objectives:

- 1) to assess and assist in improving the capabilities of the MOPI in executing periodic maintenance works for gravel pavement considering constraints in resources,
- 2) to undertake maintenance/rehabilitation of a 500m long gravel type road pilot project, and
- 3) to organize the community and generate employment within the community thru labor-based gravel road maintenance execution.

It should be noted that the primary aim of the Pilot Project is to assess and improve the capacity of the MOPI for gravel pavement and not the project itself.

25.1.3 Issues on Road Maintenance for Collector and Local Roads

The present state and poor condition of roads in Juba urban area is brought about by many factors including technical and non-technical not mentioning the long civil war that has left these roads in an almost neglected state for a long time. Since at present, one of the thrust for priority expenditures of GOSS is to improve the present road condition and to develop the overall road network, the MOPI will be tasked to handle such road improvement and maintenance under the force-account system until the time when the private sector is ready to take over.

However, several issues are identified regarding MOPI's capability to undertake road maintenance for collector and local roads in Juba urban area, which include:

- Maintenance System: The present system of implementing maintenance works in the MOPI is not clear, without any plan for annual maintenance program and prioritizing roads for maintenance/rehabilitation works. This causes further deterioration of the existing roads, making transport in Juba urban area very difficult and costly.
- Road Inventory Data Base: At present, there is no organized data base for road inventory in Juba urban area, especially the collector and local roads under the jurisdiction of the MOPI. The total road length and its condition, available right-of-way, road structure and drainage system and road structures including bridges and culverts under this class are not known.
- Road Inspection: Monitoring of road condition by inspection and condition evaluation is not being undertaken at the moment which is supposed to be the basis of road improvement and annual maintenance plan.
- Road Structure and Drainage System: Basically collector and local roads in Juba urban area are earth roads with some improved to gravel type. A major issue that leads to rapid road structure deterioration is the absence of a drainage system in these roads which causes road surface erosion and structure damage during rain.
- MOPI Staff: Although the MOPI has more than 600 staff, only 6.5% received technical education with 2.5% of Engineer class. Moreover, due to lack of opportunity to handle projects and exposure to road technology, most of the technical staff still needs improvement in their technical skills and know-how.
- MOPI Equipment: The MOPI listed owning two bulldozers and three motor graders. However, these equipments are either out of order or inoperative due to lack of maintenance and parts.
- Laboratory for Testing: The MOPI does not have a laboratory to test the materials and quality of work for maintenance and has to rely on the laboratory facilities of the MTR, with laboratory fees.
- Maintenance Budget: Budget is allocated for the State with the MOPI having its allotment. However, the disbursement and utilization of the budget for road maintenance is not clear so that very few road maintenance works are being undertaken at the State level.

25.1.4 Project Implementation Approach and Methodology

(1) Flow of Pilot Project Implementation

The 2nd Pilot Project will follow basically the maintenance implementation cycle presented in Figure 16.4-1 of Chapter 16, where possible.

Figure 25.1.4-2 illustrates the general flow of road maintenance implementation. However, due to limited time for implementing the 2nd Pilot Project, some of the steps in this figure are simplified. The following processes are considered in implementing the 2nd Pilot Project:

(a) Project Site Selection

Selection of the project site is undertaken considering the opinion of the stakeholders including the MTR, the MOPI and the Community. The candidate sites for the 2nd Pilot Project are identified thru the Working Group (with members coming from the MTR, the MOPI and the

JICA Team) and selected based on the consensus of the Working Group, as discussed in the next Section. The Payam/Community is then consulted regarding the candidate site and approval solicited from the Payam Director.

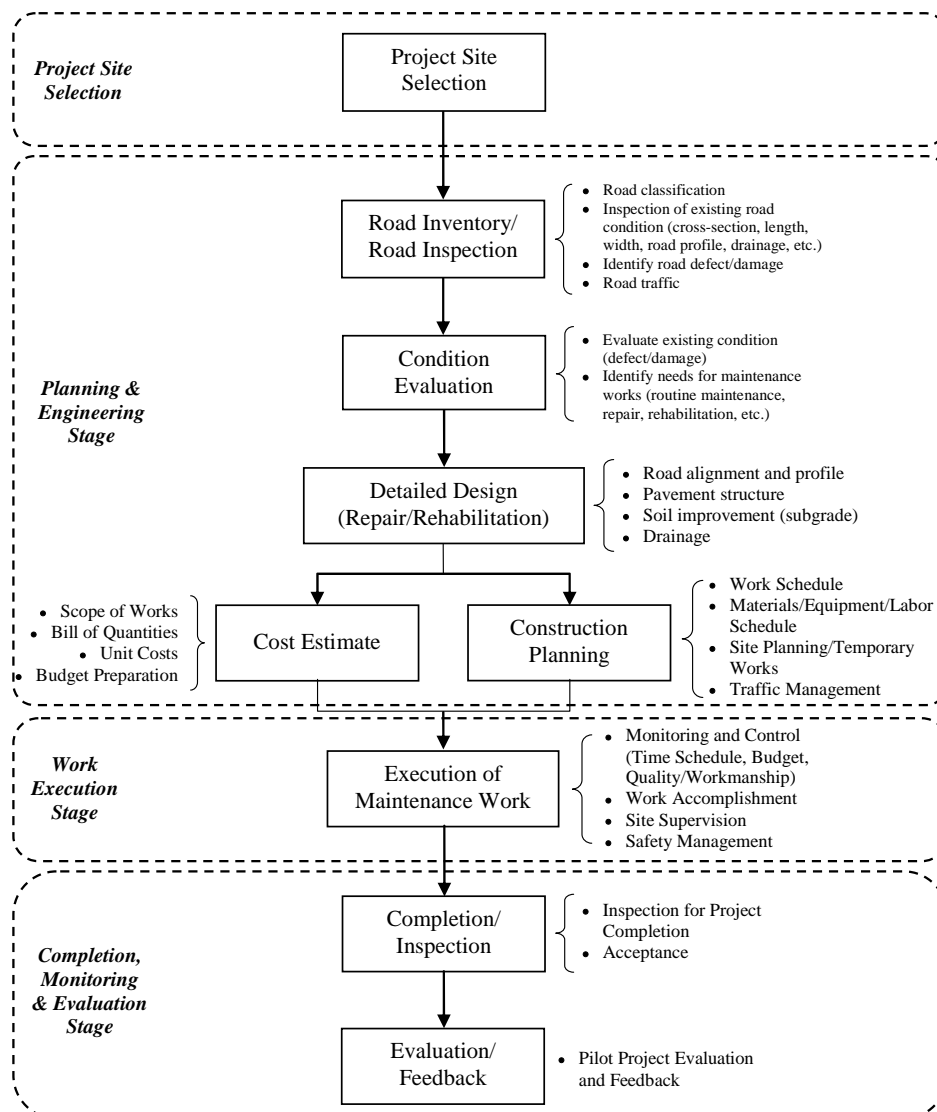


Figure 25.1.4-1 Flow of Road Maintenance Implementation (Force Account)

(b) Planning and Engineering Stage

A general inspection of the proposed site is conducted to evaluate the existing condition and define the scope of the pilot project. A simplified design is done to determine the maintenance works and establish the road cross-section, profile, road structure, drainage and treatment of soft ground/black cotton soil. Appropriate MTR Specifications to be applied for the project is decided at this stage. Moreover, cost estimate and construction plan is prepared at this stage with assessment of the MOPI's capability in planning and engineering.

(c) Work Execution Stage

The pilot project is executed at this stage with emphasis on control of work accomplishment, schedule and quality and management of site, labor, equipment, and

safety. Unlike the 1st Pilot Project (which is assisted by a local contractor in the execution stage), the 2nd Pilot Project is undertaken and managed solely by the MOPI. In this way, the MOPI's capability for road maintenance will be assessed based on the project performance. It should be noted that during most of the project execution duration, the JICA team is not present due to JICA's restriction on travel to the site.

(d) Completion, Monitoring and Evaluation Stage

Due to time constraint, the activities under this stage focused only on project completion and evaluation after project completion. In reality, maintenance works, once completed, has to be monitored continuously in terms of performance for feedback and evaluation.

(2) Pilot Project Implementation Scheme

Unlike the 1st Pilot Project, the 2nd Pilot Project will be undertaken with the MOPI as the major player in project execution, as shown in Figure 25.1.4-2. The pilot project is executed as a labor-based, equipment assisted project under the direct management of the MOPI.

(a) The Working Group (WG)

The WG, consisting of the MTR, the MOPI, Munuki Community and the JICA Team (as support) handles the policy and direction of the Pilot Project. Decision on technical matters and project implementation is handled at this level considering the consensus and agreement of the group. Moreover, planning and engineering stage is undertaken at the WG level where the scope of the project is decided based on the existing condition of the project road, considering the limited available budget for the project. The WG is basically presided by the MOPI with the Community as the 1st Stakeholder and the MTR and the JICA Team acting as project advisors.

(b) The Community Construction Group (CCG)

Construction execution is undertaken by the CCG which is the construction body for the pilot project. In the 1st Pilot Project, the CCG is headed by a local contractor in collaboration with the MOPI. However, for the present pilot project, the CCG is headed by the MOPI which controls construction execution matters of the project. Staffs of the MOPI and the labor from the Community are direct members of the CCG. In this case, the performance of the MOPI on gravel road maintenance can be directly assessed.

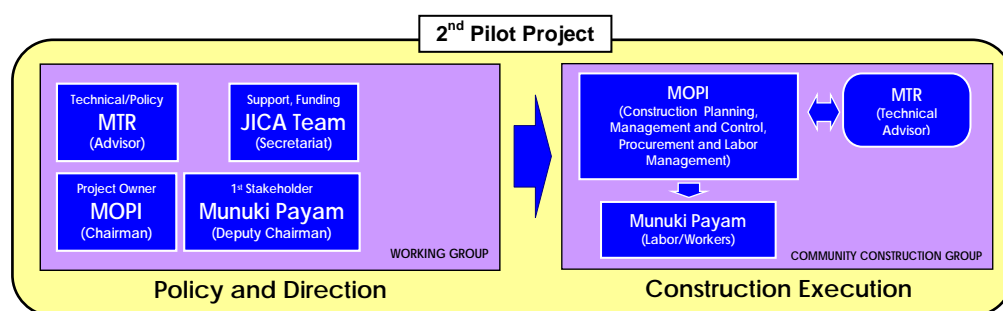


Figure 25.1.4-2 Project Implementation Scheme

(3) 2nd Pilot Project Organization

The organization of the 2nd Pilot Project is shown in Figure 25.1.4-3 below. The MOPI is the main counterpart of the pilot project and the target of capacity development. The MTR acts as the policy and technical advisor while the JICA Team supports the project technically and financially. The Munuki Community supports the project by providing the project site and the direct labor for the project.

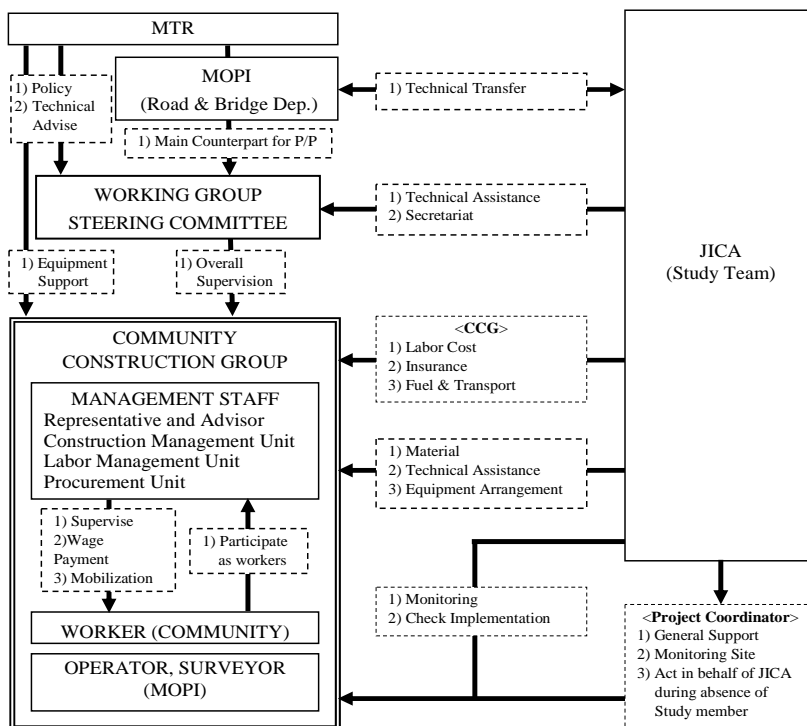


Figure 25.1.4-3 Pilot Project Organization

(4) Pilot Project Overall Implementation Schedule

The overall implementation schedule for the 2nd Pilot Project is shown in Figure 25.1.4-4 below.

2nd PILOT PROJECT OVERALL IMPLEMENTATION SCHEDULE

Activities	Y 2 0 1 0					
	Jan	Feb	Mar	Apr	May	Jun
1. Preparatory Works / Inception		■				
2. Organization of Working Group		■				
3. Selection of 2nd Pilot Project Road		■				
4. Preparation of Design, Cost Estimate and Implementation Plan		■	■			
5. Establishment of Community Construction Group		■				
6. 2nd Pilot Project Implementation/Execution		■	■	■	■	■
7. Evaluation and Feedback					■	
8. Stakeholders' Meeting						▼
9. Report Preparation					■	■
JICA Team Schedule (On-site)		■	■	■	■	■
		■	■	■	■	■

Figure 25.1.4-4 Pilot Project Implementation Schedule

The pilot project duration runs from the last week of January 2010 until the end of May 2010. However, owing to travel restriction during the national election period in Sudan, the JICA Team was able to stay in Juba for the period from 23rd of January to 5th of March and from 14th of May to 8th of June. During the period from 6th of March to 13th of May, the pilot project is being undertaken by the MOPI with guidance from the MTR and the JICA local project coordinator. The work progress is reported to the JICA Team by the local coordinator thru emails and telephone calls.

25.2 PROJECT SITE SELECTION AND JUSTIFICATION

25.2.1 Existing Conditions of Collector and Local Roads

The present stock and conditions of the roads in Juba urban area is basically unknown due to non-existing road inventory data. With the on-going emergency road rehabilitation, at least 65kms of the arterial and collector roads will be improved to asphalt concrete type pavement with proper drainage facilities. The master plan in this Study recommends improvement of arterial, collector and some local roads from earth to gravel and finally asphalt concrete until year 2025. However, improvement of majority of local roads to asphalt concrete pavement will have to wait beyond year 2025 or until sufficient funds are sourced for such improvement.

A partial road inventory was conducted for the Munuki Payam, as discussed in Chapter 24. Of the total 87.7kms of road, 14.4% are classified as arterial, 4.6% collector and 81% local. The road structure types are basically earth with some sections improved to gravel roads and with more than 90% of these roads in poor to bad condition. This road condition ratio is practically typical for the road network in Juba urban area. Photos 25.2.1-1 and 25.2.1-2 show some typical road condition and road improvement works in Juba.

In this regard, the 2nd Pilot Project is aimed at the maintenance or rehabilitation of gravel roads for collector and local road class which will be the dominant type of road structure for these lower class roads.



a. Typical Local Road with Bad Road Condition



b. Typical Gravel Road Improvement

Photo 25.2.1-1 Road Condition in Juba



a. On-going Emergency Road Rehabilitation



b. Asphalt Paved Road

Photo 25.2.1-2 Road Improvements in Juba

25.2.2 Inspection of Candidate Sites and Site Selection

(1) Alternative Sites for 2nd Pilot Project

Three alternative candidate sites for the 2nd Pilot Project were recommended, as shown in Figure 25.2.2-1. These include the road in front of the Gudele Market which forms part of the Circumferential Street C-3, the extension of the 1st Pilot Project site which is a local road in Munuki Payam and any collector or local road in the Central Commercial District (CCD) area.

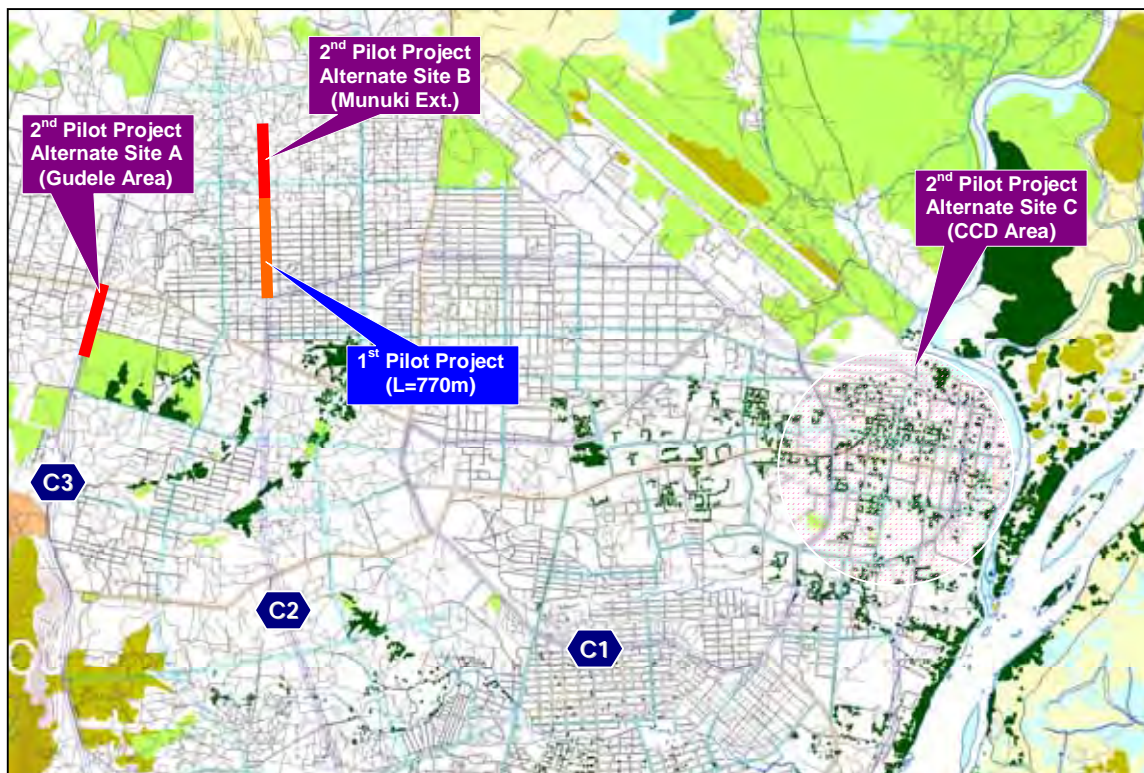


Figure 25.2.2-1 Candidate Sites for 2nd Pilot Project

The three candidate sites are briefly described below:

(a) Alternative Site A – Gudele Area (C-3 Road)

- The road section along the Gudele market is recommended as a possible site for gravel improvement since it is in front of the market itself and its improvement is considered to improve accessibility to the market. The road connects Juba-Mundri road (R-2) with Juba-Yei road (R-1), traversing the foot of the Jebel Kujur mountain. The road width is about 8m (without shoulder and sidewalk) with much of the section being taken by the market vendors. The road condition is poor earth road with no drainage system.
- However, the said road section is proposed to be part of the Circumferential Street C-3 in the master plan. And at present, with the financial assistance from the North Government, the MTR is extending the C-3 Road using Juba-Yei Road and towards the Gudele area. In this case, the Gudele market section will be improved in the very near future.



Photo 25.2.2-1 Road Condition in Gudele Market

(b) Alternative Site B – Extension of the 1st Pilot Project Road in Munuki

This 1.6km local road starts from the Circumferential Street C-2 at the Munuki market area and provides access to the residential communities north of the market and connects the road towards Terekeka and Gudele. This road was taken as the site for the 770m length 1st Pilot Project *road resurfacing*. However, the remaining 830m earth road section is left unimproved with about 100m of black cotton soil area that is very difficult to access during rainy season.

The extension of the 1st Pilot Project Road is strongly recommended by the MOPI and the MTR and endorsed by the Munuki Payam to be the site of the 2nd Pilot Project with the following justification:

- Munuki is a growing community with much of the returnees/IDPs relocating in the area. However, the road condition in Munuki Area is in such a very poor state. The only good road example is the 1st Pilot Project. In this regard, any improvement in the roads in Munuki using Gravel Wearing Course will be appreciated by the Community.
- Due to limitation in budget and time, it was decided in the 1st Pilot Project to execute only about 770m length of this road section by resurfacing. This left the remaining 830m untouched with a 100m section of soft/black cotton soil which is not accessible during rainy season – thus rendering only partial use of the road length.

- Extending the 1st Pilot Project road will make the total road length in good condition which will benefit the daily social and commercial life of the community. Positive social impact will be greatest in this location.
- The MOPI strongly requested to undertake this road section since they wanted to experience working on roads with problem areas such as black cotton soil. This will increase their capacity and experience in various road construction/maintenance activities.
- The MOPI mentioned that there is a plan to transfer the Munuki market and the bus terminal from its present position to the new site which located at the end section of the 2nd Pilot Project. Completion of the proposed road will enable the community to realize this plan.
- Since the main objective of the Pilot Project is Capacity Development for MOPI, and not the road project itself, any location for the road project will be acceptable to the stakeholders.



Photo 25.2.2-2 Road Condition in Munuki Extension Road

(c) Alternative Site C – Collector/Local Road in Central Commercial District (CCD) Area

The CCD area is one of the busy sections of Juba, being the commercial center hosting offices of major companies. It is suggested that a local road in CCD be identified to be the candidate site of the 2nd Pilot Project due to poor road condition with large traffic volume. However, recent road improvement activities in CCD indicate that a significant length of the roads (arterial, collectors and major local roads) will be paved with asphalt concrete (AC). In this regard, the community impact conducting the gravel road structure for the 2nd Pilot Project will be minimal.



Photo 25.2.2-3 Road Condition in CCD

(2) Site Selection

The site of the 2nd Pilot Project is selected based on the following policy and criteria:

- Minimal disturbance on the daily activities around the project site → Since the pilot project is basically a capacity development project, the site location should be selected that will minimize the disturbance to the daily social and commercial activities of the community
- Simple and easy to implement → Considering the limited budget and time to implement the 2nd Pilot Project, the selected site for gravel road should be easy to implement without complications in the scope of work
- Maximum positive impact on the Community → The selected site have maximum effect on the lives of the local people including transport mobility and accessibility, increase in economic activity in the area and will generate more employment opportunity for the local residents
- No duplication with other road improvement projects → The project road should not be part of any road improvement project
- Contributes to road condition improvement in the area → The project site should contribute to improvement of the road network condition in the selected area – less developed area road network is preferred
- Ease of mobilizing and organizing the Community → Due to short project implementation duration the Community in the selected site should be readily organized and available for project implementation

Considering the above policy and criteria for project site selection, the “Alternative Site B – Extension of the 1st Pilot Project Road in Munuki” is selected as the road project site.

25.3 PLANNING AND ENGINEERING STAGE

25.3.1 Inspection and Condition Evaluation of 2nd Pilot Project Site

The proposed site for the 2nd Pilot Project, as shown in Figure 25.3.1-1, was inspected by the WG (MOPI, MTR and JICA Team) to determine the existing conditions and define the scope of works for the project. The existing site conditions are summarized as follows:

- Road Class : Major Local Road
- Traffic (AADT) : 50-100 pcu

- Road Length : Total Road Length – 1600m
: Length of 1st Pilot Project – 770m
: Length of 2nd Pilot Project – 500m + 330m
- Road Cross-Section : Total ROW – 30m
: Road Width – 20m
: Intermittent 0.60m wide side ditch exist
: No defined cross-slope and crown for the road section
- Road Structure/Surface : Sta. 0 – 770m – Resurfaced with Murram
: 770 – 1600m – Earth Road, silty sand type with section of black cotton soil
- Drainage System : Earth ditch in fair condition exist until 770m from beginning of road with cross pipes for intersecting roads
: Small side ditch (0.6m wide) exist in some sections beyond 770m but there is no discharge outlet connection to the stream.
: Rain water pools on the road due to absence of crown and cross-slope
: There is no existing cross-drainage so that rain/flood water flows on the road towards the east side.
- Road Condition : The 1st Pilot Project section (770m length) is in good condition
: The remaining section until the end of the road is in poor to bad condition with potholes, corrugation and uneven road profile.
: Black cotton soil (about 100m long) exists at 1014m from beginning of road which becomes un-passable during rainy season.



Figure 25.3.1-1 2nd Pilot Project Site Condition

Based on the above conditions, the scope of project for road maintenance/rehabilitation is decided and the design carried-out.

25.3.2 Design for Gravel Road Maintenance/Rehabilitation

The design and construction of Gravel Roads/Gravel Wearing Course is not yet fully established in South Sudan. However, draft design and construction requirements for road pavements are prepared by the MTR in 2006 (with support from USAID). These guides are basically referred to

the Transport Research Laboratory (TRL) recommendations and the American Association of State Highways Officials (AASHTO) guides.

The following are referred to in the 2nd Pilot Project

- Pavement Design Manual, MTR, 2006
- Standard Technical Specifications, MTR 2006
- Ministry of Transport and Roads, Technical Advice from Staff

Following the MTR Guidelines, the Design Outline for the 2nd Pilot Project is as follows:

Road Classification	: Major Local Road
Traffic	: 50-100 pcu/day (Design)
Road Project Length	: 500m
Road Section	: Travelledway – 2 lanes @ 3.5m/lane = 7.0m Shoulder/Sidewalk/Parking – 2 @ 5.5m = 11.0m Ditch – 2 @ 1.0m/ea side = 2.0m Total Road Width = 20.0m
Cross Fall	: 4%
Cross Drainage	: 36m- ϕ 600mm RC Pipe Culverts Earth canal for discharge of storm water to existing stream channel
Subgrade/Ground Improvement	: Replacement of black cotton soil, L = 100m (0.3-0.6m deep)
Access Road	: Provision of ϕ 600mm RC Pipe Culverts, L = 10m/ea
Road Side Drain	: 1.0m wide earth ditch, L = 830m/ea side
Gravel Wearing Course	: 150mm thick at W = 7.0m for 500m for Traveledway 50mm thick for rest of road section (11.0m wide)

The “Pavement Design Manual”, Ministry of Transport and Roads (MTR), Government of Southern Sudan, (USAID) 2006 recommends the thickness of gravel wearing course based on the design (Annual Average Daily Traffic) AADT and the existing road bed CBR, refer to Appendix 14. However, for the purpose of capacity building on a limited budget, the thickness of gravel wearing course for this pilot project is decided to be 150mm thick based on the standard gravel roads being employed by the MTR for its gravel road projects.

Figure 25.3.3-1 shows the proposed pavement structure while Figure 25.3.3-2 illustrates the general plan and cross-sections.

25.3.3 Project Scope and Budget

The project activities are identified based on the necessary road improvement of the existing road condition and shown in Figure 25.3.3-2 with the following major item of works:

- 1) Site Clearing
- 2) Soft Ground/Black Cotton Soil Improvement (Subgrade)
 - Removal/Excavation
 - Disposal (Road Side)

- Backfill and Compaction
- 3) Drainage Works
- Side/Open Ditch
 - Cross-Pipe, $\phi 600$ RCPC
 - Access Road Pipes, $\phi 600$ RCPC
 - Open Canal for Discharge to Stream
- 4) Road Pavement Structure
- Subgrade Preparation
 - Gravel Wearing Course (Traveledway)
 - Gravel Wearing Course (Shoulder/Sidewalk)

However, since the project objective is capacity development, budget is basically fixed to a total of US\$ 150,000. In which case, the scope of the pilot project will be defined from this budget.

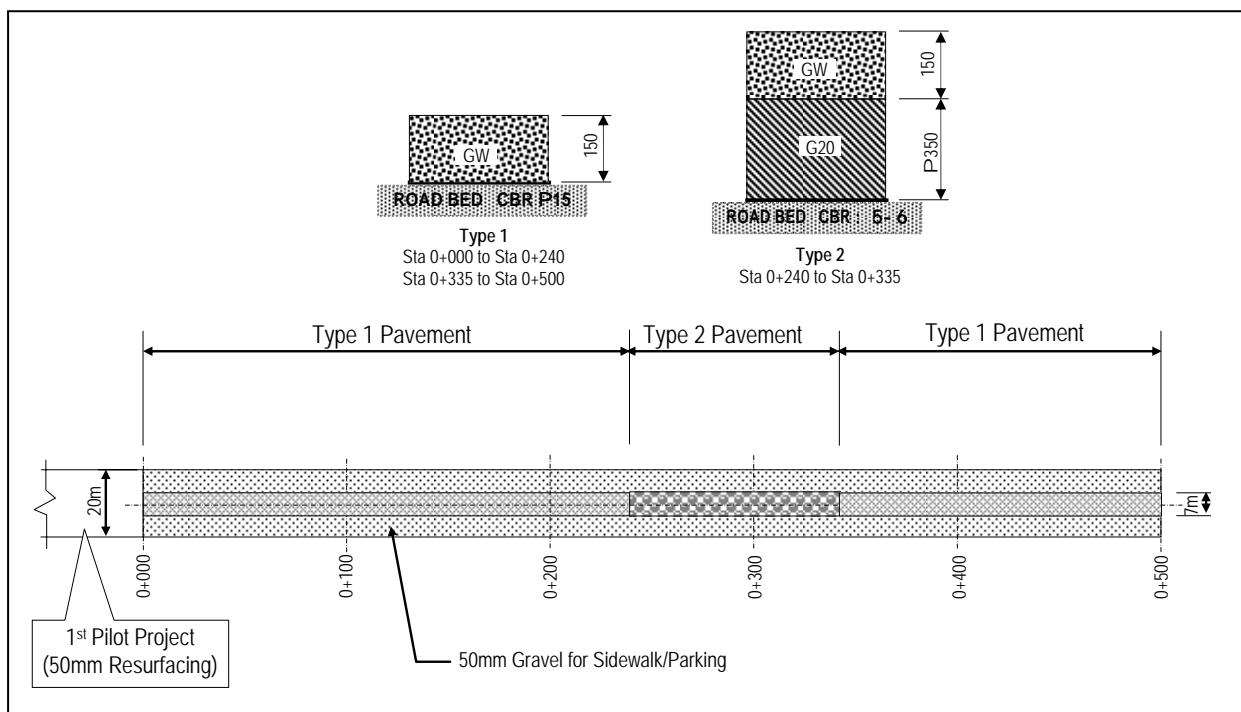


Figure 25.3.3-1 Gravel Pavement Structure

The following summarizes the project budget:

Table 25.3.3-1 Pilot Project Budget

Item	Amount in US\$
1. CCG Costs (Admin, Fuel & Labor)	55,000.00
2. Cost of Materials	<u>95,000.00</u>
Total Budget	150,000.00

Note: Payment for purchase of materials is to be done by JICA Team and CCG

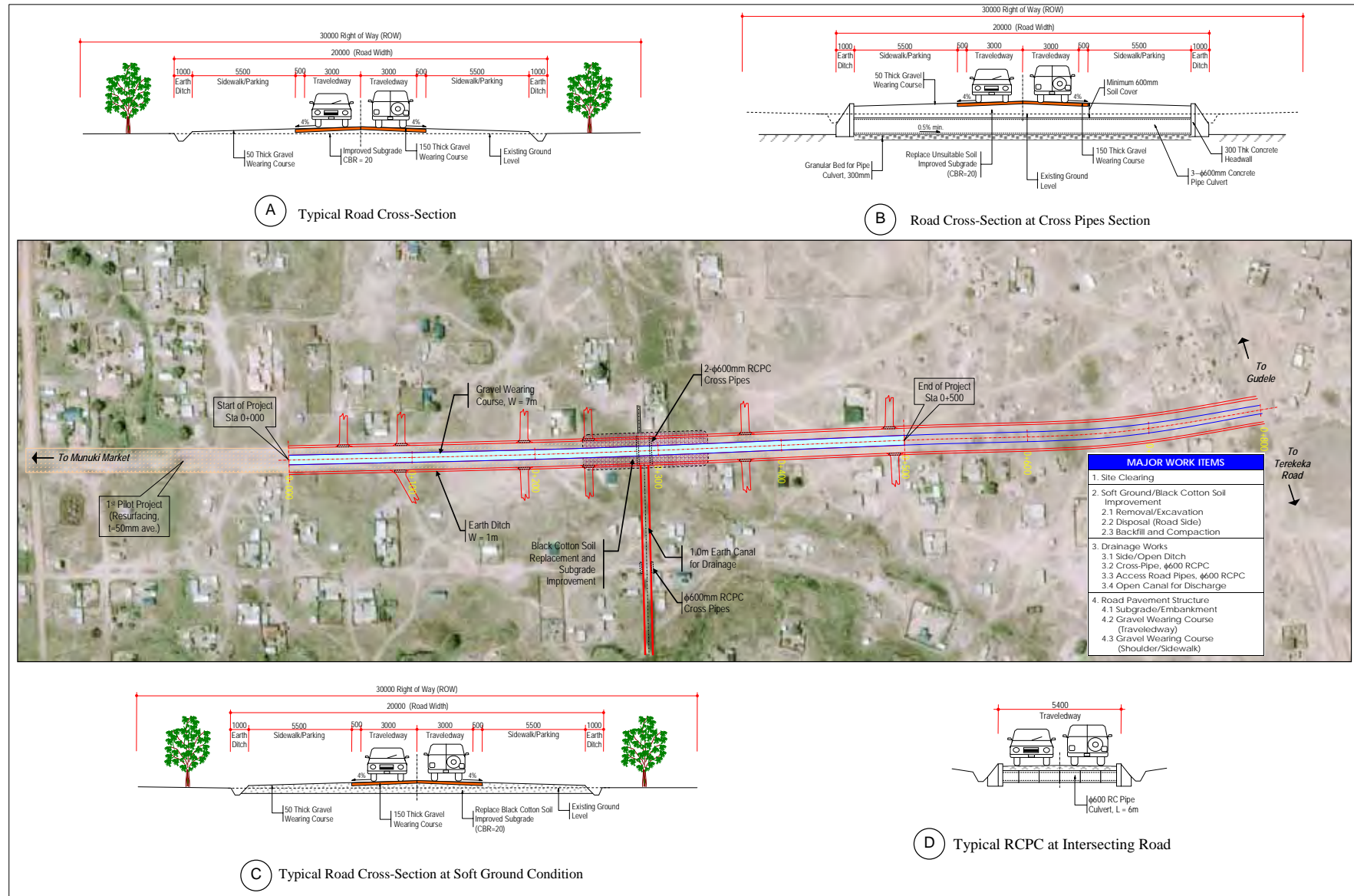


Figure 25.3.3-2 General Plan and Cross-Sections

25.3.4 Construction Planning

(1) Work Activities and Supervising

The construction works planned in the 2nd Pilot Project are as follows.

- Mobilization and demobilization
- Excavation of side ditches: 830m × 2 except ways for accesses to village
- Site clearance
- Removal of black cotton soil
- Placing of four culverts: Culverts for a main road : 2 × 18m
Culverts for a village road : 2 × 10m
Culvert along a main road: depends of time schedule
- 10m road with ditches from a main road to a stream flowing through village
- Gravel wearing course: 150mm at a travel way and 50mm at shoulder/side walks

The original planned schedule including work activities of this project are as follows:

Work items	Feb	March		April		May		June		
	30	15	30	15	30	15	30	15	30	
All schedule (Plan)	[Solid black bar from Feb 30 to May 30]									
Mobilization	[Dotted black bar from Feb 30 to Mar 15]									
Side ditches	[Solid black bar from Feb 30 to Apr 15]									
Site clearance	[Solid black bar from Mar 15 to Mar 30]									
Removal of black cotton soil	[Solid black bar from Mar 30 to Apr 15]									
10m Community road with culverts, ditches	[Solid black bar from Apr 15 to Apr 30]									
Culvert across main road	[Solid black bar from Mar 30 to Apr 30]									
Culvert along main road	[Solid black bar from Apr 15 to May 15]									
Gravel wearing course	[Solid black bar from Apr 15 to May 15]									
Demobilization	[Solid black bar from May 15 to May 30]									
Survey (measuring)	[Solid black bar from Feb 30 to Mar 15]									
Inspection of works	[Solid black bar from May 15 to May 30]									
JICA Team Schedule	[Solid black bar from Feb 30 to May 30]									
JICA members	[Solid black bar from Feb 30 to May 30]									
Local consultant	[Solid black bar from Mar 15 to May 30]									

Figure 25.3.4-1 Original Planned Schedule

(2) Traffic Management Planning

Traffic management during construction work will be done in two stages to avoid accidents between vehicles and workers while sustaining the existing traffic. One is the control of traffic along the main road for villages at the stage of excavating ditches, and the other is the control of traffic on the main road to lead them to a detour road at the stage of earthworks like removal of black cotton soil, culvert works and pavement works done on the main road. The traffic management at the two stages is discussed below.

Stage-1

During ditch excavation work the vehicles have to go and come between the main road and access roads in the village over the unconstructed ditch parts. A foreman or a time-keeper watches the vehicles passing over ditches to avoid danger.

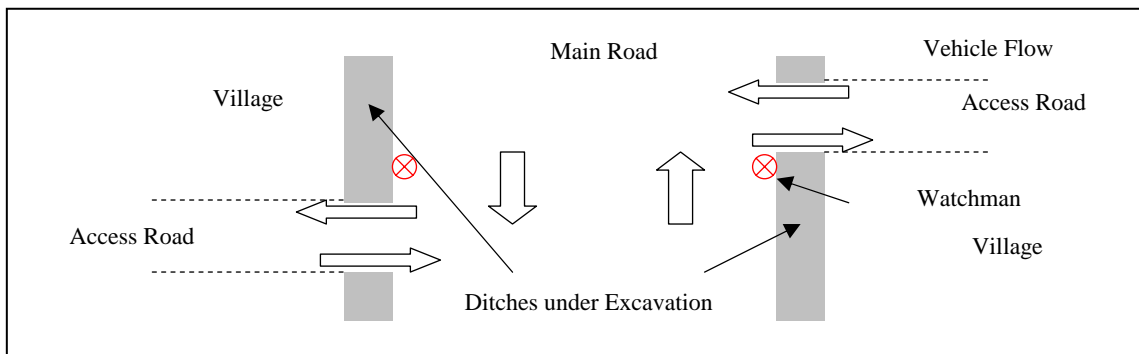
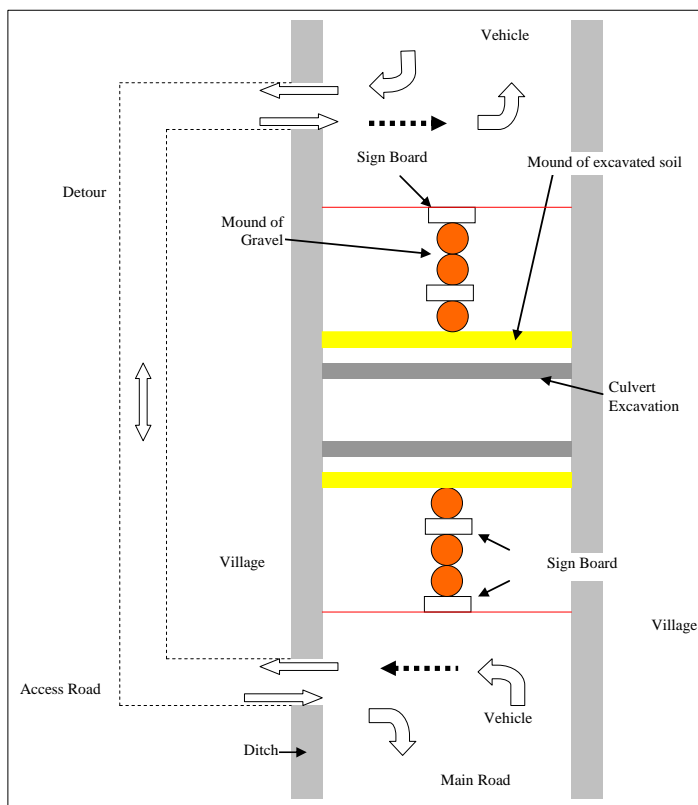


Figure 25.3.4-2 Traffic Control During Ditch Excavation

Stage-2

During excavation for culverts or removal of black cotton soil, the traffic is diverted to detours. Three steps as shown below is carried-out:

- Installing of sign boards in front of construction sites on both sides of the main road,
- Setting of mounds of gravel for road pavement to show the construction works is going on to drivers, and
- Mounds of excavated soil as barricades in line with culverts to shut off the vehicles completely.



Barricade by earth and sign boards



Sign board

Figure 25.3.4-3 Traffic Control During Culvert and Black Cotton Soil Excavation

(3) Survey Works

There are two object roads. One is a main road with a length of 500m, and another is a 10m road with ditches for drainage of water from a main road. Survey work will be done along a main road and a 10m road. In this survey the JICA Team plans to confirm the extent of a black soil area and to train pilot project participants on leveling survey.

25.4 PROJECT EXECUTION

25.4.1 Project Organization and Administration

The MOPI is the main organization for construction implementation and supports the administration of the CCG. The Munuki Community helps recruiting people from the residents of the community. The JICA Team covers technical supports, supervising and fund support. CCG is the main organization that implemented the project and the detailed organization chart is as shown.

The CCG members consist of six staffs from the MTR, the MOPI and the Community. The role of each staff is as follows:

- 25 people of unskilled workers, a foreman and two skilled workers for masonry work were recruited from local community.
- Two time-keepers concurrently in charge of survey work were from MOPI and operators of equipments were hired from a contractor and MOPI.

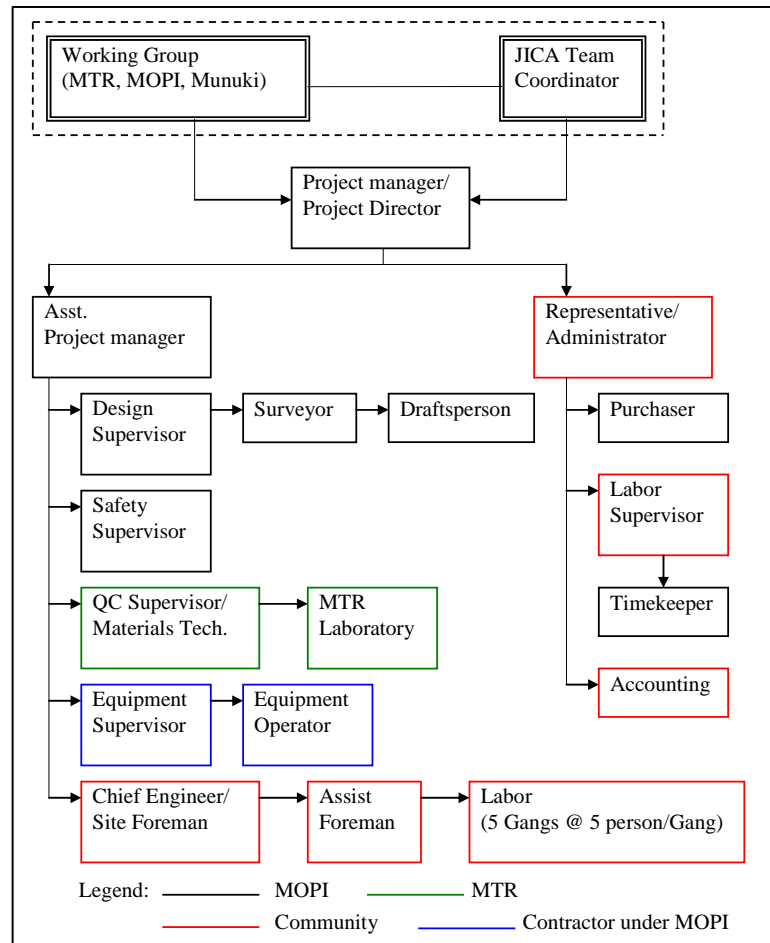


Figure 25.4.1-1 CCG Organization

Throughout the construction period, the CCG supervised and managed the construction works by itself as guided by the MTR and supported by the JICA Study Team. The representative of the CCG was assigned from Munuki Community, but the project manager was assigned from the MOPI.

25.4.2 Project Execution and Supervision

(1) Start and Setting-up

Construction work started with excavating of ditches with a width of 1m on both sides simultaneously along the road on February 18th after the work shop in Munuki Community on the 16th. The beginning point (BP) of the 2nd Pilot Project is the ending point (EP) of the 1st Pilot Project.

(2) Schedule Management

The JICA Team recommended that schedule management would be implemented by the CCG in accordance with the schedule shown in weekly Monday meetings. But the schedule management was not done properly by the CCG during construction.

(3) Labor Recruitment and Management

The CCG recruited 25 people for unskilled works, a foreman and two people for skilled works, totaling 28 people as necessary for construction from the local community (Munuki Payam). They were under the administration of the CCG. The wage per day is 25 SDG per person working 5.5 days in a week from Monday to Saturday. Working hours on Saturday was half day. Two time-keepers maintained the record of attendance and then payment was done on Friday. Payment for skilled/unskilled workers and other expenses were controlled by the administrator of the CCG. Two skilled workers for making culvert masonry walls who had the same experiences 1st Pilot Project were recruited partially.

(4) Procurement and purchasing

All materials, tools and administration supplies necessary for the construction were purchased by the CCG, using the fund from JICA Team. Culverts were produced in several factories to carry the construction works on time.

(5) Equipment scheduling and management

Equipments such as grader, a water tank and loader were rented from some contractor in accordance with the schedule of construction works. A backhoe and a roller belong to other Directorates which enabled construction easier. The backhoe and the roller operators were hired from the contractor or the MOPI. Therefore the CCG paid them the wages as incentives.

(6) Construction safety management

Construction safety has four aspects – (a) safety from vehicles passing the road, (b) safety from equipments at work, (c) human error itself during earth and culvert work, and (d) prevention from theft.

Vehicles can be easy to control when using sign boards, a mound of soil in line or tapes. But the equipments used in the construction site are difficult to control because the direction and speed of the equipment have to be controlled by the operator. Operators of the equipment have no full sight from the seat. Therefore it is necessary to make a rule between a driver and a worker, for example, workers should not approach the equipment without notice to the driver.

The third one is accident from human error. Workers use picks when excavating ditches, so an interval between the workers should be kept without fail. In the construction site, this instruction was kept strictly and team leader had kept it.

The fourth one is prevention of loss or damage of equipments or tools caused by robberies. Therefore tools were kept in a cottage with keys behind a shop beside the project site. As a result, no accident was recorded in the 2nd Pilot Project.

(7) Weekly Meetings

Regular CCG meetings for reporting the construction progress, discussing technical and various matters and holding accurate information in common in every aspect of implementation were held normally at 10:00am every Monday morning.



Photo 25.4.2-1 Survey Practice on Site

(8) Survey Works

From February 24 to March 1, the JICA Team instructed workers of the MOPI on the survey at the road project. Specific items of the instruction are alignment survey and leveling survey of the main road, ditches and 10m road with drainage as on-the-job training. Two staffs from the MOPI and the community were given practice in survey works. In this survey, the JICA Team confirmed the extent of a black soil area.

25.4.3 Project Monitoring and Control

(1) Monitoring Time/Work Schedule-Planned vs. Actual

The national election for president and other representatives in the Northern and Southern Sudan did not affect on construction progress, and the construction itself have progressed smoothly by the CCG except for gravel pavement work.

The construction was delayed for about two weeks because of the corrective work of gravel wearing-course was undertaken. A rough inspection had found that the thickness at edges and gradients in cross sectional direction of a main road did not satisfy the standard cross section of

the gravel pavement as planned. The corrective work was done after an elevation survey by the JICA Team that showed the necessary volume of supplemental gravel material.

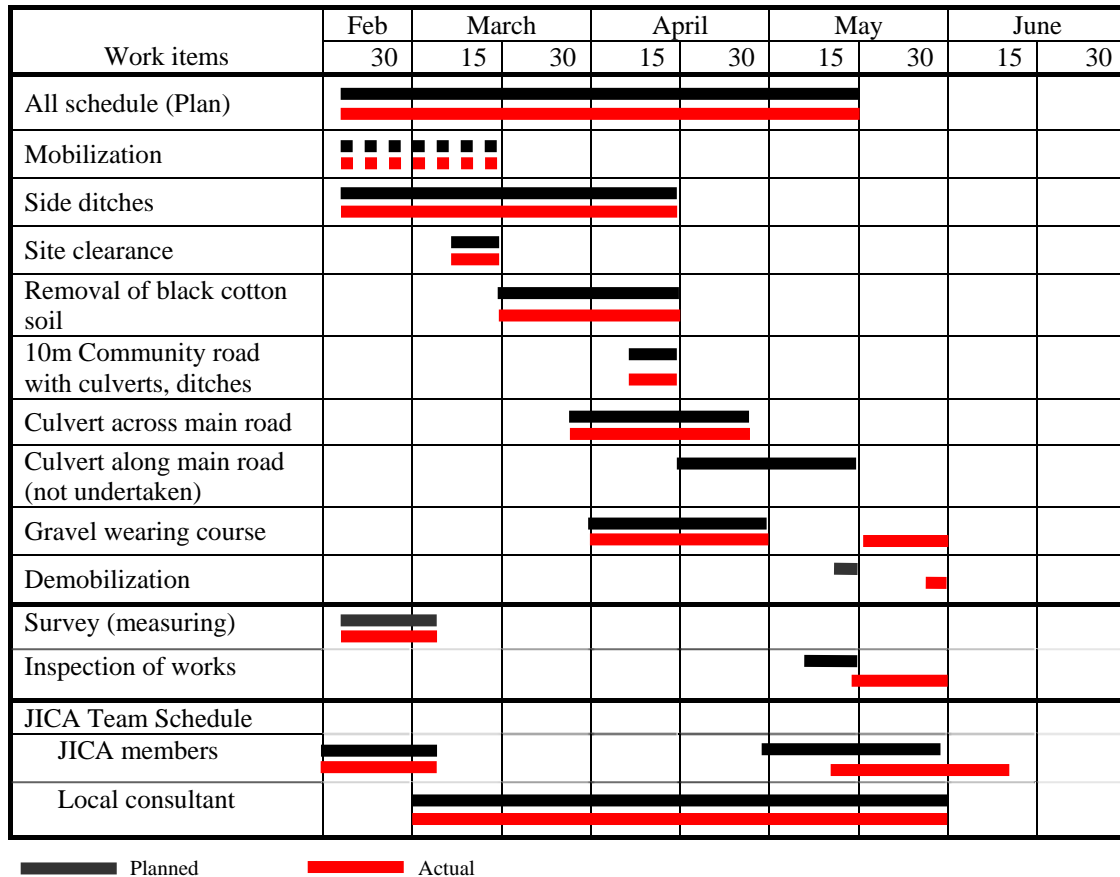


Figure 25.4.3-1 Planned and Actual Schedule

Construction works for the remaining culverts along the main road (for intersecting roads) were not implemented because of lack of time to complete the pilot project within the allowed period.

The major equipments used for the construction are a motor-grader, a road roller, a backhoe and trucks carrying culverts and gravel. The CCG employed about 28 people from the Munuki Community to excavate ditches, make culverts, cleaning site and another labor works for more than three months from February 18th to May 31st.

Unfortunately during the main construction work period, the JICA Team had to leave from Juba because of the national election in Sudan. The only work the JICA Team could supervise was the ditch excavation at the initial stage. In this work, the JICA Team corrected the alignments of ditches and practiced a detailed leveling survey of the main road and the 10m road serving both as a on-the-job training for CCG members and information for construction.

During the second stage, the JICA Team could inspect the initial completion of the road and culverts condition and suggested the CCG/MOPI to correct the defect of the gravel pavement cross section which had been constructed and bring it to the standard cross section.



Ditch Excavation



Removal of Black Cotton Soil



Site Clearance



Trenching for Culvert



Making Culvert Base



Setting of culvert



Making of Culvert Wing Wall



Construction of 10m Road

Photo 25.4.3-1 Construction Work Activities



Spreading of Gravel



Spreading and Compacting

Photo 25.4.3-2 Construction Work Activities (continued)

(2) Correction of the Wearing Course

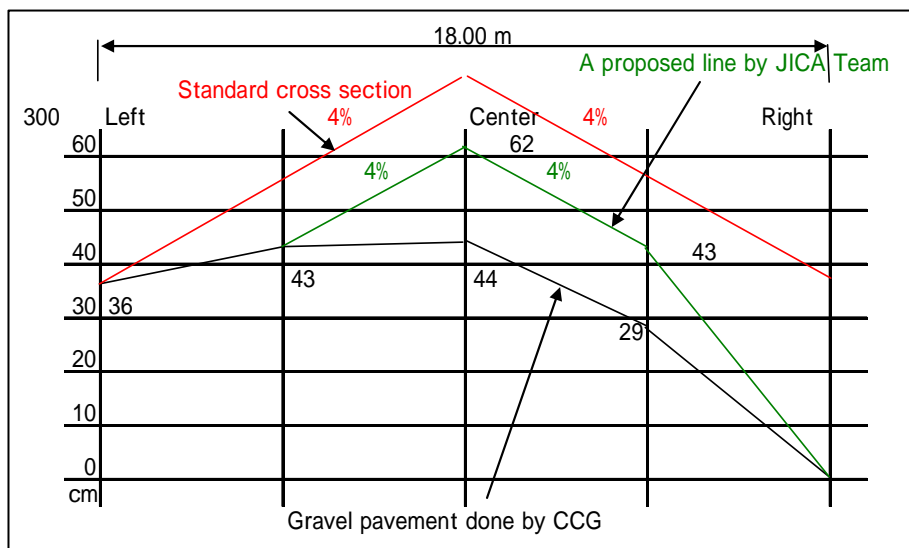


Figure 25.4.3-2 Road Cross-Section During Initial Inspection and Proposed Correction

Figure 25.4.3-2 illustrates the case at 300m point from a beginning point (BP). The black line shows the surface elevation of the gravel pavement done in April. The elevation on the left side was higher, and the one on right side lower. This condition was very far from the standard cross section shown as the red line. The JICA team suggested to correct the road section to the green line because this line could satisfy the standard cross section. The standard cross section shows that the extent of 7m at a center requires a crown with 4% gradient. After the decision to improve the road cross section, the CCG made the adjustment of the gravel pavement work. The JICA Team surveyed to confirm the heights and gradients several stage of construction keeping the new cross sections.

The corrective work was finished by the end of May, but it was 0.5 months behind the original schedule because this work occurred after the inspections of the JICA Team at second stage.



Confirmation Survey



Water Tank and Spreading



Compaction by a Roller



Completion

Photo 25.4.3-3 Correction of Gravel Wearing Course

(3) Monitoring Work of Accomplishment of Culverts

Figure 25.4.3-3 shows the results of the survey of elevations. However, the bottom heights of culverts at the northern ditch (about 100m distance) are same, so a water flow at heavy rainfall would not be sufficient. After discussing with the CCG, the JICA Team judged that the ability of flow is not sufficient but water by normal rainfall would be drained except in case of an extreme rainfall, and decided not to reconstruct them considering of a lack of construction period as well. The parts of the ditches on both corners higher than the bottom heights of culverts were re-excavated again.

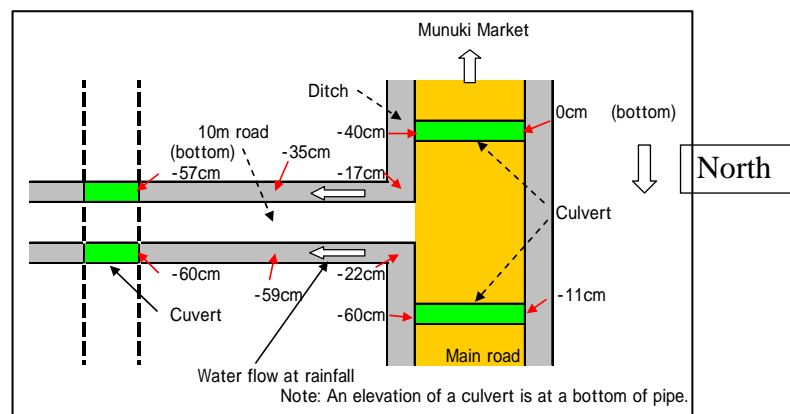


Figure 25.4.3-3 Heights of Pipe Culverts and Ditches

(4) Monitoring Cost and Budget Control

All cost or expenditures including administration and labor cost, materials, tools, fuels, equipment rental cost, office supplies and so on were managed by recording the cash flow by an accountant in the CCG.

The summary of expenditures is as follows. The actual cost of the 2nd Pilot Project is US\$121,921. This means fund had been used accordingly.

Table 25.4.3-1 Project Cost (Expenses)

Category	Items	Amount (US\$)	Remarks
CCG	Administration Cost	14,846	
	Foreman, Labor, Operator & Security	23,704	
	Fuel for Equipment & Rental	11,240	
	Office Stationary Goods	3,210	
	Material Test	255	MTR Laboratory
	Survey Works	800	
	Sub-total	54,055	
Materials	Gravel	46,366	
	Backfill	7,308	
	Cement	1,225	
	Masonry Stones	1,096	
	Sand	932	
	Aggregate	742	
	Pipe Culvert	8,654	600
	Water	107	
	Small tools / Hand tools	1,049	
	Others	387	
Sub-total	67,866		
Total		121,921	

(5) Quality Control and testing-field and laboratory test performed

(a) CBR Tests of the original road surface before gravel pavement work

CBR Tests was conducted using the soil taken from three places (two BP sides and inside of the black cotton soil area) on February 12, 2010 by the MTR laboratory with the results shown in Table 25.4.3-2.

Table 25.4.3-2 CBR Test Results

Location	Average value
BP+230	5
BP+250	5
BP+270	32

From the above results, the JICA Team decided to replace the black cotton soil up to 30cm depth from the surface and recommended that the thickness of gravel in the 7m travelway for the main road to be at least 15cm.

(b) Grain Size Analysis of Gravel

Table.25.4.3-3 Grain Size Analysis of Gravel

Sieve Size	Weight Retained	Weight Accumulated	Percent Passing	Type 1	Type 3
37.5		3,000	100	100	100
25.0	160	2,840	94.7	80-100	85-100
9.5	1,140	1,700	56.7	55-100	55-100
4.75	618	1,082	36.1	40-60	35-90
2	345	737	24.6	30-50	22-75
0.475	158	579	12.2	15-30	15-50
0.075	127	452	9.8	5-15	10-40
<750	452	-	-	-	-
Total	3,000				

From the grain size analysis of gravel, this gravel turned out to be located in Type 1, and it is classified as clayey sandy gravel.

25.4.4 Completion and Reporting

(1) Project Completion, Final Inspection, Punch Listing and Rectification

Before the project started, a work execution plan is made by the CCG to ease the execution of construction, shorten periods of construction works and reduce the project cost. Therefore the JICA Team recommended the CCG to prepare the work execution plan including the following documents and guided the CCG through instruction on how to make such documents. But the counterparts still need to improve their skills in this aspect.

- Working plan in accordance with work items and a flow chart of progress,
- Choosing equipments suitable for quantity and work conditions,
- Quality control plan,
- Procurement plan of workers, equipments, materials and transportation,
- Design and allocation plan of temporary facilities,
- Site organization plan,
- Budget plan for execution, and
- Safety control plan.

(2) Progress report

After returning from Japan, the JICA Team reviewed the progress done during the construction period, but the records of start/finish day, operating hours of equipments, achievement contents and so on does not exist in the data of CCG.

The construction works in progress should be monitored one by one depending on their progress. The records of works are very important, therefore the items regarding the progress like output, procurement, cost, quality, equipment operating hours, labor hours and workmanship of works at that time should have been kept.

(3) Project Completion Report

The JICA Team also recommended the CCG to assemble the necessary data and prepare the project completion report including the following documents. However, it is noted that the project counterparts still need much improvement in preparing such documents.

- Design drawings including standard specification, shop drawings,
 - Photos record collectors at each construction work,
 - Accounting documents,
 - Progress of construction work using charts and others,
 - Quality control charts and records,
 - Productivities of equipments and manpower,
 - Inspection records by CCG/MOPI and other authorities,
 - Safety management, and
 - Other documents

Moreover, to maintain the road in good condition the implementation of periodic activities as shown below is required, and then it is desirable that the CCG shows how to implement these items in other documents.

- Periodic patrol on foot to observe the road carefully,
- Emergency patrol after extraordinary weather to confirm the damaged places,
- Resurfacing with gravel every 6-12 months to smoothen traffic surface and diminish puddles,
 - Existing gravel wearing course material is best for supplement.
- Dredging up of mud in ditches and culverts, and
- Repairing of walls of culverts.

25.5 PROJECT EVALUATION AND FEEDBACK

25.5.1 Evaluation Method for 2nd Pilot Project

The 2nd Pilot Project, which was executed by the MOPI thru the CCG, started on February 17 until May 31, 2010. The 2nd Pilot Project is evaluated based on the criteria and method outlined in Table 25.5.1-1, considering its purpose to strengthen the capability of the MOPI on periodic maintenance of gravel road.

Table 25.5.1-1 2nd Pilot Project Evaluation Criteria and Method

Evaluation Criteria	Description	Evaluation Method	Target Group
1. Relevance	<ul style="list-style-type: none"> Consistency of 2nd Pilot Project purpose and overall goal with the road development and maintenance policies of MTR, MOPI and the Juba Urban Transport Infrastructure Master Plan and the needs of the local community. 	<ul style="list-style-type: none"> Questionnaire Interview Discussion with Working Group and CCG Review of CCG Reports Project Site Visit 	<ul style="list-style-type: none"> MOPI MTR Munuki
2. Effectiveness	<ul style="list-style-type: none"> Assessment of the extent of the 2nd Pilot Project achievement considering the purpose and target output of the project 		<ul style="list-style-type: none"> MOPI MTR Munuki
3. Efficiency	<ul style="list-style-type: none"> Analyzing 2nd Pilot Project efficiency with emphasis on the relationships between outputs and inputs in terms of timing, quality and quantity 		<ul style="list-style-type: none"> MOPI MTR
4. Impact	<ul style="list-style-type: none"> Assessing the impact of 2nd Pilot Project considering the positive and negative influences made by the project 		<ul style="list-style-type: none"> MOPI MTR Munuki
5. Sustainability	<ul style="list-style-type: none"> Project sustainability is assessed from MOPI organizational, technical and financial aspects based on the extent to which the achievements of the projects are sustained or expanded after project completion. 		<ul style="list-style-type: none"> MOPI MTR

The project evaluation is done considering the achievements of capacity development for the MOPI staff and the execution of the road maintenance project. The evaluation is conducted during the course of execution of the pilot project and after completion of the project thru discussions, site observation, interviews/questionnaire and review of the reports by the MOPI and the CCG.

It should be noted that the 2nd Pilot Project was carried-out as a continuation of the 1st Pilot Project on a limited time and budget. In such case, the pilot project is terminated when:

- the budget is exhausted, or when
- the project duration is reached.

The project evaluation is then done considering the above limitations of the 2nd Pilot Project with the main target group being the MOPI and secondary group being the MTR and the community.

25.5.2 Project Relevance

The project relevance is viewed from the points of consistencies of the project overall goal and purpose with the road development policies and needs of GOSS and CES, the capacity development needs of the MOPI, the recommendations of the Juba Urban Transport Infrastructure Master Plan and the needs of the community for better mobility and accessibility.

The present condition of the road network in Southern Sudan has been a major impediment to its economic growth affecting the daily social and economic activities of the people. There are many reasons for the present state of the roads and the lack of road development and maintenance, aside from negligence due to long running civil war. Among a few reasons include lack of funding, inadequate and uncoordinated planning and inadequate technical capacity (lack of trained and skilled personnel and absence of private sector investments). In this regard, the objectives of the “Transport Sector Policy” of the MTR, GOSS (and consequently with the States) for the Road Infrastructure is to “maintain, rehabilitate, improve and construct roads in order to ensure accessibility and minimize the road transport costs”. Together with this policy, the “Strategic Plan for the Road Sector” focuses in addressing the training and professional development needs with immediate targets for road development and maintenance thru in-service and on-the-job-training.

Moreover, more than 90% of the collector and local roads in Juba urban area are in the state of poor to bad condition, affecting the lives of the communities. Improving and maintaining these roads will in general enhance the daily lives of the people. On the contrary, the MOPI who is tasked to handle these road classes lacks the exposure to handle road rehabilitation and maintenance and thus the need to improve their capacity.

The 2nd Pilot Project is thus consistent with the road development policy and needs of the MTR (including the States, the MOPI) and the needs for capacity development of the MOPI. In addition, the project is consistent with the JICA Study “Juba Urban Transport Infrastructure” Master Plan which recommends road development and road maintenance and identifies the need to improve and strengthen the capability of the MOPI in road maintenance.

Moreover, the execution of the road rehabilitation for gravel road pavement in Munuki Payam is consistent with the Payam’s objectives to improve road mobility and accessibility within the community.

However, there is no clear policy and program in the MOPI on how to carry-out road maintenance and how to improve its capacity.

25.5.3 Project Achievement and Effectiveness

The 2nd Pilot Project was undertaken by the Community Construction Group headed by the MOPI who leads the overall execution of the project. The MTR assists in the policy and direction of the project while the JICA Team guides the MOPI in all aspect of the project. The project achievement is evaluated based on the performance of the MOPI counterparts in

undertaking the pilot project activities. Table 25.5.3-1 presents self evaluation of the pilot project effectiveness for skills and knowledge gained by the MOPI and the MTR.

**Table 25.5.3-1 Evaluation of Pilot Project Effectiveness by MOPI and MTR
(Self Evaluation)**

Road Maintenance Stage	2nd Pilot Project Activities	MOPI	MTR
Inspection Stage	Site Selection for Road Maintenance Project		
	Existing Condition Inspection		
Planning and Engineering Stage	Coordination with Stakeholders		
	Site Survey		
	Basic Design		
	Cost Estimate		
	Work Scheduling		
	Construction Planning		
Construction Execution Stage	Schedule and Output Management		
	Materials Procurement Management		
	Quality Management		
	Equipment Management		
	Labor Management		
	Site and Safety Management		
	Financial/Budget Management and Control		
	Meeting and Reporting		
Monitoring Stage	Final Inspection at Project Completion		
	Monitoring Project Impact		

Legend:

- Very Much Effective – All competency aspects considered
- Effective - Majority of competency aspects considered
- Somewhat Effective – Need to include more training
- ☒ - Not Effective/Not Sure

However, the observations by the JICA team regarding the performance of the MOPI is discussed in what follows.

(1) Planning and Design

Successful implementation of maintenance works will need proper planning and design. This stage was carried-out by MOPI Roads and Bridge Directorate during the implementation of the pilot project, with the assistance of the JICA Team and the following were noted:

1) Inspection and Road Condition Evaluation

- Lack of Road Inventory Data Base. At present, there is no existing road inventory data base in Southern Sudan and in Juba urban area which makes it difficult for road administrators to prepare an annual maintenance plan and to prioritize roads that needs immediate intervention.
- Need Skills Improvement in Inspection and Condition Evaluation of Roads. Although inspection of project road condition was carried-out by MOPI and MTR with the JICA Team, it is obvious that there is a need to improve further MOPI's capability to

undertake inspection of road condition based on standard procedures and identify the needs for maintenance works. Moreover, due to lack of exposure to road projects, the counterparts' knowledge and experience on road improvement and technology is limited and needs further enhancement.

- Lack of Staff to Perform Survey Works. In planning for maintenance works, it is important to take measurements and survey including road profiles as a basis for designing and assessing the definite scope of maintenance works. However, the MOPI Roads and Bridge Directorate lack the staff that can perform accurate measurements and profile survey on site. Some participants of the pilot project were given training in profile surveying (using Engineer's Level) and measurements of road sections but it is obvious that this aspect has to be improved within the Roads and Bridge Directorate.

2) Design for Road Maintenance and Rehabilitation

- Need Skills Improvement in Design. Basic design for gravel road maintenance considering road cross-section and road structure was done following the MTR's Manual for Design of Pavement and discussed with the Working Group. As a pilot project, the minimum requirements being adopted by the MTR for gravel roads was adopted. However, it is noted that the MOPI is not familiar with the design procedures for gravel roads and its technical specifications. Moreover, the counterparts' awareness on road construction and technology, including road drainage is still lacking.
- Lack of Staff for Drawing Preparation. Although the MOPI Roads and Bridge Directorate has a Planning Department, it lacks the staff to prepare design and construction drawings for the road maintenance.

3) Planning for Road Maintenance and Rehabilitation

- Realizing Planning as an Important Part of Maintenance Work. The MOPI counterparts seem not to put importance in planning maintenance work as an important tool to successfully complete the activities.
- Need Skills Improvement in Planning Maintenance Work Activities. Records of maintenance activities including work productivity is also lacking in the MOPI, so that preparing work schedules, procurement plans, equipment schedule, labor requirement schedule and quality and construction plans is difficult for the counterparts.

4) Cost Estimate and Budget Preparation

- Need Skills Improvement in Cost Estimating. One of the difficult tasks in executing maintenance works is to estimate the probable cost of works and prepare a budget, due to lack of cost data and experience from previous projects.

5) Value Engineering

- Need Skills Improvement in Value Engineering. Given the limited funds for maintenance, MOPI staff should consider value engineering to determine the most appropriate design or technology to be applied to road maintenance works. Moreover,

with the limited budget on hand, only the most urgent repair or maintenance work should be given priority.

(2) Execution of Maintenance/Rehabilitation Works

1) Physical Target

The target scope of the 2nd Pilot Project is periodic maintenance of gravel road are as follows:

Road Project Length	: 500m Gravel Road (original target)
	: <u>330m</u> Resurfacing (additional length to complete road section)
Total Project Length	: 830m
Gravel Wearing Course	: 150mm thick (7.0m wide) for 500m Traveledway 50mm thick for rest of road section (11.0m wide)
Cross Drainage	: 2x18m - φ600mm RC Pipe Culverts for main road 2x10m - φ600mm RC Pipe Culverts for other road
Road Side Drain	: 830m x1.0m wide (2sides) earth ditch for main road 150m (x2sides) earth canal for discharge of storm water to existing stream channel
Subgrade/Ground Improvement	: Replacement of black cotton soil, L ~100m (D=0.3-0.6m)

2) Inspection of Preliminary Accomplishment

The maintenance works was carried-out by the CCG (headed by the MOPI) initially from February 17 until the end of April with the JICA Team being absent for the period from March 6 to May 13. Inspections of the project accomplishment done on May 15 by the MOPI, the MTR and the JICA Team indicated the following observations and countermeasures summarized in Table 25.5.3-2.

Table 25.5.3-2 Inspection Results for 2nd Pilot Project

Items Inspected/Observations	Remedial Measures
1. Road Structure	
<ul style="list-style-type: none"> ▪ Gravel Material <ul style="list-style-type: none"> - testing results for quality of gravel materials thickness is less than 150mm 	→ Check results of Sieve Analysis and other properties by MTR laboratory. If materials do not conform with requirements, obtain from other sources. Check material optimum moisture content and maximum dry density.
<ul style="list-style-type: none"> ▪ Main Traveledway (7m) <ul style="list-style-type: none"> - thickness is less than 150mm, some sections have no gravel 	→ Place additional Gravel Wearing Course (150mm)
<ul style="list-style-type: none"> ▪ Sidewalk/Parking <ul style="list-style-type: none"> - thickness in some areas is less than 50mm, some areas have no gravel 	→ Place additional Gravel Wearing Course (50mm)
<ul style="list-style-type: none"> ▪ Compaction <ul style="list-style-type: none"> - Verify in-situ compaction density to be 95% of maximum dry density 	→ Check compaction, in-situ density test, etc.

2. Road Cross-Section and Profile
 - Cross-Slope
 - Road cross-slope is less than 4% → Adjust cross-slope to 4% by regarding
 - Road Profile
 - Elevation of some areas need to be adjusted → Adjust road profile by regarding and additional gravel
3. Drainage Works
 - Earth Ditch
 - Some sections need reshaping, removal of soil blockage and water ponding and adjustment of level → Reshape and remove soil blockage, ponding and adjust levels
 - RC Pipe Culvert
 - Outlet of cross-pipes are silted → Clean cross-pipe outlet
 - Additional RC pipe culverts needed for intersecting roads → Place additional pipe culverts, if budget will allow (priority is gravel road)
4. Black Cotton Soil Area
 - On average, only 0.30m thickness of black cotton area replaced → Observe subgrade, may need to remove and replace more black cotton soil – could be future work for MOPI.
 - Swelling of subgrade observed near cross-pipe



Figure 25.5.3-1 Results of 2nd Pilot Project Inspection (15 May 2010)

3) Evaluation of Performance

- a) Need Skills Improvement in Interpreting and Implementing Design and Construction Plans. The pilot project basically calls for 500m of road rehabilitation to gravel road standard. However, the MOPI initially failed to comply with the requirements of the plans and drawings regarding the gravel structure and road section. Instead of focusing on 150mm thick gravel road for 500m long section of the road, the gravel was extended to 800m length of the road with average thickness of 50mm or less. Moreover, there was no crown in the road section and the 4% required slope was not complied with.

Moreover, there is still a need to improve the MOPI's skills understanding MTR technical specifications and implementing such in road maintenance works.
- b) Need Skills Improvement in Schedule and Output Management. The MOPI was asked to monitor the schedule and output of the pilot project work activities. However, recording and monitoring activities and activity outputs were not properly done with inputs and outputs not monitored. Sufficient skills in work scheduling, quantity survey and output measurement and preparing work accomplishment reports are still lacking.
- c) Need Skills Improvement in Materials Procurement and Management. Although purchase of materials for pilot project works are easily handled by the MOPI counterparts, knowledge and skills in materials specifications (especially gravel) and preparing procurement schedules are still lacking. At present, procurement of construction materials in Juba is one critical factor that affects the project schedule since uncommon materials are purchased on a per order basis so that sufficient lead time should be considered in procuring such materials.
- d) Need Skills Improvement in Site Quality Control. After the initial inspection of the pilot project output, many defects in quality and workmanship were observed. For instance, (a) the gravel pavement was executed without consideration of the crown or road cross slope which is very important for longer life of gravel road, (b) the thickness of gravel wearing course is much less than what is planned and in some areas, there is almost no gravel surface, (c) profiles and elevations of drainage ditches and pipe culverts were not carefully monitored which causes lack of down slope for proper drainage of storm water, (d) excavation and replacement of black cotton soil is not deep enough to avoid the effects of such soil, and (e) there is no checking of quality of workmanship like compaction, road cross-slope and profile, deviation in required thickness of gravel wearing course, grading of gravel materials, etc. This indicates that quality control should be a major subject in capacity improvement.
- e) Need Skills Improvement in Equipment Management. The MOPI does not have any working equipment at the moment and all of the MTR's equipment is being utilized in other projects. However, the pilot project was able to source out an Excavator with back Loader and a Roller Compactor from other Directorates but the project is forced to hire equipment like grader and loader. During the project execution, the MOPI does not maintain proper records of equipment utilization which makes it difficult to determine the output and productivity of the equipment.
- f) Need Skills Improvement in Monitoring Labor Productivity. Labor was recruited from the Munuki Payam and managed by the CCG to undertake manual work like excavation

of earth ditches for drainage, pipe culvert construction and cleaning/clearing of the road and the ditches. The labor is organized into 5 gangs with each group headed by a gang leader who controls the activities and output of the group. However, the MOPI failed to monitor, record and control the utilization of labor which again makes it difficult to determine the productivity of labor work on site. This made the cost of labor work too high.

- g) Need Skills Improvement in Management and Control of Budget. Funds were given to MOPI to manage and control for the pilot project. The budget is allocated for the expenses of the CCG including management, labor wages and insurances, fuel, office supplies and equipment rental and for the purchase of materials. Although the MOPI recorded the expenses, the counterparts failed to monitor the expenses against budget which tends to overspend on some items.
- h) Site and Safety Management. The pilot project was undertaken without any untoward incident and accidents. Information signs and traffic rerouting plans were carried-out during project execution. However, policy and program for accident prevention and emergency measures should be improved.
- i) Need Skills Improvement in Facilitating Meetings. The Working Group and the CCG meetings were normally held on Mondays to discuss the activities of the previous week, the week's schedule and technical matters related to the project. The MOPI counterparts chaired the meetings but most of the time fails to focus on important items to discuss, sometimes proceeding without an agenda that leads to long meetings without much direction.
- j) Need Skills Improvement in Preparing Project Reports. It is observed that the MOPI counterparts lack the skills in preparing weekly or monthly accomplishment reports of the project.
- k) Coordination with the Community and Stakeholders. The MOPI counterparts were able to counteract and deal properly with the community and the stakeholders. The community was properly informed about the project and interaction with the stakeholders is very positive.
- l) Need Skills Improvement in Project Inspection After Completion. The MOPI counterparts need to improve the skills in inspecting the project after completion if it complies with the design and specification requirements and identification of countermeasures for defects.
- m) Monitoring Project Impact. Project impacts (positive and negative) were satisfactorily monitored by the MOPI during construction and after completion.
- n) Effectiveness of the CCG. Policy, project direction and technical supports were provided by the MTR in the CCG with the JICA Team providing support. Project execution is a partnership between the MOPI and the Community with MOPI taking the lead role. However, although the CCG is considered to be effective, it still lacks cohesion as a group, especially the working relationship between the MOPI and the MTR.

4) Pilot Project Contribution to Munuki Community

a) Employment Generation in Munuki.

28 labors were directly hired from Munuki Payam as follows:

Labor Category	Salary/Day (US\$/day)	Work Activities	Remarks
1 – Labor Supervisor	13.00	<ul style="list-style-type: none"> • Manual excavation of drainage ditch, • Clearing & Cleaning • Pipe Culvert Construction 	The Munuki labor team is involved in the project for a total of 3.5 months.
1 – Overall Foreman	13.00		
1 – Timekeeper	13.00		
5 – Gang Leaders	13.00		
20 – Unskilled Labor	10.00		
Total Wages paid for Munuki Labor		US\$ 21,655.00*	

*Excludes wages for Equipment Operators

b) Contribution to Local Economy in Munuki

The following materials, tools and fuel were purchased directly from Munuki market:

Particular	Cost (US\$)
Materials for Culverts (Cement, Sand, Gravel, Masonry/Stones)	4,102.00
Small Tools and other Items	4,646.00
Fuel	1,873.00
Total	10,621.00

5) Pilot Project Completion

Figure 25.5.3-2 shows some of the 2nd Pilot Project road sections before and after execution of the road maintenance/rehabilitation works.

Before



After



Black Cotton Soil Area



Cross-Pipe Drainage Area



End Point of Pilot Road Project



Local Road and Open Drainage Ditch to Stream

Figure 25.5.3-2 Completion of 2nd Pilot Project

25.5.4 Project Efficiency

The project efficiency is evaluated in terms of appropriateness and sufficiency of project inputs and its relationship with the project outputs as follows:

(1) Project Inputs

- Project Participants

The following participated as inputs to the 2nd Pilot Project:

MOPI/CCG	: 1-Construction Engineer, 1-Planner, 1-Administrator, 1-Technician
MTR	: 2-Engineers
Munuki	: 1-Labor Supervisor, 1-Foreman, 1-Timekeeper, 2-Skilled Worker, 1-Security
	: 5-Gang Leaders, 20-Labor
JICA Team	: 2-Members

- Project Budget. The project is designed to support the MOPI Roads and Bridge Directorate capacity development by executing periodic maintenance/rehabilitation of gravel roads. The project budget is limited to US\$150,000 which targets about 500m of gravel road rehabilitation. Due to the high cost of construction in Juba, the project was executed focusing on 7m wide gravel road to 150mm thickness. However, the road was extended by 300m with less gravel surface until the end of the road and additional cross-culverts and side ditches.

Table 25.5.4-1 Summary of Budget and Expenses

Item	Budget in US\$	Expenses in US\$
1. CCG		
1.1 Administration/Management	19,000.00	14,846.00
1.2 Wages for Labor	23,000.00	23,704.00
1.3 Fuel, Equipment Rental, Others	<u>13,000.00</u>	<u>15,505.00</u>
Sub-total	55,000.00	54,055.00
2. Cost of Materials		
2.1 Gravel Materials	60,000.00	46,366.00
2.2 Select Fill Materials	13,000.00	7,308.00
2.3 Culvert Materials	20,000.00	12,756.00
2.4 Others	<u>2,000.00</u>	<u>1,436.00</u>
Sub-total	95,000.00	67,866.00
Total	150,000.00	121,921.00

The project budget was not spent entirely when the target completion date was reached due to the following factors:

- the project duration is reached and needed to be terminated,
- lack of equipment necessary for project execution which resorted to hiring equipment from contractors and difficulty in fixing the schedule,
- lack of materials supply such as reinforced pipe culverts which needs to be purchased on a per order basis that requires three to four weeks of lead time, and

- the absence of JICA team on site during the national election which causes delay in project execution.
- Timing and Duration. Execution of the pilot project is about three months but considering the availability of materials and equipment in Juba, the project duration is too short. Moreover, the national election in Sudan was held in the second week of April which prohibits the JICA Team from physically monitoring the pilot project from March 6 to May 14. This caused the project termination to be extended from May 15 to May 31.
- JICA Team. Two members of the JICA Team (planning and construction) were assigned to plan, monitor and supervise the pilot project. However, restrictions on site mobilization minimized contacts with the counterparts thus limiting technical guidance to the MOPI during project execution.
- MOPI Counterpart Staff. The project requires several counterparts from the MOPI during planning and execution. However, due to other assignments only three staffs (2 Engineers for planning and construction and 1 Technician) were on full time basis. Other counterparts participated only for a short period and are not available to become a member of the CCG Organization. This limited the opportunity to maximize capacity development for MOPI staffs.
- MOPI Equipment. MOPI equipments were not available during project execution due to maintenance and operation problems. However, one unit of backhoe excavator and one unit of roller compactor were sourced from other MOPI Directorate to be used in the project. Other equipment like grader, water truck and loader had to be rented out from contractors which increased the cost of works and affected the schedule since usage depends on equipment availability.

Equipment Input

1 – Excavator/Backloader	- under MOPI, charges include fuel and maintenance
1 – Roller/Compactor	- under MOPI, charges include fuel and maintenance
1 – Grader	- rented out from contractor
1 – Water Truck	- rented out form contractor
1 - Loader	- rented out from contractor

- MTR Counterpart Staff. Two Engineers of the MTR (highway and maintenance) assisted the CCG and gave guidance in terms of project policy, direction and technical aspects. However, due to other work assignments in the MTR, the staffs were sometimes unavailable during the project execution.
- MTR Equipment. It is the intention that in order to minimize project costs, the MTR should provide the equipment necessary for project execution. However, due to other project requirements, the MTR equipments were unavailable necessitating hiring equipments from contractors and thus raising the project cost.
- CCG Member. The community is represented in the CCG by one member from the Munuki Payam which enables the community to know the activities of the pilot project and learn about road maintenance works.

- Community Labor Force. Sufficient number of labor force was sourced from the community thus helping the Payam in employment generation.
- Pilot Project Road Site. The Munuki Payam provided the pilot project road which is the continuation of the 1st Pilot Project road.

(2) Project Output

- Improvement of MOPI Counterparts' Knowledge and Skills in Gravel Road Maintenance.

The MOPI, thru the CCG was able to undertake the pilot project for gravel road maintenance but due to the limitations and constraints in resources including project duration, funds, equipment availability, materials availability and contact with the JICA team, it is assessed that the knowledge and skills gained by the counterparts will need follow-up and further upgrading.

- Rehabilitation of Munuki Road.

About 500m of road in Munuki Payam was rehabilitated with 150mm thick gravel surface wearing course and extended 330m to the end of the road by gravel resurfacing. Additional works include 830m long earth ditches on both sides of the road, 36m cross-pipe culverts on the main road, 150m earth ditch for discharge to the stream and 20m pipe culverts for the access roads. Most of these works were undertaken during the absence of the JICA team, which makes it difficult to control the activities on site. It was observed during the inspection of accomplishment that the MOPI counterparts did not comply with the design and plans in carrying-out the project, as pointed out in the inspection results. Moreover, project challenges including availability of pipe culverts and availability of heavy equipment has made the project output less satisfactory.

- Community Involvement in Road Maintenance.

The involvement of the Munuki Payam in undertaking the pilot project has given the community awareness in the importance of maintaining the roads in their daily life. The pilot project, moreover, has generated employment in the community and has given them an opportunity to work and observe road maintenance/rehabilitation activities. However, given the short duration of the project, the community employment and experience is temporary. The Munuki Payam and the MOPI should give them more opportunity when similar projects occur in the future.

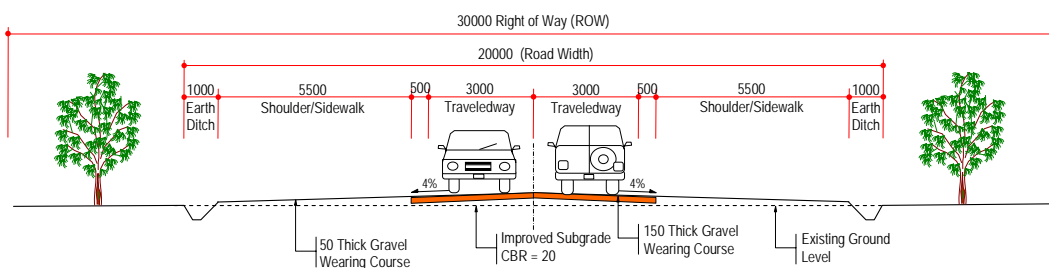


Figure 25.5.4-1 Typical Road Cross-Section

(3) Project Cost Performance

The project is geared towards capacity development for the MOPI case of force account maintenance works. In this condition, the project is evaluated on the cost performance considering resource input and the actual outputs.

a) Gravel Wearing Course

The cost performance is evaluated based on the scope of works and the typical cross-section shown in Figure 25.5.4-1.

Scope of Work for Gravel Surfacing					
Road Section	Length (m)	Width (m)	Area (m ²)	Gravel	
				Thickness (mm)	Volume (m ³)
Traveledway	500	7.0	3,500	150-400	962.5
Shoulder/Sidewalk	500	11.0	5,500	50-150	550
Additional Road Section	300	18.0	5,400	50-200	675

The cost performance is evaluated as shown below.

Cost Evaluation for Gravel Wearing Course					
Road Section	Cost in US\$			Cost/m ²	Cost/m ³
	Materials	Equip't & Labor	Total		
Traveledway	20,405	4,685	25,090	7.17	26.07
Shoulder/Sidewalk	11,660	2,678	14,338	2.61	26.07
Additional Road Section	14,310	3,286	17,596	3.26	26.07

* Only fuel charge on Roller (by MOPI)

b) Subgrade Improvement – Replacement of Black Cotton Soil

The scope of black cotton soil section replacement in the road project covers:

Length of Section (m)	Width of Section (m)	Thickness Replaced (mm)	Total Volume (m ³)
100	18	200-300	450

Similarly, the cost is evaluated as:

Cost Evaluation for Subgrade Improvement					
Road Section	Cost in US\$			Cost/m ²	Cost/m ³
	Materials	Equip't & Labor	Total		
Subgrade Improvement	7,308	3,356	10,664	5.92	23.70

* Only fuel charge on Excavator (by MOPI)

c) Excavation of Earth Ditch for Drainage Works by Labor (Manual)

Ditch excavation is done 100% manually to involve the community in maintenance works and to stress the importance of proper drainage to keep the road in good condition. The scope and cost of ditch excavation covers:

Ditch cross-section	: 1.0m wide x 0.6m deep (V-shape)
Length	: 830m x 2sides
Total Volume	: 450 m ³ (excluding access roads intersection)
Labor	: 5 Gangs at 5 member/gang + 3 Supervisors
Total Labor Days	: 44.5 days at 8hrs per day (9,968 hrs)
Total Labor Cost	: US\$ 12,923.0
Productivity	: 0.045 m ³ /hr/person or 0.36 m ³ /day/person
Cost per m ³	: US\$ 28.72/m ³

d) 600mm ϕ RC Pipe Culverts

Two lines of 18m cross-pipes are installed in the main road and two lines of 10m cross-pipes are installed in the discharge canal leading the stream. The scope and costs of the pipe culverts are as follows:

Size of Pipe Culverts	: Φ 600mm RC Pipes
Length of Pipe Culverts	: 2-18m + 2-10m = 56m

Cost Evaluation of Pipe Culverts for Drainage Works

Road Section	Cost in US\$			Cost/m
	Materials	Equip't & Labor	Total	
60mm ϕ RC Pipe Culverts	12,756	5,486	18,242	325.75

* Only fuel charge on Excavator (by MOPI)

e) Comparison of 2nd Pilot Project Cost Performance with Other Projects

The cost performance of the 2nd Pilot Project is compared to gravel road rehabilitation works which are being undertaken by the MTR for Interstate Roads and the Juba Urban Roads. Table 25.5.4-2 presents the 2nd Pilot Project costs compared with the MTR on-going projects in Juba and the Interstate Roads.

Table 25.5.4-2 Item Cost Comparison for 2nd Pilot Project Cost Performance

Work Item	Unit	2 nd Pilot Project Cost	Other Project Costs*	Remarks
1. Gravel Wearing Course	US\$ /m ³	26.07	(a) 27.50 (b) 23.80	(a) Juba urban roads project (b) Interstate road projects
2. Subgrade Improvement	US\$ /m ³	23.70	(a) 38.70 (b) 33.90	(a) Juba urban roads project (b) Interstate road projects
3. Earth Ditch Excavation	US\$ /m ³	28.72	(a) 18.00 (b) 12.00	(a) Juba urban roads project (b) Interstate road projects
4. RC Pipe Culvert, 600mm Φ	US\$ /m	325.75	340.00	- Juba urban roads project

* Source: MTR

The cost performance of the 2nd Pilot Project indicates that:

- The gravel wearing course unit cost is cheaper than the Juba Urban Roads Project cost but higher than the Interstate Road Projects (outside Juba urban area). This cost can be improved further if the MOPI utilizes its own set of equipment.
- The subgrade improvement and the pipe culverts the costs are comparable and relatively cheaper than the costs of the other projects in Juba.
- On the other hand, the cost of manual excavation (labor intensive) is about 1.6 to 2.4 times that of other projects which is equipment-based. In this case, it will be better to use equipment for excavation works with the assistance of labor doing the trimming and final shaping of excavation.

However, it should be noted that during the execution of the pilot project, the costs of the two equipments (excavator and roller) includes only fuel and maintenance cost which gives a relatively lower cost compared to other projects. It is thus advantageous if the MOPI will have a complete set of equipment for road maintenance that will bring down the costs of maintenance works much cheaper.

Considering the total project cost, the cost per kilometer is calculated using an equivalent 8m wide gravel road (MTR standard for Interstate Road Projects), as follows:

2 nd Pilot Project Cost	: \$121,921.00
Length (m)	: 800
Width (m)	: 20 (18m road + 2m ditch)
Volume of Gravel (cu.m.)	: 2188 @ 150mm thick
Equivalent Length (km)	: $2188\text{m}^3 / (0.15\text{m} \times 8\text{m}) = 1.82\text{km}$
Cost per km	: US\$ 66,990.00/km
MTR Cost per km (8m wide)	: US\$ 90,000-120,000/km

The cost per kilometer of the 2nd Pilot Project gravel rehabilitation is cheaper than the MTR costs for gravel roads. This is because the 2nd Pilot Project covers only partial rehabilitation in terms of the road structure and does not cover road profile adjustment as opposed to full depth gravel rehabilitation in MTR interstate roads.

25.5.5 Project Impact

(1) Attainment of Overall Goal

The overall project goal is to improve the condition of collector and local roads (with about 94% in poor to bad condition) under the jurisdiction of the MOPI through strengthening of MOPI's capacity on road maintenance. In this regard, a pilot project is undertaken for 830m section of gravel road as a case project for the MOPI. The project output yielded the required rehabilitation of 500m gravel road as part of periodic maintenance. Moreover, the project was further extended to the end section by a further improvement of the remaining 330m with less gravel surface.

Since this project is the continuation of the 1st Pilot Project for resurfacing works, the whole section of the road beginning from the Munuki Market and stretching to 1600m until the end was improved. At present, the road section functions as one important road in Munuki Payam with

good road condition. Traffic has been observed to increase drastically after completion of this road section thus improving road transport efficiency in the area and contributes to reducing transport costs. Moreover, mobility and accessibility in Munuki has been improved by this road section.

Although this road section covers only 1.8% of the total collector and local roads in Juba (1.6km out of 88kms of road in Munuki Payam only), it illustrates the importance of improving the road conditions thru proper road maintenance. The pilot project increases the fair to good road surface condition from 4.63km to 6.23km.

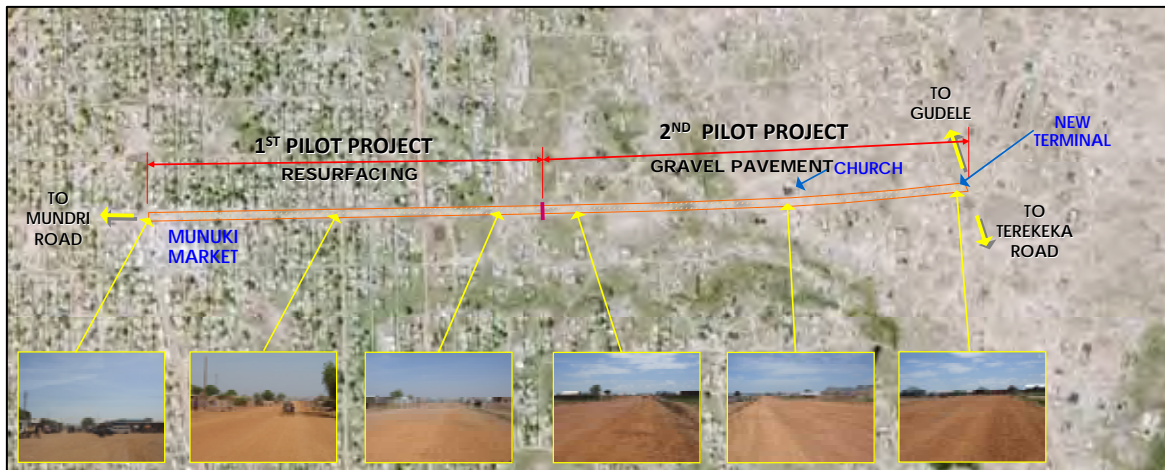


Figure 25.5.5-1 Completion of the 1st and 2nd Pilot Projects

(2) Impact of Pilot Project to Community

The pilot project impact to the community is assessed from the comments and discussions of the MOPI and the JICA Team with the Community directly and indirectly affected by the project. The following positive and negative impacts were noted:

1) Positive Impacts

- Employment Generation. The project, thru the CCG, was able to generate employment in Munuki Community by employing twenty eight (28) persons as labor for a period of about 3 months. This number consists of skilled and unskilled workers who were able to observe and learn road maintenance and construction and pipe culvert installation. The total wages paid to the community labor amounted to US\$ 21,655.00.
- Increase in Business Opportunity for Local Businesses. Materials (like cement, sand, stones, etc.), small tools and food were purchased from the local stores in the nearby area thus increasing their sales during the project execution. The total contribution to local business amounted to US\$ 10,621.00.
- Increase in Mobility and Accessibility. Mobility was greatly enhanced since the road functions as a major north-south route in Munuki after completion. Moreover, accessibility to the market, church, schools, hospital and other community centers in the area was also greatly improved. The black cotton area of the road section which was normally inaccessible during period of rains is now improved by the project and has become accessible in all weather.

Prior to improvement of the pilot project road section, the road condition is very poor and is not passable during rainy season. During this period, the community has to seek other alternative routes to travel from the north section to the south section and to Munuki market. Although this road is only 1.6km in length, alternative routes are longer by about three times this length or about 4.8km which is likewise in poor condition.

Average travel speed in the area before the pilot project is about 10-20km/hr which is improved to about 40km/hr after implementation of the pilot project road. This increase in travel speed translates to about 17 minutes time travel savings.

- Improved Security in the Area. The completion of the pilot project has contributed to improved security since the police can access readily the north-south section of Munuki Payam thru this road project.
- Savings in Transport Costs. Movement and transport of goods and people has been very difficult and costly before the road improvement was undertaken by the project. The completion of the project has made travel distance shorter and vehicle operating and maintenance costs lesser due to better road condition. The road is being utilized at present to transport commercial goods including food, water, construction materials, etc.

A simplified analysis of the benefit of the road section improvement is calculated based on the time savings cost and savings in vehicle operating costs of Chapter 19, as follows:

Road Section Length : 1.6km
 Detour Length Without Project : 4.8km (average)

Table 25.5.5-1 Cost Benefit of 2nd Pilot Project

Vehicle Type	PCU/day (Approx.)	Vehicle-Km. Savings/Day	Vehicle-Hr. Savings/Day	Operating Cost Savings (US\$)	Time Cost Savings (US\$)	Total Savings/Day (US\$/day)
Motorcycle	150	480	42	20.16	52.58	72.74
Car	70	224	20	40.32	77.02	117.34
Bus	20	64	6	9.15	68.03	77.18
Truck	30	96	9	29.18	4.37	33.55
Total				98.81	202.00	300.81

Considering the daily savings in transport costs of US\$ 300.81, the road users in the Munuki community can derive an annual benefit of about US\$ 109,796 per year (at present prices) which can translate into cheaper costs of goods.

- Improvement of Supply of Basic Needs. The completion of the whole pilot project road has improved much the supply of water in the area which was very difficult to when the road is still inaccessible.
- Improvement of Public Transport. Before completion of the pilot project, people residing in the north area have to walk to the Munuki Market to take the public transport. However, with the completion of the road project a new public transport terminal is established at the north end of the road.
- Better Drainage. Road drainage is physically non-existent in the project road before the 1st and 2nd Pilot Projects. After completion of the project rain water is properly drained

and conveyed to nearby streams by side ditches and cross-pipe culverts, thus eliminating flood on the road.

2) Negative Impacts

- Traffic Safety Concern. Better road condition in Juba has led to faster vehicle speed which contributed to higher traffic accident rates. This concern has to be addressed by proper authorities, including Police and Traffic Agency, thru better traffic education and campaign and strict traffic law enforcement.
- Flooding of House Near the Stream. The road drainage system was improved during the pilot project, bringing rain water to the nearby stream. A resident, living in the low area beside the stream complained about flood during rain due to concentration of rain water discharge from the drainage system. This concern has to be addressed by the MTR, the MOPI and Munuki Payam by studying the overall drainage in the area and improving the cross-sections of streams and rivers. The matter has been conveyed by the MOPI to the Payam.

25.5.6 Project Sustainability

(1) Organizational Aspect

- Although both the MTR and MOPI counterparts are satisfied with the learning from the pilot project, they expressed their interest in improving further the capacities of both organizations in road maintenance and requested that more similar training and pilot project be conducted focusing on planning, design and management of road maintenance projects. They further suggested widening the participation of the organization by including more staff to be trained in various stages of road maintenance.
- There are 7 Departments in the Directorate of Roads and Bridges (MOPI), however, there are only 12 Engineers and 28 Supervisors and Technicians to handle the CES road maintenance works. However, the Directorate is in the process of hiring 10 new young Engineers to be part of the organization. In this regard, the MOPI requested more assistance in improving the capacity of these young Engineers thru training and on-the-job practice and exposure to road maintenance works.
- The MOPI at the moment does not have a concrete idea of the length of existing road stock in the State and would like to perform a road inventory and create a road inventory database. However, the MOPI does not have the experience and technology in performing such inventory works and would like to have technical assistance from donor agencies on this matter. Once the road inventory is established, the MOPI can then plan for the annual maintenance works of collector and local roads.
- At present, only 1-Bulldozer and 1-Grader is in operation in the MOPI equipment stock which, due to age and lack of preventive maintenance, breaks down during operation. The MOPI would like to procure a set of equipment (Dozer, Grader, Roller/Compactor, Tipper/Dump Truck and Loader) for road maintenance. But due to lack of budget from the State, the MOPI is looking for other alternative sources like grants from JICA or other donor agencies. Moreover, the MOPI would like to improve its capacity in heavy equipment operation and maintenance.

- During the execution of the 2nd Pilot Project, the MOPI rely on the MTR for laboratory and filed testing. However, internal problems with the MTR have led to delays in testing during the pilot project and the MOPI noticed the importance of having its own testing laboratory for road construction and maintenance. In this regard, the MOPI expressed their request to JICA to assist in providing a laboratory facility and training of technicians for testing.
- During the implementation of the Pilot Project, the MTR and the MOPI noticed the importance of having standard procedures for planning, design and management of road construction and maintenance. Following this observation, both agencies expressed their willingness to establish such standard manuals, guidelines and procedures including Standard Manuals for Inspection, Design, Maintenance/Repair, Management and Construction, Quality Control, etc. to guide the Engineers and Technicians in planning and executing maintenance works. Such manuals and guidelines shall be prepared with the assistance of JICA or other donor agencies and the Engineers of the MTR and the MOPI trained on how to use and apply these manuals.

(2) Financial Aspect

- In 2008, the MOPI has a budget of US\$10,860,000 of which US\$ 5,380,000 is for Capital expenses (including road opening, road maintenance, equipment maintenance and other road related operating expenses). Although an annual budget is allocated by the State for the MOPI's Directorate of Roads and Bridges, the composition covers basically salaries, operation and capital expenses. However, delays in the release and disbursement are common.
- Moreover, the MTR allocates about SDG 1.5 million (US\$ 600,000) annually for each State which covers road improvement and maintenance. However, each State has to prepare a project proposal in order to receive this amount but the MOPI has not yet received this allocation due to lack of project proposal.
- The pilot project is aimed at road maintenance works for roads under the jurisdiction of the MOPI. However, the present state of roads in Juba will require major rehabilitation works before maintenance work is to be carried-out. In this regard, huge amount of road infrastructure investment is necessary, which at the moment is not available with the State.

(3) Individual (Technical Staff)

- The 2nd Pilot Project enables the MOPI counterparts to directly undertake maintenance/rehabilitation works for gravel roads. Although the hands-on experience has improved the counterparts' capability in the aspect of gravel road maintenance, it is assessed that due to the limitation in inputs including time, funds and contacts with the JICA team, the level of skills and knowledge gained during the pilot project implementation is still insufficient. In this regard, the counterparts expressed their need for further exposure and hands-on training in the areas of:
 - Road Inventory and Road Condition Inspection & Evaluation
 - Design for Road Rehabilitation and Maintenance
 - Construction Planning and Cost Estimating

- Construction Management
- The MOPI presently has 12 Engineers and is currently recruiting 10 young Engineers to augment their staff in the Department of Roads and Bridges. In this regard, the MOPI plan to develop further the knowledge and skills of the existing Engineers for road maintenance and train the new young Engineers in this field. Classroom type lectures and on-the-job pilot project type training are the means which the MOPI are planning to request from JICA or other donor agencies.

A more comprehensive capacity development program of the technical cooperation type for the MOPI and the MTR will have to be developed to improve the performance of the individuals and the organization.

25.6 RECOMMENDATIONS

The 1st and 2nd Pilot Projects were undertaken in preparation for the recommendations of the JUTI Master Plan for the MOPI to handle road maintenance of collector and gravel roads on a force account system until the private sector is ready to undertake road maintenance. The pilot projects are basically carried-out to assist the MOPI in such works as resurfacing and gravel road periodic maintenance and assess the MOPI's capabilities while handling the project. The following items are recommended based on the experience of the 2nd Pilot Project:

- Although the MTR has a clear policy and strategy in addressing the needs for improving the road infrastructure at the national level, the MOPI, on the contrary, has no clear policy and programs in the aspect of road improvement and maintenance. The MOPI should then establish a definite set of policies, strategies and programs in road development and maintenance and address the issues of strengthening its capacity for road rehabilitation and maintenance.
- Additional capacity development and technical cooperation programs are necessary to improve further the MOPI's technical capability in road rehabilitation and maintenance including:
 - Establishment of Road Inventory Database and computer literacy,
 - Preparation of Road Inspection and Road Maintenance Manuals and training the technical staff on how to utilize these manuals
 - Training the technical staff in interpreting the MTR Design Guidelines and Standard Specifications
 - Planning and design for road rehabilitation and maintenance,
 - Technology on road repair and rehabilitation,
 - Drainage works, and
 - Project execution management and quality control.
- Involvement of the Community in road maintenance works including basic skills training for labor based maintenance works, repairs of road pavement and road structures (including drainage structures). Possible basic skills to be developed includes:
 - Masonry works for drainage and culverts,
 - Concrete and reinforcement works, and
 - Basic carpentry works.
- Taking into account the local conditions in Juba in terms of availability of resources such as technical staff, materials, equipment and skilled labor, programs for technical cooperation and capacity development training programs should consider sufficient time and duration in implementing similar pilot projects.
- MTR and MOPI should provide sufficient number of counterparts for similar capacity development programs to increase the project's output and efficiency.
- One of the difficulties experienced during the execution of the pilot project is the lack of equipment running in good conditions which are owned by the MOPI. This resulted in uncertain execution of work schedules and resorting to hiring of equipment from Contractors. The MOPI should maintain its own fleet of heavy equipment running in good condition to be able to respond to the needs of road maintenance.

- Moreover availability of road construction materials in Juba is very limited and items like concrete pipe culverts are not readily available and purchased on an order basis. In this case, the pipe culverts has to be ordered at least three or four weeks prior to intended use which causes delay in project implementation. Proper procurement planning is very important in such case to proceed with the schedule on time. In addition, the government should encourage the private sector to invest in road construction materials to save procurement time and reduce materials cost.
- Quality control in road rehabilitation and maintenance is a major issue in the MTR and the MOPI. Although the MTR is equipped with its own laboratory to handle laboratory and field tests on road materials and workmanship, the MOPI has no means of such capability and rely solely on the MTR. Tests conducted during the pilot project were limited due to physical problems with the MTR laboratory. Considering the urgency of road maintenance and rehabilitation works, the MOPI should have its own laboratory to check the quality of materials and workmanship.
- Although the pilot projects (1st and 2nd) contributed somehow to the knowledge and skills of the MOPI counterparts in road resurfacing and gravel road maintenance/rehabilitation, it is obvious that there is a need to broaden and expand the scope of capacity development program for the MTR and the MOPI to make it more effective and sustainable.
- It is thus recommended that a more comprehensive program such as Technical Cooperation Project on Sustainable Road Maintenance be developed for the MTR and the MOPI to address the organizational and individual issues of capacity development.

CHAPTER 26

CAPACITY DEVELOPMENT PLAN

CHAPTER 26 CAPACITY DEVELOPMENT PLAN

26.1 CAPACITY DEVELOPMENT THRU PILOT PROJECT

26.1.1 Objectives of Capacity Development for MOPI thru Pilot Project

Since the focus of Capacity Development under the USAid program is the Ministry of Transport and Roads (MTR) GOSS, the present program for capacity development in this Study will concentrate on capacity building of the Ministry of Physical Infrastructure (MOPI), Directorate of Roads and Bridges for road maintenance.

This Chapter will then focus on the following objectives:

1. Analyze the structure of the MOPI including its organization, staff, budget, project and resources and identify the areas for capacity improvement for road maintenance.
2. Conduct workshops to identify the needs of the MOPI for capacity development using different tools including project cycle management.
3. Develop the project design matrix for the Pilot Project and its plan of operation.
4. Examine and evaluate the results and lessons learned from the Pilot Project.
5. Prepare a Capacity Development Program for the MOPI.

26.1.2 Outline of the MOPI

(1) MOPI Organization

The Ministry of Physical Infrastructure (MOPI) of the Central Equatorial State (CES) consists of the following directorates:

- Directorate of Housing
- Department of Survey
- Directorate of Roads and Bridges
- Directorate of Transport and Communication
- Directorate of Rural Water Development

In this Study, the subjects for capacity development are analyzed for the Directorate of Roads and Bridges.

(2) MOPI Staff

The MOPI has 482 classified staffs and 1,459 unclassified staffs which totals 1,941 staffs. This figure is the highest number of persons among the CES ministries. The budget for salaries reaches around SDG 9,000,000. However, the Directorate of Roads and Bridges has 674 staffs.

Table 26.1.2-1 Staffs of the Directorate of Roads and Bridges, MOPI

Department	Name of Director	Name of D/Director	Number of Engineer	Number of Classified	Number of Unclassified	Total number
Administration	Sebit Onorato	-	1	17	29	47
Road & Bridges	Paulio Foggak	Leon Laku	2	20	314	336
Construction	Sammuel	Bullen Pitia	2	8	66	76
M.E.D	Michael Logugu	Gabriel Wau	1	15	156	172
Road Survey	Sebit Onorato	Anthony Lako	3	0	0	3
Maintenace	Roman Margan	Peter Lako Log	2	0	0	2
Planning	Charles Hakim	-	1	0	0	1
Total			12	60	565	637

Table 26.1.2-2 Classified Male Staffs

Class	Number of Staffs
Civil Engineer	9
Mechanical Engineer	5
Road Technician	13
Mechanical Technician	3
Road Supervisor	12
Total	42

In the above tables, classified staff means people who received technical education and unclassified staff means people who did not receive any technical education.

(3) MOPI Budget

There exist official figures for operating and capital budget, but actual disbursement of the allocated amount has always been a problem.

Table 26.1.2-3 Budget Allocation for Roads and Bridges in 2008 and 2009

Unit: SDG 1,000

Items	2008	2009
Salaries	4,482	1,455
Operating	1,002	1,087
Capital	5,379	2,387
Total	10,864	4,930

(4) MOPI Projects

There are very few on-going projects because of lack of capital budget. Very few heavy equipment exists, of which most are inoperable because of lack of spare parts. At present, the Central Equatorial State, MOPI there is only one good conditioned motor grader.

26.1.3 Training Need Analysis

The USAID conducted the study “Training Need Analysis” in the year 2007. This study report discussed the detailed survey and analysis on the employees of the MTR. Following this study, a “Training Plan” was proposed for the MTR.

However, there is no study on the capacity development of the MOPI of CES. Therefore, the institutional development theme on the MOPI was taken more in this Study.

(1) Training Need Analysis

Using same formats of Training Need Analysis for the MTR, the survey was conducted on the staffs of the Directorate of Roads and Bridges in the MOPI. The number of people who replied was twenty two staffs. The result of the survey is as follows:

1) Age

They are rather old. The age distribution is:

Twenties: 3, Thirties: 4, Forties: 11, Fifties: 3

2) Title

Technical staffs are classified as:

Engineer: 7, Technician: 9, Supervisor: 2

Administrative staffs are classified as:

Administrator: 2, Clerk: 2

3) Education

Education level (including withdrawals) is as follows:

University: 7, Technical School: 7, High School: 1, Secondary School: 2, Training School: 3

4) Training Need Areas for Current Position

Answers to the question “What areas/skills in your current job position do you need training to perform better?” are as follows:

Table 26.1.3-1 Training Need Areas for Current Position

Area	Number of Answers
Bridge and culvert	3
Road construction or maintenance	3
Civil engineering	5
Vehicle maintenance	1
Quality control	1
Project planning and evaluation	1
Administration	4
Budgeting	1

The answers can be recognized in close relationships to their daily job.

5) Training Need Areas for Career Development

Answers to the question “What other areas/skills do you need further training in to enhance your carrier development?” are as follows:

Table 26.1.3-2 Training Need Areas for Career Development

Areas	Number of answers
Budgeting	3
Engineering	3
Civil engineering	2
Construction	1
Bridge construction	3
Highway	1
Computer	2
Mathematics and statistics	1

These answers seem the needs for wider and more basic areas. It means basic knowledge training is also necessary.

26.2 PROJECT CYCLE MANAGEMENT FOR CAPACITY DEVELOPMENT PLAN

Since there has been a lot of studies and projects for capacity development in the MTR, this Study will focus on the capacity development of the MOPI. Several workshops were held with the staff of the MOPI to identify and discuss the training needs and the aspect of project cycle management in capacity development.

The procedure of the development of Project Cycle Management (PCM) is introduced and tried in the workshops held with the people of the Directorate Roads and Bridges. The results of the workshops were not complete and more workshops with other stakeholders such as the MTR and the community people should be continued in the future.

However it is worth to introduce one example in order to recognize the orientation of the capacity development through the Pilot Project.

- Participant analysis
- Problem analysis
- Object analysis
- Project alternative analysis
- Project Design Matrix (PDM)
- Plan of operation

(1) Participant Analysis

The participants of the workshops held on October 9 and 10 2009 were as follows;

Table 26.2-1 Classification of Participants

Classification	Detailed Classification	Persons
Engineer		1
Technician	Mechanics	2
	Road	1
	Electrics	1
	Civil	1
Supervisor		1
Assistant		7
Administrator		2

(2) Problem Analysis

Problem analysis was undertaken during the workshop and an example result is shown as follows:

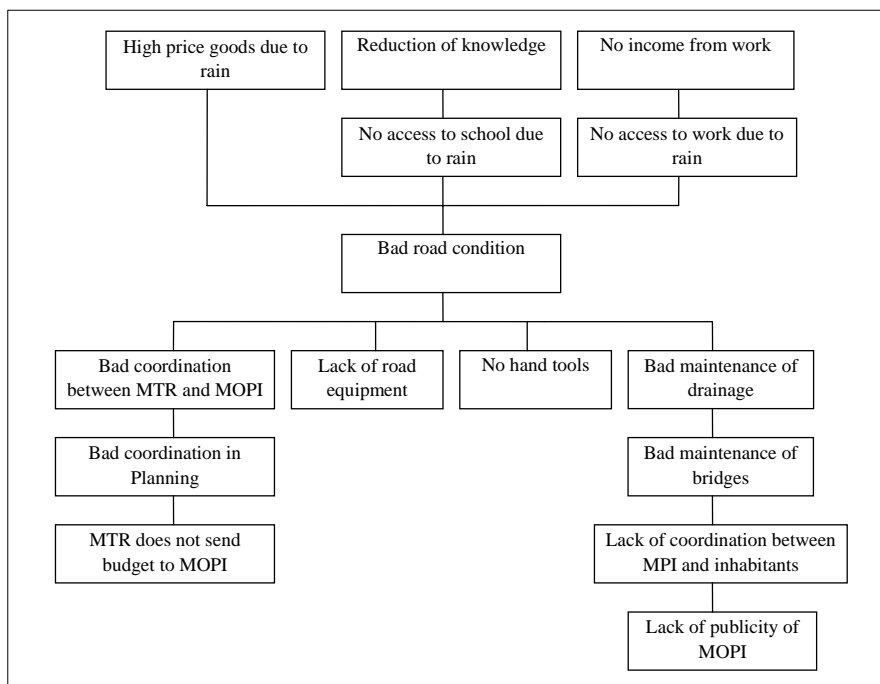


Figure 26.2-1 Problem Analysis

(3) Objectives Analysis

A sample objective analysis result in the workshop is shown as follows:

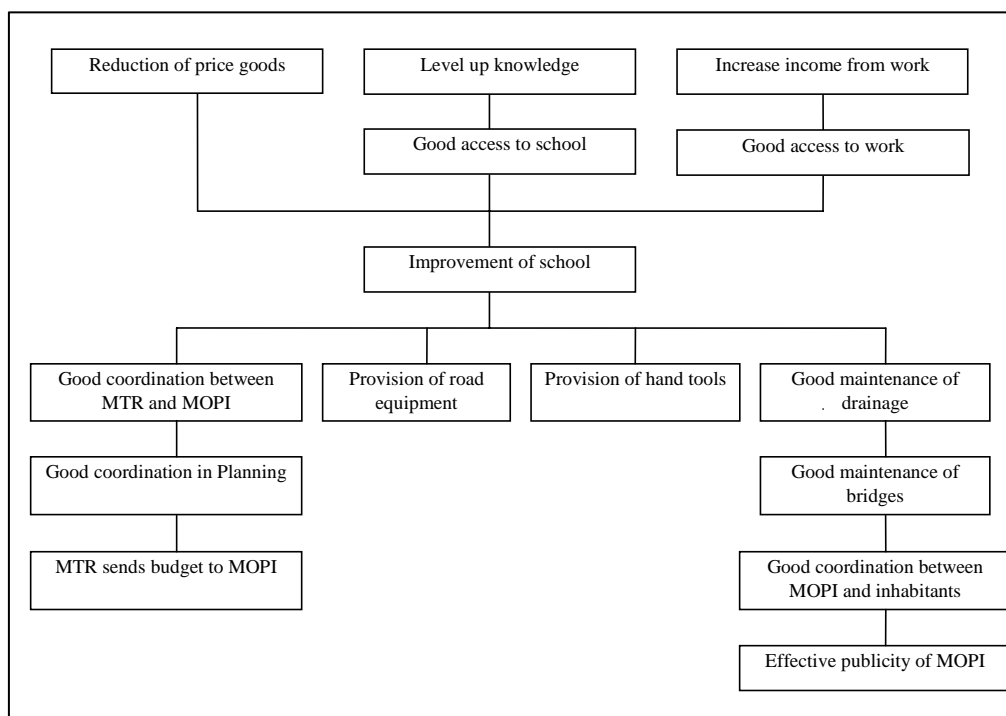


Figure 26.2-2 Object Analysis

(4) Alternative Analysis

An analysis of alternatives was also conducted with the following results:

Table 26.2-2 Alternative Analysis

Alternatives	1	2	3
Contents	Inter-institution Coordination Improvement	Maintenance Equipment Improvement	Community Participation
Target group	MTR MOPI	MOPI	Community MOPI
Cost	Low	High	Middle
Effects	Government	MOPI Society	MOPI Society
Possibility	Middle	Difficult	Middle
Sustainability	Middle	Difficult	Middle

As a result of the workshop discussion, the combination of Alternative 1 and Alternative 2 was selected in order to improve the coordination among the MTR, the MOPI and Communities.

(5) Project Design Matrix (PDM)

A preliminary PDM was presented and discussed in the first joint workshop with the MTR and the MOPI held on 30th of January. The PDM for the 1st Pilot Project is shown in Table 26.2-3. More studies and workshops are necessary to improve the PDM of the Project.

Another PDM is developed for the 2nd Pilot Project focusing on gravel pavement, as shown in Table 26.2-4

(6) Plan of Operation

The plan of operation was discussed in the first joint workshop with the MTR and the MOPI held on 30th of January. The general schedule is shown in Table 26.2-5.

Table 26.2-3 PDM for 1st Pilot Project

Narrative Summary	Objectively verifiable indicators	Means of verification	Import assumptions																								
Overall goal Citizen's mobility improvement through Capacity Development	- Time to City center	- Measure																									
Project purpose Capacity development of MTR, MOPI and Communities through the road improvement project	- Improvement of work	- Achievement																									
Outputs - Good coordination between institutions - Participation of Communities - Guaranty of access for Communities	- Number of meetings - Number of participants - Household with access	- Count - Count - Count																									
Activities - Creation of Committee for Project - Periodical Workshop - Publicity and Education - Provision of tools - Provision of materials - Payment for workers	Inputs <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; width: 25%;"><u>MTR</u></td> <td style="text-align: center; width: 25%;"><u>MOPI</u></td> <td style="text-align: center; width: 25%;"><u>Community</u></td> <td style="text-align: center; width: 25%;"><u>JICA</u></td> </tr> <tr> <td>- Planning</td> <td>- Design</td> <td>- Participation</td> <td>- Training</td> </tr> <tr> <td>- Meeting</td> <td>- Meeting</td> <td>- Labor</td> <td>- Budget</td> </tr> <tr> <td>- Provision of equipment</td> <td>of - Supervision</td> <td>- Security</td> <td>- Tool, Equipment</td> </tr> <tr> <td></td> <td></td> <td></td> <td>- Material</td> </tr> <tr> <td></td> <td></td> <td></td> <td>- Transport</td> </tr> </table>			<u>MTR</u>	<u>MOPI</u>	<u>Community</u>	<u>JICA</u>	- Planning	- Design	- Participation	- Training	- Meeting	- Meeting	- Labor	- Budget	- Provision of equipment	of - Supervision	- Security	- Tool, Equipment				- Material				- Transport
<u>MTR</u>	<u>MOPI</u>	<u>Community</u>	<u>JICA</u>																								
- Planning	- Design	- Participation	- Training																								
- Meeting	- Meeting	- Labor	- Budget																								
- Provision of equipment	of - Supervision	- Security	- Tool, Equipment																								
			- Material																								
			- Transport																								

Table 26.2-4 PDM for the 2nd Pilot Project

Project Name: **Pilot Project for Gravel Road Maintenance and Rehabilitation** Implementation Period: **16 February – 31 May, 2010**
 Target Area: **Munuki Payam Local Road** Target Group: **Ministry of Physical Infrastructure, CES**

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p><u>Overall Goal</u></p> <p>The condition of low capacity roads (collector and local roads) in Juba is improved thru proper and efficient maintenance.</p>	<ul style="list-style-type: none"> - Increase in mobility and accessibility in community area - Decrease in poor and bad road condition - Maintenance program can be prepared by MOPI 	<ul style="list-style-type: none"> - Road Inventory - Road Inventory - Maintenance program by MOPI 	<ol style="list-style-type: none"> 1. The Juba Urban Transport Infrastructure Master Plan is being implemented by GOSS. 2. GOSS has sufficient funds and resources to maintain roads in Juba.
<p><u>Project Purpose</u></p> <p>Capabilities of MOPI on periodic maintenance of gravel roads for collector and local streets are strengthened.</p>	<ul style="list-style-type: none"> - Quality of road inspection and condition evaluation - Quality of executing periodic maintenance of gravel roads - Number of pilot project participants 	<ul style="list-style-type: none"> - Road Inventory - Record of periodic maintenance and Road Inventory - Record of Participants 	<ol style="list-style-type: none"> 1. Sufficient number of Planners, Engineers and Technicians are available for the 2nd Pilot Project. 2. Equipment for road maintenance work available from MTR and MOPI. 3. Community will give full support to the project.

<p><u>Outputs</u></p> <ol style="list-style-type: none"> 1. Periodic maintenance of gravel road appropriately planned 2. Gravel road periodic maintenance works and drainage works for 500m of pilot project local road is appropriately carried-out. 3. Labor-based works for gravel road periodic maintenance properly undertaken in collaboration with the local community. 	<p><u>Output 1:</u></p> <ol style="list-style-type: none"> 1. Inspection and assessment of existing road conditions to determine necessary maintenance works by MOPI Planners and Engineers. 2. Preparation of construction plan/design, cost estimate and work schedule for gravel road periodic maintenance by MOPI Planner and Engineers 3. Proper coordination of maintenance work activities with community by MOPI Staff <p><u>Output 2:</u></p> <ol style="list-style-type: none"> 1. Improvement of 500m road section to gravel road standard with proper roadside earth ditch, RC pipe culverts and improvement of black cotton soil area. 2. Supervision and management of periodic maintenance of gravel road by MOPI Engineers 3. Preparation of maintenance work record and report <p><u>Output 3:</u></p> <ol style="list-style-type: none"> 1. Awareness of community on proper periodic maintenance of gravel roads 2. Participation of community in labor-based road maintenance 	<p><u>Output 1:</u></p> <ol style="list-style-type: none"> 1. Road Inventory and Inspection Report 2. Gravel road periodic maintenance plan including basic design, cost estimate, schedule, etc. 3. Meeting, coordination and workshop with community. <p><u>Output 2:</u></p> <ol style="list-style-type: none"> 1. Road Inventory for pilot project section. 2. Maintenance work record and report for pilot project 3. Maintenance work record and report for pilot project <p><u>Output 3:</u></p> <ol style="list-style-type: none"> 1. Pilot project report 2. Pilot project report 	<ol style="list-style-type: none"> 1. Planners, Engineers and Technicians of MOPI available for Pilot Project. 2. Equipment to be provided by MTR is available for Pilot Project 3. Materials necessary for the execution of pilot project available during the project period. 4. Community will give full support to the Pilot Project. 5. Enough supply of labor available in the community.
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Activities	Inputs		
<p>1.1 Select appropriate site for the 2nd Pilot Project.</p> <p>1.2 Inspect and evaluate existing condition of project road</p> <p>1.3 Plan/design for periodic maintenance/ rehabilitation of selected site by gravel wearing course pavement structure.</p> <p>1.4 Plan for the execution of pilot project works, including schedule, materials, equipment and labor and estimate budgetary cost.</p> <p>2.1 Execute, supervise, manage and control periodic maintenance activities for pilot project</p> <p>2.2 Recruit labor, arrange equipment and purchase materials for pilot project road</p> <p>2.3 Rehabilitate 500m long of road to gravel wearing course pavement including improvement of drainage facilities and replacement of black cotton section</p> <p>3.1 Organize the community and conduct workshop for execution of maintenance works for the pilot project.</p> <p>3.2 Recruit and manage community labor for pilot project execution.</p>	<p><JICA></p> <p>Personnel: JICA Team Members Planning/Design – 2 MM Construction – 2.5 MM</p> <p>Funds: Cost of supervision, labor and materials for the road project. Cost of office supplies</p>	<p><MOPI/CES and MTR></p> <p>Personnel: Project Manager, Planners, Engineers, Technicians, MTR Engineers as Member of WG MTR Laboratory Technician Munuki Technician and Labor</p> <p>Equipment: Bulldozer, Grader, Roller, Excavator, Tipper (Dump Truck), Water Truck</p> <p>Facilities: MOPI Project Office MTR Laboratory</p> <p>Funds: Cost of management and administration of project</p>	<p>1. Planners, Engineers and Technicians trained in the pilot project will remain with MOPI.</p> <p>2. Trained staff shall disseminate their acquired knowledge/skills with other MOPI staff.</p> <p>3. Trained labor in the community can find employment with road contractors and improve their skill further for road maintenance.</p>

- Notes: 1. MOPI - Ministry of Physical Infrastructure
2. CES - Central Equatoria State
3. MTR - Ministry of Transport and Roads, GOSS
4. JICA - Japan International Cooperation Agency

Table 26.2-5 Plan of Operation

Activities	Output	Schedule	Responsibility	Actor	Material
Committee	Coordination	Feb.- Dec.	MTR, MOPI	MTR, MOPI, Community, JICA	Paper
Design	Plan, Profile, Section	Feb.- Apr.	MOPI	MOPI, MTR	Computers Printer
Equipment	Construction	May - Oct.	MTR	MTR, MOPI, Community	Fuel Oil
Work	Labor	May - Oct.	Community	Community, MOPI	Payment, Tools
Training	Technical improvement	Jun. - Nov.	JICA	MTR, MOPI, Community	
Workshop	Capacity Development	Mar.- Dec.	Committee	MTR, MOPI, Community, JICA	Space

(7) Participatory workshops

In the course of the Study, participatory workshops were introduced in order to confirm participation and ownership of stakeholders of the Study. Table 26.2-6 shows the list of workshops and meetings held during the course of the Study.

Table 26.2-6 List of Workshops

Date	Type	Participants	Theme
16th September 2008	Workshop	Roads & Bridges MOPI	Existing situation
17 th September,2008	Workshop	Roads & Bridges MOPI	Existing problems
3 rd October 2008	Workshop	Roads & Bridges MOPI	
7 th October 2008	Workshop	Munuki community	Existing problems, Objective analysis
9 th October 2008	Workshop	Roads & Bridges MOPI	Problem analysis
10 th October 2008	Workshop	Roads & Bridges MOPI	Selection of the project, Preparation of PDM
22th January 2009	Workshop	Roads & Bridges MOPI	Discussion on PDM
27 January 2009	Workshop	Roads & Bridges MTR	Explanation on the outline of the Study. Explanation on PCM., Explanation on the analysis done by MOPI people, Discussion on the PDM
30 January 2009	Joint Workshop	MOPI, MTR	Discussion on the PDM
2 February 2009	Joint Workshop	MOPI, MTR, Munuki	Explanation on the outline of the Study. Explanation on PCM., Explanation on the analysis done by MOPI people, Discussion on the PDM

17 th June, 2009	Workshop	MTR, MOPI, Munuki	Explanation on the P/P and registration of workers
13 July, 2009	CCG Meeting	MOPI, MTR, Munuki	Progress of Pilot Project
20 July, 2009	CCG Meeting	MOPI, MTR, Munuki	Progress of Pilot Project
27 July, 2009	CCG Meeting	MOPI, MTR, Munuki	Progress of Pilot Project
10 August, 2009	CCG Meeting	MOPI, MTR, Munuki	Progress of Pilot Project
12 October, 2009	CCG Meeting	MOPI, PTR, Munuki	Additional work
19 October, 2009	CCG Meeting	MOPI, PTR, Munuki	Additional work
24 October, 2009	Workshop	Munuki people	Evaluation of Pilot Project
26 October, 2009	CCG Meeting	MOPI, PTR, Munuki	Additional work
30 October, 2009	Stakeholder Meeting	MTR, MOPI, Munuki, LBG	Result of Pilot Project, Capacity development plan

26.3 LESSONS LEARNED FROM PILOT PROJECTS

26.3.1 Relationship Between Capacity Development and the Pilot Project

The general flow and each step of the maintenance project, such as Design, Cost estimation, Bid, Supervision of works, Examination and Evaluation can be learned through the project, although size of a project is small. Some classes of lessons on theories on project management or construction technology are necessary, same as the case of foreign conversation leaning that requests conversation practice and also grammatical lesson.

Therefore the capacity development plan for the Pilot Project that consists of following components is proposed.

(1) Participation

When the pilot project progress go up from one step to the next step, workshop are held among the person who is in charge of the project, trainees and community people in order to learn lessons from the pilot project implementation. The participation of the community is necessary.

(2) Technical Training

The technical training on the project implementation and each element is necessary according to the progress of the project. The contents of the technical training could be

enumerated as follows;

- Planning and project appraisal
- Road inventory and maintenance
- Design and cost estimation
- Tender management
- Quality control and supervision

(3) Project Site Observation

Generally speaking the staffs of the MOPI have long employment experience in the MOPI, but there is lack of opportunity to participate in recent technology of work because of very few projects handled by the MOPI. The chance to learn good examples and bad examples by means of observation on other project sites will be given. Project site observation is not desired only for the participation of trainees but also the participation of some representatives of the community.

(4) Implementing Body

As an implementing body for training, two cases are considered, but the former one was better to manage a pilot project and training courses.

a) Subcontract with an NGO or a contractor which has capacity to implement both construction work and training.

b) Divided subcontracts. One is for construction work with a contractor and the other is for training work with an NGO.

Execution of the 1st Pilot Project is therefore handled by the Community Construction Group (CCG) which is headed by a local contractor. In this case, the MOPI and the Community learn by participating in the execution of the pilot project with the local contractor managing the overall activities. The 2nd Pilot Project tends to utilize the learning obtained from the 1st Pilot Project so that the CCG is headed by the MOPI (no local contractor is involved) and pilot project execution is implemented with the CCG consisting of the MOPI, the MTR and the Community. The JICA Team assisted and coached the CCG on various aspects of the project from Site Inspection, Basic Design, Cost Estimate, Schedule and Work Planning, Construction Execution and Inspection and Evaluation.

26.3.2 Lessons Learned from 1st Pilot Project

(1) Lessons by Each Organization

1) MTR

The critical issues and their countermeasures experienced from 1st Pilot Project for the MTR are as follows:

Table 26.3.2-1 Critical Issues and Countermeasures for the MTR

Critical Issue	Countermeasures
<ul style="list-style-type: none"> - Lack of technical persons - Lack of machine operating management administration - Lack of requisition information - Lack of control and management 	<ul style="list-style-type: none"> - Increase personnel - Technical training - Reinforcement of machine operating management function - Reinforcement of requisition management function - Reinforcement of control management function

2) MOPI

The critical issues and their countermeasures experienced from 1st Pilot Project for MOPI are as follows:

Table 26.3.2-2 Critical Issues and Countermeasures for MOPI

Critical Issue	Countermeasures
<ul style="list-style-type: none"> - Lack of technical persons - Planning and designing capacity - Administration and management - Lack of quality control - Lack of heavy machines - No basic equipment (computer) - Lack of investment budget - Lack of projects 	<ul style="list-style-type: none"> - Technical training - Reinforcement of technical function - Reinforcement of management function - Reinforcement of control management function - Increase of heavy machines - Purchase of basic equipments - Allocation of investment budget - Creation of projects

3) Local Government

The critical issues and their countermeasures experienced from 1st Pilot Project for Munuki Payam are as follows:

Table 26.3.2-3 Critical Issues and Countermeasures for Munuki Payam

Critical Issue	Countermeasures
- Lack of technical person	- Recruit of technical person
	- Technical training
- No basic equipment	- Purchase of basic equipments
- No principal tool	- Purchase of principal tools

4) Local Contractor

The critical issues and their countermeasures experienced from the 1st Pilot Project for Local Contractor are as follows:

Table 26.3.2-4 Critical Issues and Countermeasures for Local Contractor

Critical Issue	Countermeasures
- Lack of technical person	- Recruit of technical person
- No academic carrier	- Technical training
- Lack of basic knowledge	- Technical training
- Lack of experiences	- Technical training/subcontract work
- Lack of basic equipment	- Purchase of equipment
- Lack of budget control	- Technical training for budget control
- Lack of quality control	- Technical training
- Lack of labor management	- Labor management training
- Lack of procurement management	- Administration training

5) Community

The critical issues and their countermeasures experienced from 1st Pilot Project for Munuki Community are as follows:

Table 26.3.2-5 Critical Issues and Countermeasures for Munuki Community

Critical Issue	Countermeasures
- Lack of experience	- Creation of opportunities
- No existence of leader	- Foster of leaders
- Lack of ownership	- Education
- Lack of basic knowledge	- Technical training

(2) Capacity Issues and Proposed Countermeasures Identified During the 2nd Pilot Project

Several issues on capacity development were identified during the implementation of the 2nd Pilot Project with the proposed countermeasures presented in Table 26.3.2-6.

Table 26.3.2-6 Capacity Issues and Countermeasures Identified in the 2nd Pilot Project

Capacity Issues	Countermeasures
<ul style="list-style-type: none"> • Lack of Road Inventory Database 	<ul style="list-style-type: none"> • Developing Manual on Road Inspection and Condition Evaluation • Preparing Road Inventory Database • Training in Conducting Road Inventory and Inspection and Maintaining Inventory Database • Pilot Project in Road Inventory and Inspection • Computers for use in Database Management • Tools/Equipment in Inventory and Inspection
<ul style="list-style-type: none"> • Needs Skills and Knowledge Improvements in Planning: <ul style="list-style-type: none"> - Scheduling - Cost Estimating and Budget Preparation - Road Maintenance and Repair Technology - Value Engineering 	<ul style="list-style-type: none"> • Developing Guidelines and Manuals on Maintenance Planning <ul style="list-style-type: none"> - Work Scheduling - Cost Estimating - Value Engineering • Training in Using and Application of Guidelines and Manuals on Maintenance Planning • Training in Road Maintenance Technology
<ul style="list-style-type: none"> • Needs Skills and Knowledge Improvements in Design: <ul style="list-style-type: none"> - Identifying and Analyzing Damages/Defects in Roads - Understanding MTR/AASHTO Design and Specification Manuals - Methods of maintenance, repair and road rehabilitation - Road Design - Drainage System and Design 	<ul style="list-style-type: none"> • Developing Manuals on Road Maintenance, Repair and Rehabilitation • Training in Road Technology and Application of Road Maintenance, Repair and Rehabilitation Manuals • Training in Analyzing Road Damages and Defects • Training in using MTR/AASHTO Design and Specifications Manuals • Training in Basic Road Design • Training in Drainage Design • Hands-on Planning and Design for a Pilot Road Maintenance Project • Computers for Planning and Design
<ul style="list-style-type: none"> • Needs Skills and Knowledge Improvements in Executing Maintenance Works : <ul style="list-style-type: none"> - Schedule Control and Output Management - Management of Site, Labor and Equipment - Quality Control and Testing - Budget and Cost Control - Materials Management - Project Management - Project Evaluation 	<ul style="list-style-type: none"> • Preparing Guidelines and Manuals on Project Management and Control <ul style="list-style-type: none"> - Resources Management/Control - Quality Control - Cost Control - Materials Management • Training in Using and Application of Guidelines and Manuals on Project Management and Control • Training in Project Management • Laboratory and Field Testing Equipment • Pilot Project in Road Rehabilitation and Maintenance • Equipment for Road Maintenance Training

Capacity Issues	Countermeasures
<ul style="list-style-type: none"> • Lack of Technicians <ul style="list-style-type: none"> - Equipment Operators - Equipment Maintenance Technicians - Laboratory Technicians • Lack of Skilled Workers <ul style="list-style-type: none"> - Masonry Works for Roads - Carpentry Works - Steel/Rebar Fixer 	<ul style="list-style-type: none"> • Training in Equipment Operation • Training in Equipment Maintenance • Training in Laboratory and Field Testing • Cooperation with JICA Vocational Training Center for Training on Masonry, Carpenter and Steel/Rebar Fixer
<ul style="list-style-type: none"> • Lack of Hardware <ul style="list-style-type: none"> - Computers for Database, Planning and Design - Heavy Equipment for Road Maintenance - Laboratory and Field Test Equipment 	<ul style="list-style-type: none"> • Assistance in Procuring <ul style="list-style-type: none"> - Computers for Database, Planning and Design - Heavy Equipment for Road Maintenance - Laboratory and Field Test Equipment

(3) Training Conducted in the Implementation of the Pilot Project

- P.C.M

As described above, PCM method was introduced to develop the Pilot Project and the people concerned to the Pilot Project had the opportunities to learn PCM.

- O.J.T

In the course of the Pilot Project from the planning to evaluation of the project people could learn how to improve roads on every occasion of the project through the work.

- Lectures on Flood discharge, Road network, Environmental study, Land survey, Daily maintenance etc.

On the occasion of CCG meeting, members of JICA Study Team were invited to give lectures to the participants. The subjects consisted from various sectors related road improvement projects such as technical examination on flood discharge, road network function, environmental and social consideration, land survey, importance of daily maintenance on roads etc.

- Observation tour on other construction sites

The site observation for the people of Munuki was conducted. The road construction sites of MTR conducted by bigger contractors in Juba town. People could observe and learn civil works of road improvement.

- Invitation for training in Japan

Three engineers of MOPI (one from the Directorate of Roads and Bridges) were invited to Japan for technical training in Japan.

26.4 CAPACITY DEVELOPMENT CONDITION

As mentioned in the Handbook for Capacity Development of JICA, capacity development has three levels such as person level, organization level and society level. Through the pilot project implementation three levels should be developed, but for the capacity development of entire Roads and Bridges Directorate of MOPI many issues have to be resolved. Therefore final capacity development plan should be formed together with the implementation of the pilot project. In this chapter the conceptual plans of three levels are described.

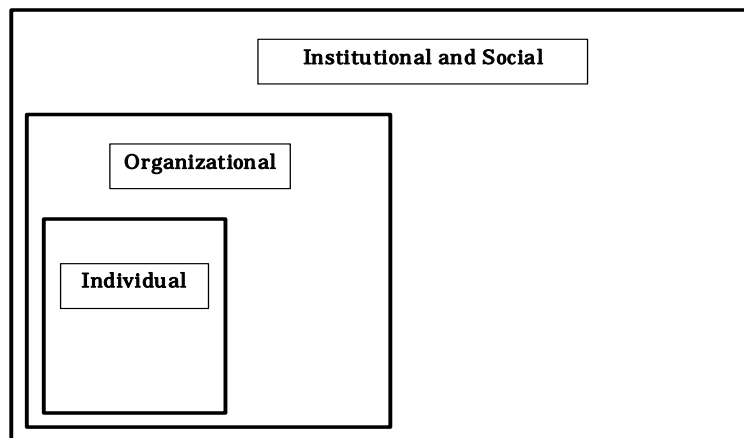


Figure 26.4-1 Level of Capacity Development

(1) Individual Level

Development of human resources is one of the most important issues, but in MOPI any means of development is not considered recently. The following schemes should be recommended.

1) Training/Lecture Course

- a) Basic knowledge development
- b) Computer operating
- c) Engineering
- d) Project management
- e) Specific technology on road and bridge

2) On the Job Training/In-Service Training

Since today the MOPI has very few projects, there exist very few opportunity to learn job implementation. Pilot project type of on-the-job training is very effective for capacity development of the MOPI and the MTR staffs.

(2) Organization

MOPI has a lot of problems for the implementation of projects. The following issues should be resolved. Otherwise human development cannot be realized.

- a) Adequate office space and power supply for office equipments especially computers
- b) Heavy equipments and spare parts for road construction and maintenance
- c) Vehicles and tools for road maintenance
- d) Road and bridge inventory should be done for road development program
- e) Road development program.
- f) Budget allocation for projects of MOPI
- g) Coordination and communication between MTR and MOPI
- h) Human development section should be developed

(3) Society level

- a) Information dissemination on importance of road maintenance is necessary
- b) Participation of stakeholders on programs and projects should be accelerated
- c) Participation of communities related to projects should be accelerated

26.5 CAPACITY DEVELOPMENT PROGRAM

26.5.1 Targets of Capacity Development

(1) Basic Approach

a) Ministry and Road Class for Study

The Capacity Development thru Pilot Work in the Study aims to develop the maintenance technique and skill as well as administrative compliance of road maintenance agencies of the MTR and the MOPI employing labor-intensive and community-based maintenance method for low-class urban streets such as collectors and local streets in Juba urban area.

The intensive capacity development programs for transport sector have been practiced in the MTR covering planning, construction and sustainable operation, maintenance and management of the transport infrastructure in Southern Sudan. The MTR is responsible for maintenance of national roads (arterials roads in functional classification) and the MOPI is in charge of state roads and county roads (collectors and local streets).

Therefore, this Section mainly discusses the capacity development of the MOPI, involving the maintenance of collectors and local streets in Juba urban areas.

b) Directorate of Roads and Bridges, MOPI

The Directorate of Roads and Bridges (DRB), the MOPI, lacks the skilled staff and ability to plan, design, construct and implement road maintenance projects. Until such time that the capacity of private sector will be developed, it is expected that the DRB shall retain a staff of highly skilled managers, planner, engineers, technicians and some administrative staff.

The maintenance staff of the DRB shall be given training particularly in labor-based maintenance technology, and be formed into routine and emergency maintenance section under the DRB.

After such trainings, some staff may be transferred to private sector contractors, and expected to act as trainers for labor-based maintenance works in the private sector.

c) Pavement Types

The predominant pavement types to be maintained in Juba urban area in the near future are

earth surface and gravel pavement of collectors and local streets which are main concern of the Study, while asphalt concrete pavement are planned to be applied for arterial roads.

d) Maintenance Work Method and Contract Type

The routine maintenance of low class street is in urgent need, and main subjects of the Study. This maintenance is practical to be executed employing labor-intensive maintenance method under the force account systems of the MOPI who is administratively responsible for the works.

e) Encouragement of Private Sector

The local contracting industry contractors are very weak at present. The private industry is expected to deliver the required services and works with quality and competitive price. Support from the government is needed for the private industry in terms of encouragement policy, contract administration, construction technology and quality control. Other factors for development of private contractor may include access to credit, access to equipment and access to construction materials.

(2) Main Subjects and Technologies

Figure 26.5.1-1 graphically presents the implementation cycle of road maintenance works and main works under each stage.

Tables 26.5.1-1 and 26.5.1-2 show a list of technologies required for road maintenance for engineering and construction, respectively, following the implementation cycle, and summarized as follows.

a) Main Subjects/Stages of Engineering Capacity Development

- Inspection
- Planning (Annual Maintenance Planning and Budgeting)
- Budgeting (Plan and Budget Justification)
- Engineering
- Bidding and Contracting
- Execution (Construction and Maintenance)
- Monitoring (Monitoring and Reporting)

b) Main Subjects for Construction Capacity Development

- Construction Management
- Finance Management
- Personnel Management
- Construction Management
- Construction Technology
- Maintenance Technology
- Equipment Technology

(3) Target Groups for Capacity Development

Tables 26.5-1 and 26.5-2 also suggest the target groups for each subject for the capacity development which are classified as follows:

	Engineering Capacity Development	Construction Capacity Development
Planner Class	<ul style="list-style-type: none">• Planner• Sr. Engineer	<ul style="list-style-type: none">• Sr. Administrator
Engineer Class	<ul style="list-style-type: none">• Engineer• Sr. Supervisor	<ul style="list-style-type: none">• Administrator• Accountant
Technician Class	<ul style="list-style-type: none">• Technician• Inspector• Supervisor	<ul style="list-style-type: none">• Engineer• Technician• Mechanic

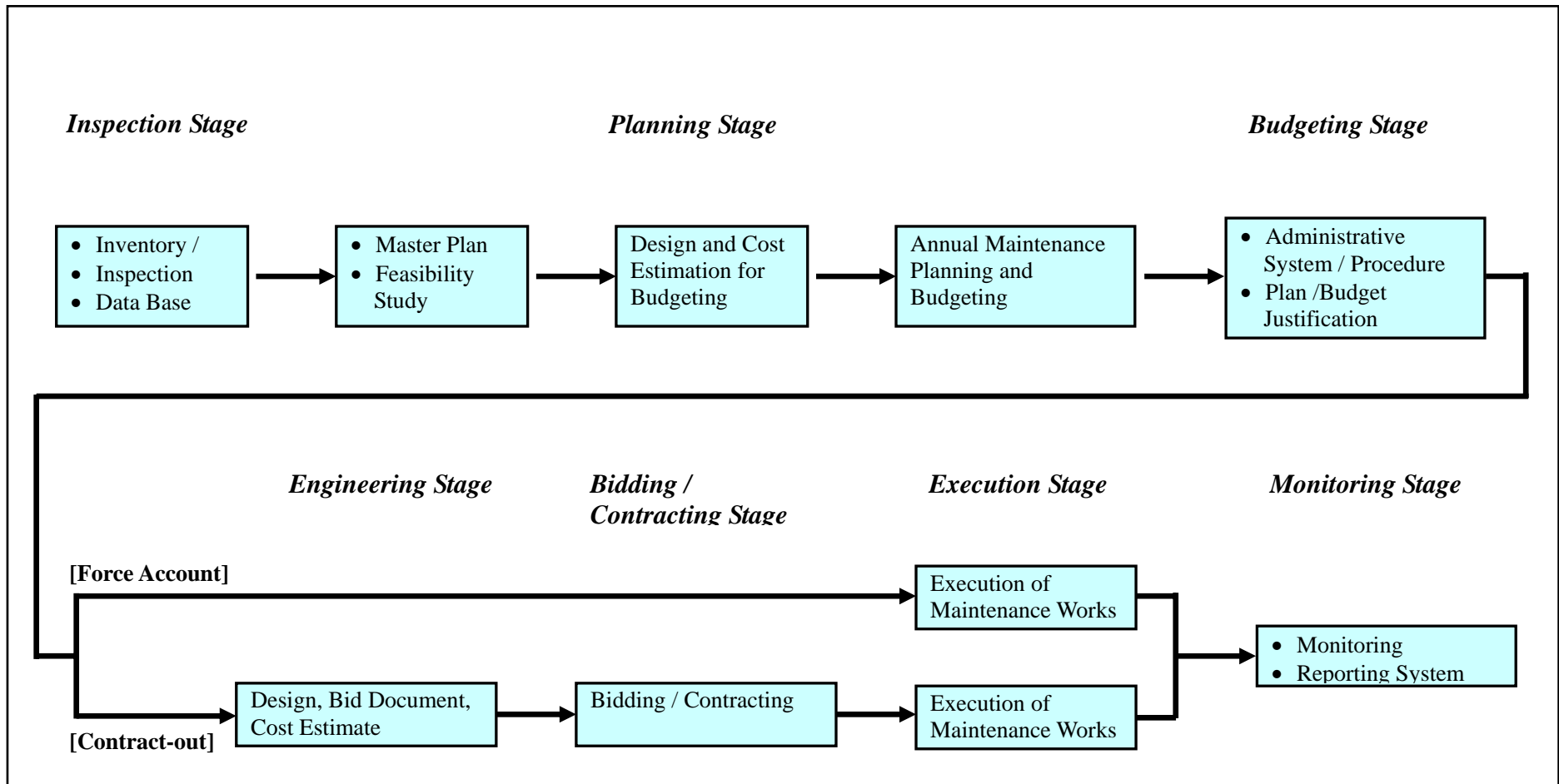


Figure 26.5.1-1 Implementation Cycle of Road Maintenance

limited. The small-scale maintenance works of local streets such as leveling, re-surfacing and re-gravelling can be easily and economically carried out by the workforce of the MOPI who presently have enough numbers of engineers and technicians.

The force-account teams may be retained in the MOPI during the transition period until maintenance works can be contracted out to the private sector.

It is, therefore, strongly recommended that the curriculums of maintenance techniques for force-account shall be prepared for force-account teams of the MOPI.

c) Equipment Operation for Force-Account

The minimum equipment for force-account team of the MOPI mentioned above is recommended to be arranged. The training of operator and mechanics for such equipment shall be carried out to effectively perform maintenance works as one of curriculum for the capacity development.

The financial arrangement for the on-the-job training in the fields, such as salary of workforces and operators and purchase of materials should be confirmed before starting the training in the field.

It should be noted that such trial works do not mean to permanently restore the construction and maintenance capacity of the MOPI. The roles of force-account are very limited in terms of function, scale and manpower.

d) Development of Engineering Level

The engineering courses of road design, construction and maintenance including drainages, pavement etc. are one of the most important curriculums which can be covered by the classroom type of capacity development program.

It is, however, emphasized that the basic engineering courses shall be practiced simultaneously with implementation of pilot work which requires such engineering knowledge.

In addition, it is preferable to prepare engineering standards to be used for design, construction and maintenance through the curriculum of the capacity development.

e) Construction Supervision

To supervise the rehabilitation and maintenance of works, the following items should be mastered by the staff of the MOPI. It is strongly recommended that such items will be studied in the field as a course of the capacity development because each item is connected with each other.

- Inspection forms
- Preparation of progress reports

- Quality control / assurance
- Issuance of change order
- Assessment of invoice for progress payment / change order
- Construction Safety

(2) Capacity Development Methods

a) Technical Cooperation Project Type

The prevailing methods and manners of training adopted in individual capacity development are fragmented, which have been mainly done in classroom. It is highly recommended that training should be done in the field, not only in class room but learning by doing process in field, as on-the-job training and in-the-service training. This method is particularly inevitable in road maintenance where trainees absolutely need actual works practice and experience in the field to ensure real and useful capacity development of individuals involved.

As a conclusion, the Pilot Project Type – Technical Cooperation Project Type – is recommended to be the most practical and effective method of the capacity development including the following methods of capacity development courses.

- Course 1: Seminar / Workshop
- Course 2: Class Room
- Course 3: On-the-job Training
- Course 4: In-service Training
- Course 5: Training Tour in Foreign Countries

b) Incentive upon Completion

It is widely understood that the capacity development requires incentives for private sector as well as prolonged support for government institutions.

After completion of a course of capacity development program, some incentives should be considered for participants. Otherwise, trainees are not willing to participate in some courses of the capacity development.

Such incentives should include provision of suitable employment opportunities and proper professional positions and issuance of diploma that should certify their capabilities as professionals.

26.5.3 Proposed Progress and Action Plan

(1) Proposed Programs

Program 1: Establishment of Road Maintenance and Management System of the MOPI

- Program Objectives
This program aims to establish the practical and effective road maintenance and management system for the MOPI, CES.
- Program Activities
 - Recommendation of the road maintenance and management system adoptable for Directorate of Roads and Bridges (DRB) of the MOPI.
 - Preparation of the annual road maintenance plan and budget for the DRB.
 - Establishment of Force-account section for road maintenance in the DRB.
 - Development of Contract-out system for road maintenance to private sector.
 - Capacity Development for the above activities.
- Counterpart
 - DRB, MOPI
- Target Group
 - Planner, Sr. Engineer, Sr. Administrator and DRB.
- Inputs from Foreign Donors
 - Sr. Road Management Expert
 - Sr. Road Maintenance Expert
- Duration
 - Scheduled for 2 years

Program 2 : Capacity Development for Road Maintenance Technology Under Force-Account Scheme for MOPI (Pilot Project I)

- Program Objectives
This program is planned to develop the road maintenance technology through implementing pilot project of the force-account team of the Directorate of Roads and Bridges (DRB), MOPI
- Program Activities
 - Practice of road inspection and inventory
 - Selection of pilot street suitable for gravel pavement (GR)
 - Design and cost estimate of gravel pavement of pilot street improvement (Pilot Project)
 - Study on construction / maintenance method of pavement and drainage
 - Procurement of construction equipment and materials

- Organization of working group mainly composed of community
 - Execution of road / maintenance work of pilot streets under force-account schemes
 - Preparation of road maintenance manual (gravel road)
 - Evaluation on pilot project implementation
 - Capacity development for the above activities
- Counterpart
 - DRB, MOPI
- Target Group
 - Project Manager
 - Sr. Engineer, Engineer, Technician
 - Construction supervisor
 - Equipment operator
 - Accountant
- Inputs from Foreign Donors
 - Sr. Highway Engineer
 - Sr. Road Maintenance Engineer
 - Procurement of construction equipment and materials
- Duration
 - Scheduled for 2 years

Program 3: Capacity Development of Road Maintenance Technology under Contact-out Scheme for Public and Private Sector (Pilot Project II)

- Program Objectives

This program aims to develop the road maintenance technology through implementing pilot project for the public sector (the Directorate of Roads and Bridges, MOPI) and private sector (local contractors)

- Program Activities

Public Sector

- Practice of road improvement and inventory
- Selection of pilot streets suitable for asphalt concrete pavement (AC)
- Design and cost estimate of AC pavement of pilot streets improvement (Pilot Project)
- Study on construction / maintenance method of pavement and drainage
- Preparation of tender and contract document
- Construction supervision of pilot streets under contract-out scheme
- Preparation of road maintenance manual (AC)
- Evaluation on pilot work implementation
- Capacity development for the above activities

Private Sector

- Construction of pilot street
- Procurement of construction equipment and materials
- Counterpart
 - DRB, MOPI
- Target Group

Public Sector

- Project Manager
- Sr. Engineer, Engineer
- Construction supervisor

Private Sector

- Construction Manager
- Construction Engineer and Technician
- Contract Administrator

- Inputs from Foreign Donors
 - Sr. Highway Engineer
 - Sr. Road Maintenance Engineer
 - Project Cost
- Duration
 - Scheduled for 2 years

Program 4: Equipment Operation and Management for Small-scale Road Maintenance

Program Objectives

The MOPI, CES is expected to execute the small-scale routine maintenance works mainly for local streets under force-account scheme until such time that the maintenance capacity of private contractors will be developed to execute the required works. This program is, therefore, planned to develop equipment operation and management capacity of the MOPI for small-scale road maintenance.

- Program Activities
 - Purchase of minimum number of equipment for road maintenance required for the MOPI
 - Preparation of manual for equipment operation and management
 - Capacity development of equipment operation and management
- Counterpart
 - MOPI
- Target Group
 - Force-account team, DRB, MOPI
 - Maintenance Engineer
 - Equipment Operator
- Input from Foreign Donors

26.6 STRENGTHNING OF THE PRIVATE SECTOR

26.6.1 Roles of Private Sector

The Strategic Plan of the MTR provides the following capacity policies.

- Short form of contract
This type of contract is recommended for construction work of relatively small capital value or repetitive work e.g. routine maintenance in a given period.
- Performance-based contract for management and maintenance of roads
- Design and build contract
- Work supervision services
Experienced engineering firms are engaged for project implementation, by procuring through Quality and Cost – Based Selection (QCBS)

In line with the MTR strategy and findings discussed in the Master Plan of the Study, there are two areas, namely engineering and construction, which should be dealt with, and be provided by the private sector. The engineering consultants and construction industry should be responsible for delivering the required services and works through competitive bidding at cost-effective basis.

The main players for road maintenance works in the private sector are recommended in relation to scope of works and required skillfulness to be as follows:

a) Engineering

- Consultant
 - Responsible for rendering engineering services including survey, feasibility study, engineering design, construction supervision and environmental assessment, etc.
 - Main services include:
 - Design of maintenance works
 - Cost estimate
 - Bidding assistance (Bidding, Evaluation, Contracting, etc.)
 - Supervision of construction works

b) Maintenance Works

- Private Construction Company
 - Suitable for large size maintenance works such as periodic maintenance for arterial road

- Main services include;
 - Perform major maintenance contracts under performance-based contract.
 - Perform emergency maintenance, if required
- Community-based Road Maintenance Company;
 - Appropriate for small size maintenance works such as routine maintenance of collector and local streets.
 - Main services include:
 - Execute small scale maintenance works of collectors and local streets to the required standard level
 - Serve as the agency of community regarding roads works including maintenance
 - The objectives of the community include:
 - Create employment opportunities
 - Develop the road maintenance knowledge of people in the community
 - Increase social status of rural people living in road corridors
 - Increase community cohesion
 - Increase the empowerment of community

26.6.2 Government's Support to Private Sector

To encourage and develop the local construction industry, the government support is absolutely indispensable including the following:

- Appropriate Classification of Contractor

Nowadays, local contractors are ineligible to bid for road projects funded by the MTR or donors without joint ventures / associations with foreign contractors. Especially for small and medium – sized contractors, lack of up-front capital as well as absence of credit / banking / insurance, non-availability of equipment and skilled manpower are common problems.

To solve such problems, contractors should be classified based on their capability so that they will be assigned the suitable size of project through the competitive bidding procedures.

The classification of contractor should be done in accordance with the following basic criteria, among others:

- Financial Status
- Personnel, Equipment and Equipment Capabilities
- Work Experiences of similar works in recent years
- Litigation History, if available
- Continuous Supply of Maintenance Projects consistent with the practicable road maintenance

plan of the government.

To achieve their aim, the government should formulate and announce to the private sector the clear annual maintenance plan with a sufficient fund allocation required for the maintenance works. In this way, the private sector will be ready to follow the government plan, and prepare them to render the required works and services.

- Establishment of Community-based Road Maintenance Companies

The government is primarily responsible for unemployment issue, poverty alleviation and community cohesions/security, for which the establishment of such companies may be meaningful. The companies will later be privatized at appropriate time.

- Compulsory Engagement of Local Contactor

Inclusion of local contractor as sub-contractor in the construction contract of international contractor for donor sponsored road projects shall be compulsory and mandatory to foster the development of private construction industry in the country.

- Preference of Local Contractor in International Bidding for Road Project in the country

Qualification of local contractors in international bidding for road improvement and maintenance projects funded locally by the government and sponsored by international donors may be nearly impracticable at this time. Therefore, local contractors shall be given preference or bonus points in evaluation of their qualification.

- Provision of Access to Credit / Banking / Insurance

Contractors are required the deposition of bid and performance guarantees before actual commencement of works. The up-front capital requirements are so huge that some local contractors may encounter the difficulties in arranging the financial requirements. The government is recommended to provide some access to financial agencies for such local contractors.

- Practice Training for Business and Engineering

Some local contractors lack the experiences in undertaking road construction and maintenance works. The work experiences of similar works are one of the mandatory requirements in pre-qualification in tendering of projects. Without such experiences, they can not be qualified regardless of their capabilities in other aspects.

The government is recommended to give reasonable opportunities for such contractors to undertake practical sizes of works, such as routine maintenance of collectors and local streets, as a course of local contractors training under the “Project Type Pilot Project” scheme giving the preferred priority to such local contractors.

PART VI

CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 27

CONCLUSIONS AND **R**ECOMMENDATIONS

CHAPTER 27 CONCLUSION AND RECOMMENDATION

Study Intention

- The Study proposes a set of measures to solve the present transport issues and formulates a functional transport system for the target year 2025. The output of the Study is expected to contribute to the development of urban transport system and encouragement of socio-economic activities in Juba urban area.
- The actual implementation of proposed projects is highly expected to commence immediately after the end of the Study, with the joint efforts of the central and state governments as well as the private sector.
- Such joint efforts and cooperation between the two sectors, public and private, shall be encouraged under the guidance and direction of the government.
- To this end, it is noted that the thoughtful understanding and unprejudiced support of the master plan in policy makers and budgeting agencies of Southern Sudan and the international society are indispensable for the successful implementation of the master plan.

27.1 CONCLUSIONS

27.1.1 Urban Transport Development Master Plan

(1) Plan Justification

- The Master Plan for Urban Transport Infrastructure in Juba urban area is formulated in comprehensive and systematic manner to cope with the present and future transport demands, and to support the socio-economic development in Juba urban area and Southern Sudan.
- The Master Plan identified the investment requirements within the following time frame:
 - Short Term (2009-2015) : US\$ 510 Million
 - Medium Term (2016-2020) : US\$ 640 Million
 - Long Term (2021-2025) : US\$ 710 Million
- The Master Plan is justified to be technically feasible and acceptable from the environmental and social viewpoint including the road network development plans for the Short, Medium and Long Terms as well as the plan beyond the year 2026.

(2) Plan Components

The Master Plan defines "Juba Urban Area" as the area enclosed by the proposed Circumferential Street No.4 (C4), and identified a number of projects and measures with the following main components:

Road Network Development

- Formulation of "Circumferential and Radial Street" Network System

<u>4-Circumferential Streets</u>	<u>6-Radial Streets</u>
C-1 : 10.1 Km	R-1 : 6.5 Km (Juba – Yei Road)
C-2 : 16.7 Km	R-2 : 5.8 Km (Juba – Mundri Road)
C-3 : 34.2 Km	R-3 : 7.7 Km (Juba – Terekeka Road)
<u>C-4 : 53.4 Km</u>	R-4 : 6.3 Km (Juba – Bor Road)
Total : 114.4 Km	R-5 : 12.0 Km (Juba - Lafon Road)
	<u>R-6 : 7.7 Km</u> (Juba – Nimule Road)
	Total : 46.0 Km

- Collector Street Development inside C-4 : 116.0 Km
- Local Street Rehabilitation inside C-4 : 498.2 Km

Public Transport Development

- Policy and Regulation on Operation
- Designation of Bus Routes
- Construction of Bus Terminal
- Vehicle Regulation

Traffic Management

- Policy and Regulation on Management
- Enforcement of Practical Traffic Rules and Regulations
- Practice of Traffic Safety Education

Transport Institution

- Human Resource Development
- Institutional Development

(3) Project Implementation

In order to smoothly implement the proposed projects, the establishment of the Inter-Ministry Committee for Transport (IMCT) is proposed with the role of formulating the transport development policy and plan, and coordinating between Ministries.

27.1.2 Pre-Feasibility Study Projects

(1) Project Selection

- The 4 Projects for Pre-Feasibility Study are selected among the high priority projects under the Short-Term period with the intension of providing urgent measures for rapid increase of urban population due to returning refugees/IDPs and migration from rural areas and permanent measures for the systematic formation of future urban structure, thus preventing the disorderly urban development in Juba.
- The Pre-Feasibility Study also proposes an effective road maintenance system which is in urgent need to support the socio-economic activities of the people focusing on collector and local street maintenance, as well as the urban environment improvement in the Central Commercial District (CCD).

(2) Project Components

1) Formulation of Urban Street Maintenance System

Administrative Jurisdiction of Urban Street

- The MTR, GOSS is responsible for the improvement and maintenance of arterial streets.
- The MOPI, State is responsible for the improvement and maintenance of collector and local streets.

Maintenance Works

- 3 types of maintenance works (re-surfacing, gravel pavement and asphalt concrete pavement) are proposed to be adopted in consideration of area characteristics, traffic volume and social acceptance.
- Temporary leveling of existing street (not improved/maintained streets) is suggested to be carried out wherever required.
- Leveling and re-surfacing maintenance works of seriously deteriorated local streets is recommend to be executed with community-based labor intensive method.

Table 27.1.2-1 Annual Budget Required for Maintenance in 2010 and 2016, the MOPI, CES

Road	Year 2012		Year 2016	
	Length (Km)	Cost (US\$)	Length (Km)	Cost (US\$)
Improved Streets *	21.3	495,000	95.9	2,520,000
Not-Improved Streets	10.0	400,000	20.0	800,000

*: Maintenance Cost only

2) Urban Street Improvement in Central Commercial District (CCD)

- The CCD is a historical area developed as the center of commercial, business and institutional activities and is presently suffering from deteriorated road surfaces, heavy traffic congestion and severe urban environment. Therefore, the urban scenery of this district is aimed to be improved at an international level.
- The Project is composed of the following:

	<u>Length (Km)</u>	<u>Construction Cost (Million US\$)</u>
Arterial Street	0	0
Collector Street	0.5	1.1
Major Local Street	3.0	5.7
Minor Local Street	9.1	5.6
	<u>12.6</u>	<u>12.8</u>

- The urban street improvement in the area, with acceptable environmental and social impacts, is justified technically and economically feasible based on the economic indicators and is concluded to be executed as early as possible to accelerate the socio-economic activities in the Juba urban center and Southern Sudan as a whole.
 - Net Present Value (Million US\$) : 10.8
 - Benefit Cost Ratio : 1.39
 - Economic Internal Rate of Return (%) : 12.4

3) Route Location Study

- The route alignments for the arterial streets of C2, C3 and R5 are newly established, while those of C1, R1 to R4, sections of R5 and R6 basically following the alignment of the existing roads.
- Several alignments of C3 Nile Bridge No.1 (south side) crossing the White Nile River are examined in terms of engineering, traffic efficiency, cost and environmental and social consideration. A detailed feasibility study of the bridge is, however, recommended to be undertaken at the earliest possible time to identify and resolve various engineering, environmental and social issues.
- Preparatory works should be conducted as soon as possible in order to minimize further encroachment and reserve the road right of way required for road construction in the future. This will save land acquisition and relocation costs, minimize negative social and environment impacts, and induce the systematic urban development in the area.

4) Urban Street Network Development in Southern Juba

- Juba urban area is rapidly expanding towards the east and southward of Juba due to continuous increase in population and settlement. The provision of a well planned transport infrastructure in the area is a vital need for the promotion of the systematic urban development of the region.
- The project is composed of the following:

		<u>Length (Km)</u>	<u>Construction Cost (Million US\$)</u>
- Arterial	C-2	7.2	73.6
	C-3	11.1	199.3
- Collector	Lologo	3.3	33.1
- Collector	Nyakuron	2.0	20.2
		<u>23.7</u>	<u>326.2</u>

- The project is justified to be technically and economically feasible and acceptable from the environmental and social viewpoint with the following economic indicators.
 - Net Present Value (Million US\$) : 11.4~75.8
 - Benefits Cost Ratio : 1.30 ~ 1.71
 - Economic Internal Rate of Return (%) : 11.2~11.7

27.1.3 Bridges and Culverts Reconstruction Project

- The project is formulated for 16 bridges to assume the structural safety of bridges and improve mobility and accessibility within Juba urban area.
- The improvement priority of each bridge and culvert is evaluated in terms of urgency, structural stability and traffic needs and classified as follows:
 - Priority “A” Bridges : 3 Bridges
 - Priority “B” Bridges : 1 Bridge, “B” Culverts : 3 Culverts
- The priority “A bridges” and priority “B” culverts are recommended for the early implementation.
- The Exchange of Notes between the Government of Japan and the Government of National Unity was signed on November 19, 2009 for the Construction of the three (3) priority bridges and the 3 priority culverts.

27.1.4 Capacity Development Thru Pilot Project

(1) 1st Pilot Project Implementation

- A section of a local street in Munuki was successfully maintained as the 1st Pilot Project adopting the *re-surfacing maintenance method* implemented by the Community Construction Group (CCG) consisting of representatives from the MTR, the MOPI and the unskilled workers from the community in the pilot project area.
- Pilot project implementation was justified with several facts in road maintenance system and methods. The MOPI, thru the assistance of a local contractor, demonstrated the capability to implement such level of road maintenance works by direct management/force account system including labor arrangement, materials procurement and equipment provision. The community showed the strong willingness in joining such community construction groups to improve their crucial infrastructure facility necessary for their daily activities.
- It is therefore concluded that, the routine maintenance of low class streets such as collectors and local streets may be carried out by community-based, labor-intensive maintenance method under the direct administration and engineering guidance of the MOPI.

(2) 2nd Pilot Project Implementation

- The 2nd Pilot Project is done as a continuation of the 1st Pilot Project after its successful implementation. The project focused on the next level of road maintenance works which is *maintenance of gravel pavement type* for collector and local roads. In the same manner, a Community Construction Group (with representatives from the MTR, the MOPI and the Munuki Payam) is organized to execute the road maintenance activities.
- The gravelling of the remaining section of the 1st Pilot Project road in Munuki is successfully undertaken by direct management of the MOPI and the participation of the local community thru labor support. The MOPI carried-out the project including planning, work management, labor management, quality management and safety management under its own force without assistance from a local contractor.
- It is noted that labor-based, equipment-assisted maintenance and improvement works of collector and local roads can be implemented successfully by the MOPI using its own force in collaboration with the local community. The community exhibited strong willingness and cooperation towards improving the local road infrastructure which is vital to their daily activities. Further, this maintenance system can generate the much needed employment opportunities in the local community which is very much helpful in enhancing their economic life.

(3) Issues on Capacity Development for Road Maintenance

- Although the MTR has a clear policy and strategy in addressing the needs for improving the road infrastructure at the national level, the MOPI, on the contrary, has no clear policy and

programs in the aspect of road improvement and maintenance. The present system of implementing maintenance works in the MOPI is not clear, without annual maintenance program and schedule of prioritizing roads for maintenance and rehabilitation works.

- Although there are seven (7) Departments in the Directorate of Roads and Bridges (MOPI), there are only twelve (12) are Engineers and Twenty Eight (28) Supervisors and Technicians to handle the CES road maintenance works. With the present stock of road network in Juba urban area, the MOPI will need more personnel to handle the demand for road maintenance. Moreover, during the course of the pilot projects, it is noted that the Staffs of the MOPI will need further upgrading in their knowledge and skills in planning, design and implementing road maintenance works.
- At present, there is no organized data base for road inventory in Juba urban area making it difficult for MOPI to prepare a plan and program for annual road maintenance and prioritize the roads for maintenance and rehabilitation.
- At present, only 1-Bulldozer and 1-Grader is in operation in the MOPI equipment stock which, due to age and lack of preventive maintenance, breaks down during operation. This lack of equipment for road maintenance, coupled with lack of available funds, make it almost impossible for the MOPI to handle the demand for road maintenance in Juba.
- During the execution of the 2nd Pilot Project, the MOPI rely on the MTR for laboratory and filed testing. However, internal problems with the MTR have led to delays in testing during the pilot project and the MOPI noticed the importance of having its own testing laboratory for road construction and maintenance.
- Moreover, during the implementation of the pilot projects, the MTR and the MOPI noticed the importance of having standard procedures for planning, design and management of road construction and maintenance. Following this observation, both agencies expressed their willingness to establish such standard manuals, guidelines and procedures including Standard Manuals for Inspection, Design, Maintenance/Repair, Management and Construction, Quality Control, etc. to guide the Engineers and Technicians in planning and executing maintenance works. However, assistance from foreign agencies in preparing such manuals and guidelines is necessary together with training the Engineers of the MTR and the MOPI on how to use and apply these manuals.

(4) Capacity Development Plan

- The present state of the road network in Juba urban area and the level of road maintenance technology and system of the MOPI, as observed during the implementation of the pilot projects, suggest an urgent need to develop such technology and system for maintaining the roads under MOPI's jurisdiction.
- The proposed capacity development programs include the following, which shall be implemented in the form of a Technical Cooperation Project Type:

Program 1: Establishment of Road Maintenance and Management System, the MOPI, State

Program 2: Capacity Development on Road Maintenance Technology under the Force-Account Scheme, the MOPI, State (Pilot Project I)

Program 3; Capacity Development on Road Maintenance Technology under the Contract-Out Scheme, the MOPI, State (Pilot Project II)

Program 4; Capacity Development on Equipment Operation and Management, the MOPI, State

(5) Government's Support for Strengthening of the Private Sector

- The areas of engineering and construction shall be provided by the private sector who should be responsible for delivering the required service and works through competitive bidding at cost-efficient basis.
- Support from the government is needed for the private industry in terms of encouragement, policy, contract administration, construction technology and quality control.
- Such supports include the continuous supply of maintenance projects, compulsory engagement and preference of local contractors in international bidding and provision of access to credit, banking and insurance.

27.2 RECOMMENDATIONS

(1) Plan Authorization

- The authorization of the Master Plan by the government of Southern Sudan is vital for the systematic implementation of the projects recommended in the Plan. The plan authorization should assure all efforts to be integrated towards the same directions and targets of Juba Urban Transport Development.
- Projects in the Master Plan should be included in the National Development Plan to initiate the implementation arrangement and secure the funds required for the smooth implementation of projects.

(2) Plan Premise

- The future land use pattern and urban structure are presumed in the Study focusing on the expansion of Juba urban area and the future transport patterns in the region, since there is no official land use plan or urban structure development plan.
- Juba urban area is being widely and drastically developed at present. Therefore, the

modification of the Master Plan may be required according to changes and development in the region such as socio-economic activities and land use pattern in the future.

(3) Project Arrangement

- The Master Plan provides only the concepts and outlines of the projects proposed in the Plan. Feasibility Studies and Detailed Engineering Studies should be conducted to define the project details including engineering requirement, economic justification and environmental and social impacts.
- To implement the project as scheduled, such Feasibility Studies and Detailed Engineering Studies should be performed a few years before the commencement of project construction to avoid unnecessary delay due to implementation problem such as acquisition of road right of way and resettlement of the people affected by the projects.
- The Feasibility Study on C3 Nile Bridge No.1 (south side) should be conducted as soon as possible because of the urgency of the project which is a catalyst required for the dynamic development in the region.

(4) Constitution of Inter-Ministry Committee for Transport (IMCT)

- The clear and comprehensive transport development policy, strategy and plan for Juba urban area are indispensable for the development, management and operation of efficient urban transport infrastructures.
- The Inter-Ministry Committee for Transport (IMCT) is recommended to be organized in order to discuss and enforce such clear and consistent plan. In order to have a smooth and effective coordination, the members of the committee should be composed of all ministries, traffic police and other agencies related to the Juba urban transport development, management and operation.

(5) Establishment of a Task Force for Road ROW Reservation

- The proposed routes for the arterial streets (4-circumferential streets and 6-radial streets) are identified only at the Pre-Feasibility Study level.
- A Task Force is recommended to be established to define the road right of way (ROW) in order to reserve the ROW corridor and minimize encroachment within the areas of the proposed routes and to induce the systematic development in Juba urban area.

(6) Adoption of Community Based Local Street Maintenance System

- The routine maintenance of local streets (leveling of existing deteriorated street surface, re-surfacing with minimum materials and minor gravelling works etc.) if carried out with labor-intensive maintenance method by the community-based working groups can also be expected to contribute to job creation.

- Community-based groups are recommended to be organized with the guidance of the Ministry of Physical Infrastructure (MOPI), the Central Equatorial State (CES) who should also be responsible for the technical supervision, material supply, equipment provision and labor costs, among others.
- Such maintenance works of local streets can be executed under a force account scheme of the MOPI who can employ the necessary labor-forces on labor contract bases. The MOPI should maintain the minimum equipment and tools required for such maintenance works.

(7) Community Participation in Project Planning and Implementation

- Public consultation meetings are strongly recommended to be held at the proper timing to build public concerns through a professional and transparent manner, during the planning, design, construction and operation and maintenance stages.
- The existing transport problem should be identified, and measures to cope with such problems should be discussed during the public consultation meetings at the project planning stage so that a common recognition of problem solution may be shared between the community and project implementing agency.

(8) Environmental Impact Assessment

- Initial Environmental Examination (IEE) is a mandatory requirement in planning projects, and Environmental Impact Assessment (EIA) shall be conducted for project where negative impacts are anticipated, in advance during the detailed engineering stage of such project.
- For projects with negative social impact such as land acquisition and project affected persons are identified, the land acquisition plan and Resettlement Action Plan (RAP) should be prepared during the conduct of the EIA.

(9) Traffic Safety Education and Enforcement

- It is widely understood that when roads are improved, vehicles tend to travel at higher speed resulting in increase in traffic accident. A traffic safety education program should be established involving education in schools and periodic education of drivers.
- The strengthening of traffic enforcement is also indispensable not only for the street adherence to traffic rules but also for maintaining certain urban activities of people and trust by community.

(10) Road Improvement and Land Development

- Road improvement, which is expected to lead to land development by the private sector, shall be implemented prior to or simultaneously with land development so that a systematic and controlled land development can be achieved.

- Some roads with high potential for land development are recommended to be improved through the Public-Private Partnership (PPP) scheme which shall be exercised whenever possible.

(11) Organization and Human Capacity Development

- The Plan includes a large number of transport projects embracing road improvement, public transport, and traffic management, which require large investments and implementation capacity. An effective organization for the systematic implementation approach is a vital key to the successful realization of the plan.
- Human capacity development programs for management and maintenance engineers, as well as for other fields, is the major task that should be strongly instituted to develop the required experience through on-the-job training and other systemized training programs.