Appendix 6

Geotechnical Survey Results

Geological Study Results

Geotechnical exploration was done to determine the soil properties and profile of the underlying soil at the proposed site for foundation design. Six borehole drilling points were undertaken, four in the river and two on the land. The locations of the boreholes are shown in Figure A6-1. CBR tests were also done at eleven points to determine the soil properties for the approach road (see Figure A6-2). Material tests were likewise done at three quarry sources for soil, sand and aggregate.

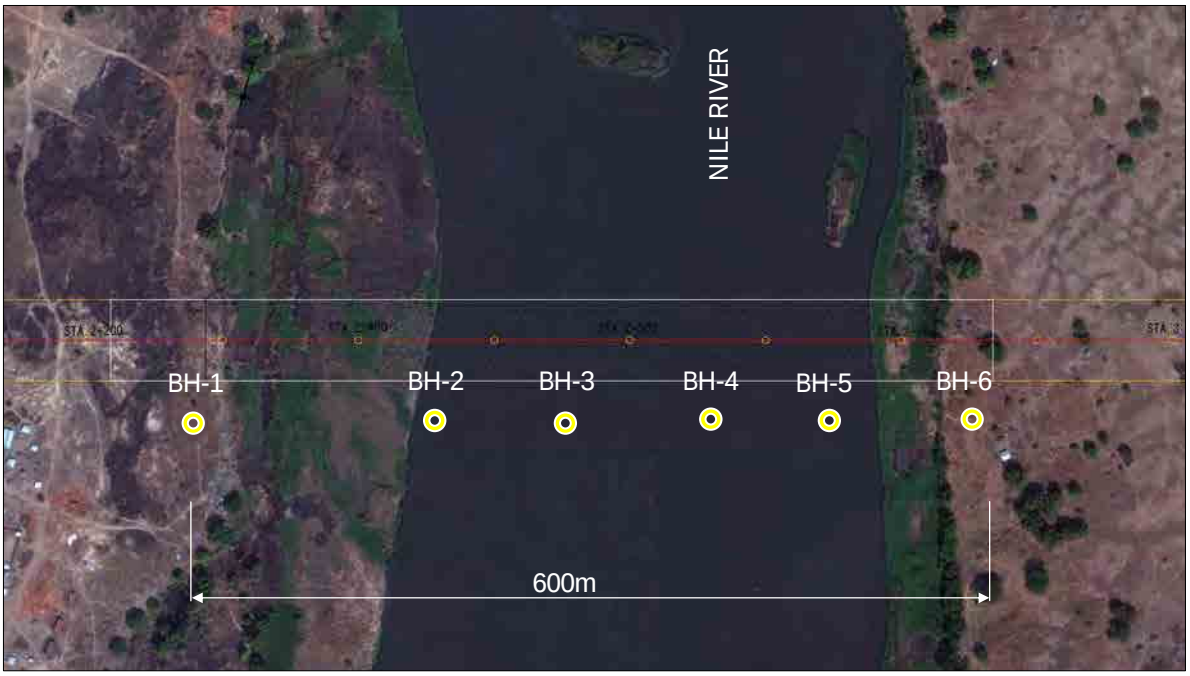
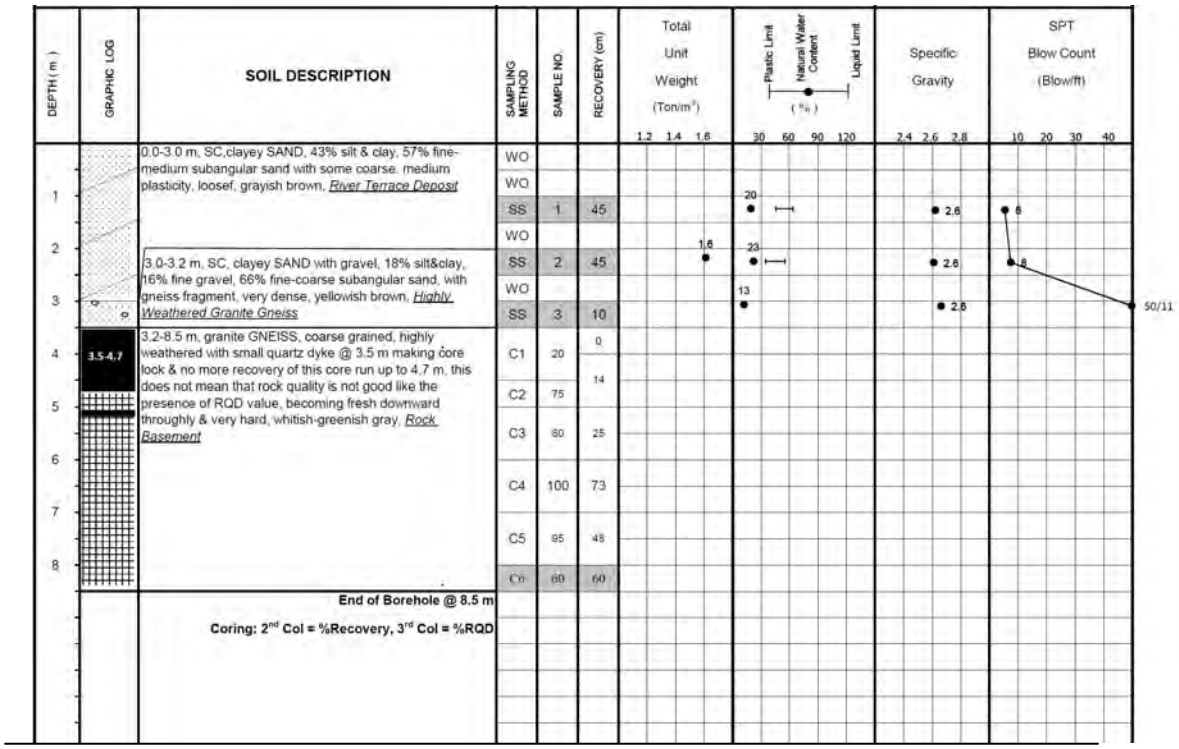


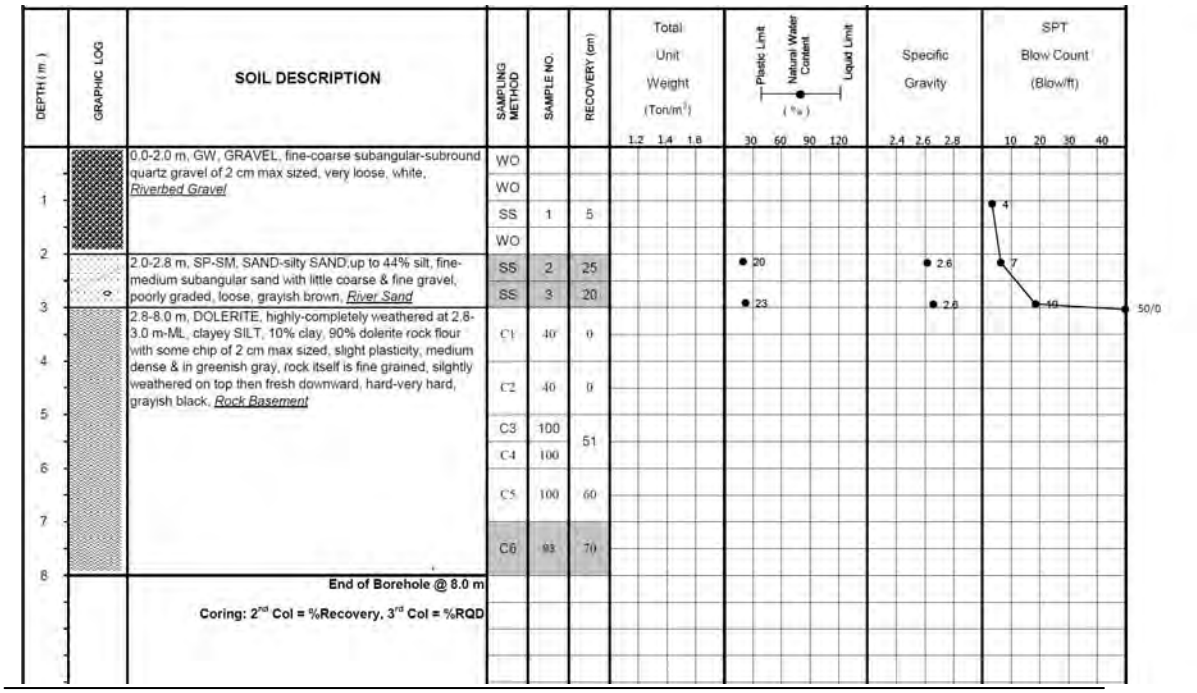
Figure A6-1 Points of Boring Exploration for Bridge Construction

図資 6-2 Points of CBR Test for Approach Road Construction

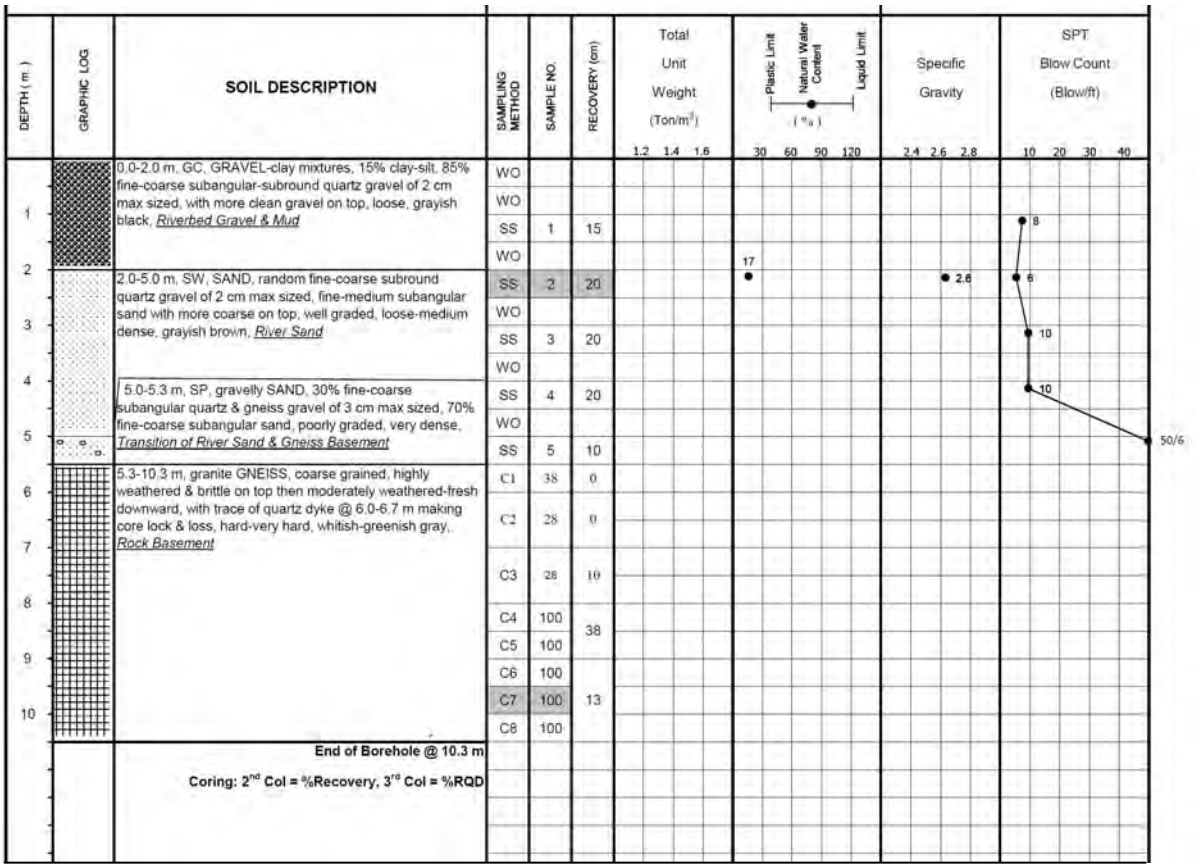
Soil Profile for BH-1



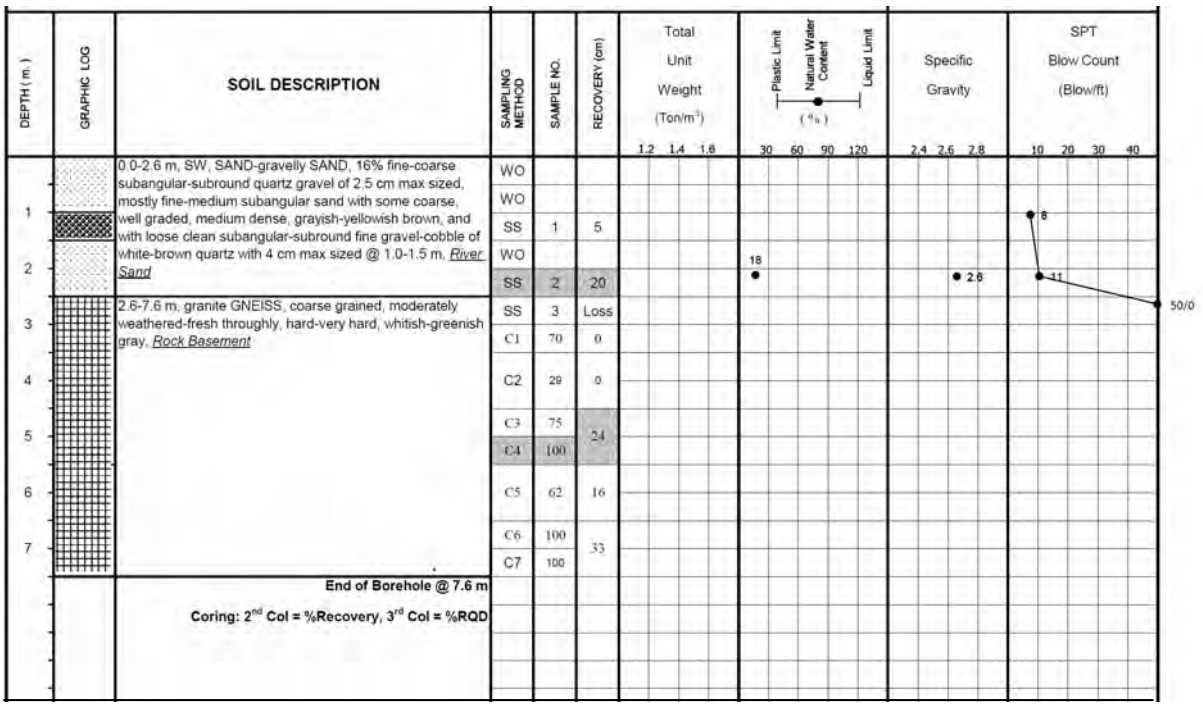
Soil Profile for BH-2



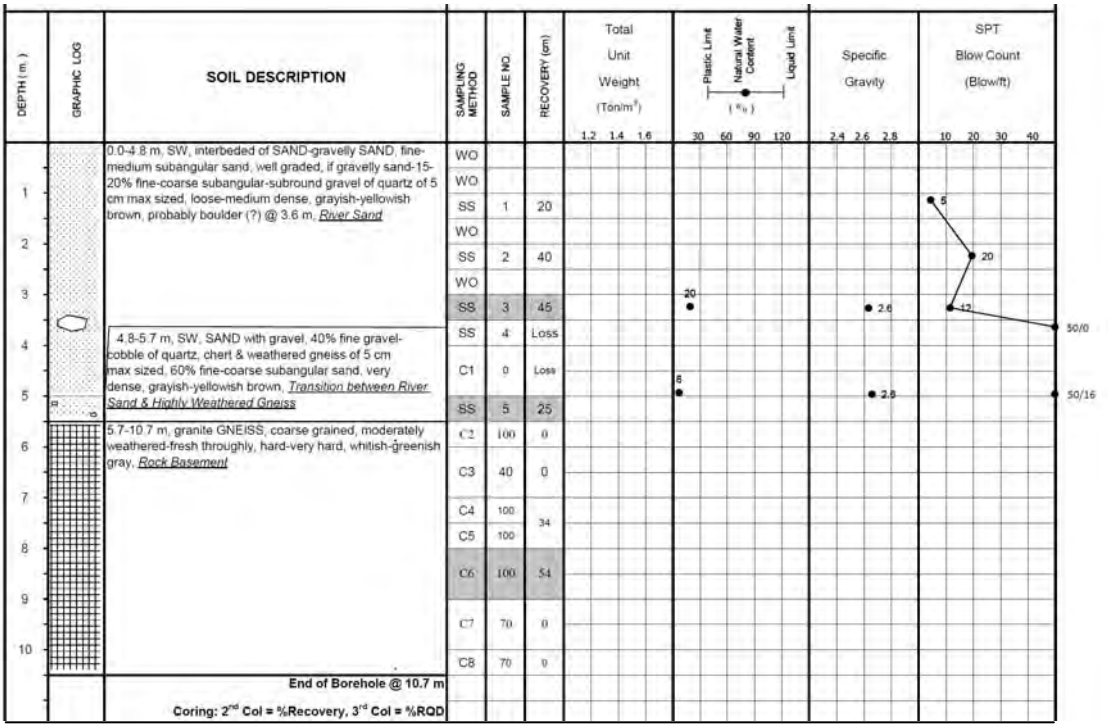
Soil Profile for BH-3



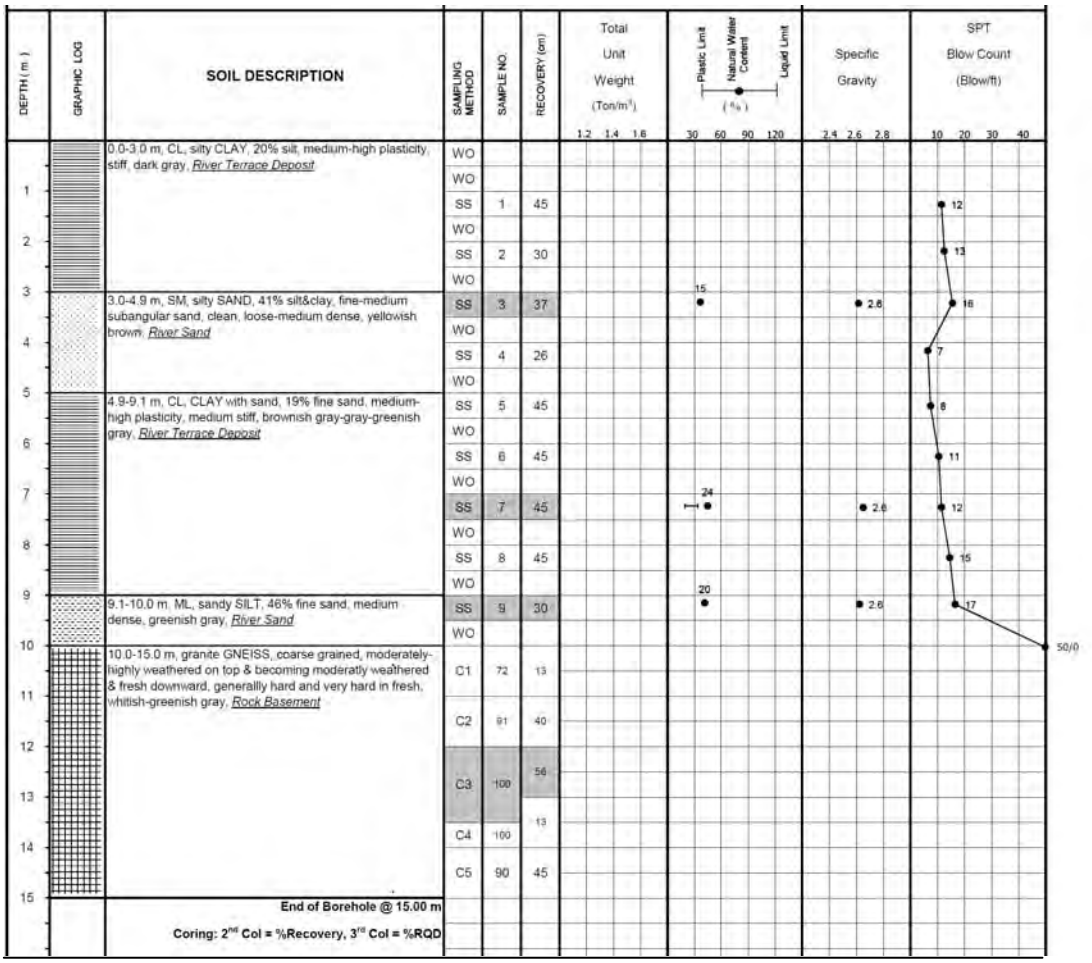
Soil Profile for BH-4



Soil Profile for BH-5



Soil Profile for BH-6



Soundness Test Results

Project : New Nile River Bridge, S-Sudan

Location : Fattouch Crushing Plant Testing Date : 21/03/2011

Tested by : MAA ASSHTO Classification :

Testing Method ☑ Sodium sulphate Solution ☐ Magnesium sulphate Solution

TESTING DATA

Sample No.	Type of Sample	Sieve Size		Grading of Original Sample	Weight of Fractions Before Test	Weight of Fractions After Test	Percentage Passing Designated Sieve After Test	Weighted Percentage Loss
		Passing	Retained	(%)	gm.	gm.	(%)	(%)
AGG1	Coarse Aggregate	2 1/2"	1 1/2"					
		1 1/2"	3/4"	60.1	1509.00	1509.0	0.0	0.0
		3/4"	3/8"	39.9	1000.85	989.0	1.2	0.5
		3/8"	No.4					
		Total		100	2509.85	2498.03		**0.47**

Remarks :

Appendix 7

Seismic Design Data

Seismic Design Data for Nile Bridge

1. Past Earthquake Records in Juba

The available data on past earthquake occurrences in Juba and the surrounding areas is very limited with some incident records presented in **Table A7-1** and shown in **Figures A7-1** and A**7-2**. It is seen in the records of **Figures A7-1** and A**7-2** that earthquake epicenters occur in the northern and eastern sections of Juba near the Nile River. Earthquakes of magnitudes of more than 7.0 are experienced at least twice in the year 1990 at a distance of about 60kms from Juba. Moreover, closer earthquake events occurred at just 16kms and 25kms from Juba, although the magnitudes are just over 5.0.

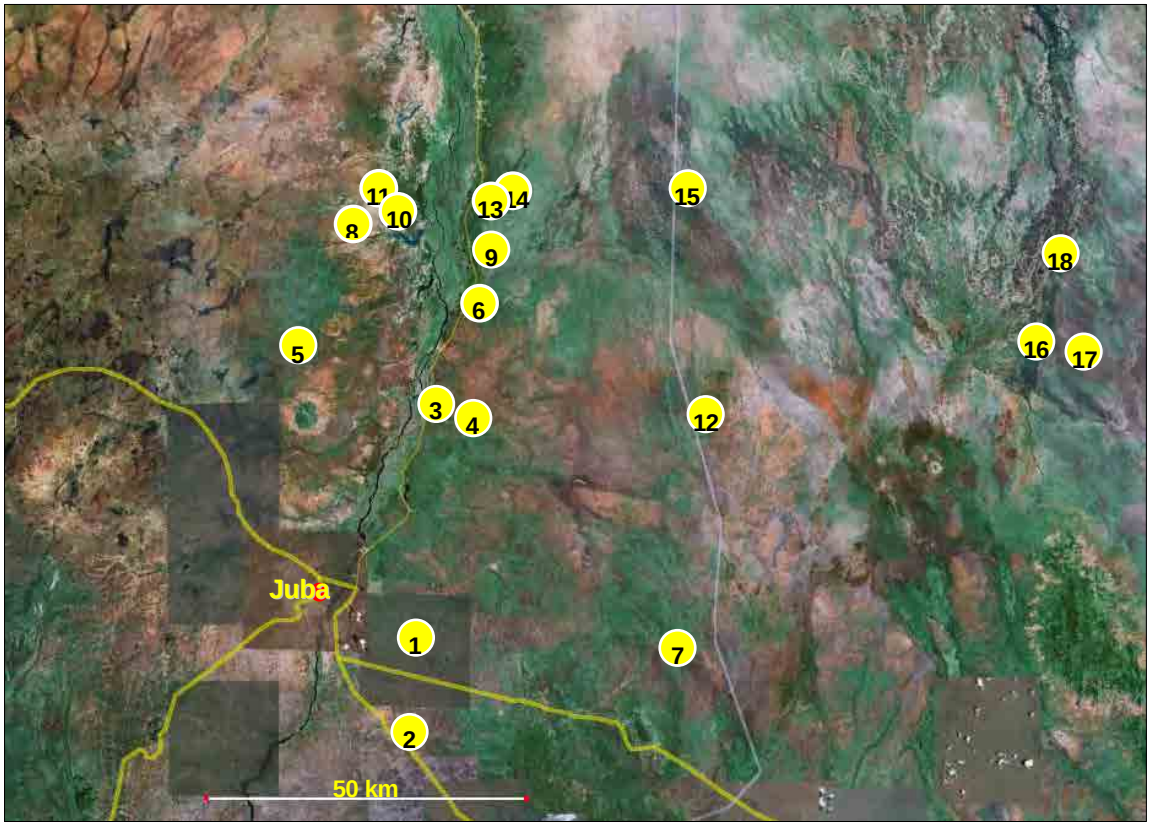
In this regard, although with a very limited data available, it is necessary to consider the seismic excitation effects in the design of structures in Juba and its surrounding areas, including the proposed new Nile River Bridge.

Table A7-1 Record of Past Earthquake in Juba

No.	Magnitude	Date	Time of Occurrence	Depth of Hypocenter (km)	Distance from JUBA (km)
1	5.1	15-Oct-1982	8:37:00 AM	10.0	25
2	5.0	02-Mar-1992	8:30:00 PM	10.0	41
3	***7.2***	***20-May-1990***	***2:22:00 AM***	***14.9***	***67***
4	5.4	29-Mar-1991	9:06:00 AM	10.0	125
5	6.5	24-May-1990	7:34:00 PM	16.5	54
6	***7.1***	***24-May-1990***	***8:00:00 PM***	***16.0***	***63***
7	5.5	24-May-1990	10:16:00 PM	10.0	71
8	5.3	25-May-1990	12:42:00 AM	10.0	69
9	5.0	26-May-1990	2:22:00 PM	10.0	37
10	5.0	27-May-1990	7:29:00 AM	10.0	16
11	5.1	03-Jun-1990	4:23:00 PM	10.0	87
12	5.2	20-Jun-1990	6:47:00 PM	15.6	64
13	6.6	09-Jul-1990	3:11:00 PM	12.6	61
14	5.3	28-Jul-1990	4:46:00 PM	10.0	118
15	5.2	10-Jan-1991	7:06:00 AM	11.4	38
16	5.2	07-Sep-1990	12:12:00 AM	10.0	66
17	5.0	03-Oct-1992	4:22:00 PM	33.0	57
18	5.0	11-Dec-1990	5:09:00 AM	10.0	127

*Seismic data are based on the United States Geological Survey (USGS).

**Refer to Figure A7-1 for the locations of the events.



*Refer to Table A1-1 for the details of the events.

Figure A7-1 Seismic Center around Juba

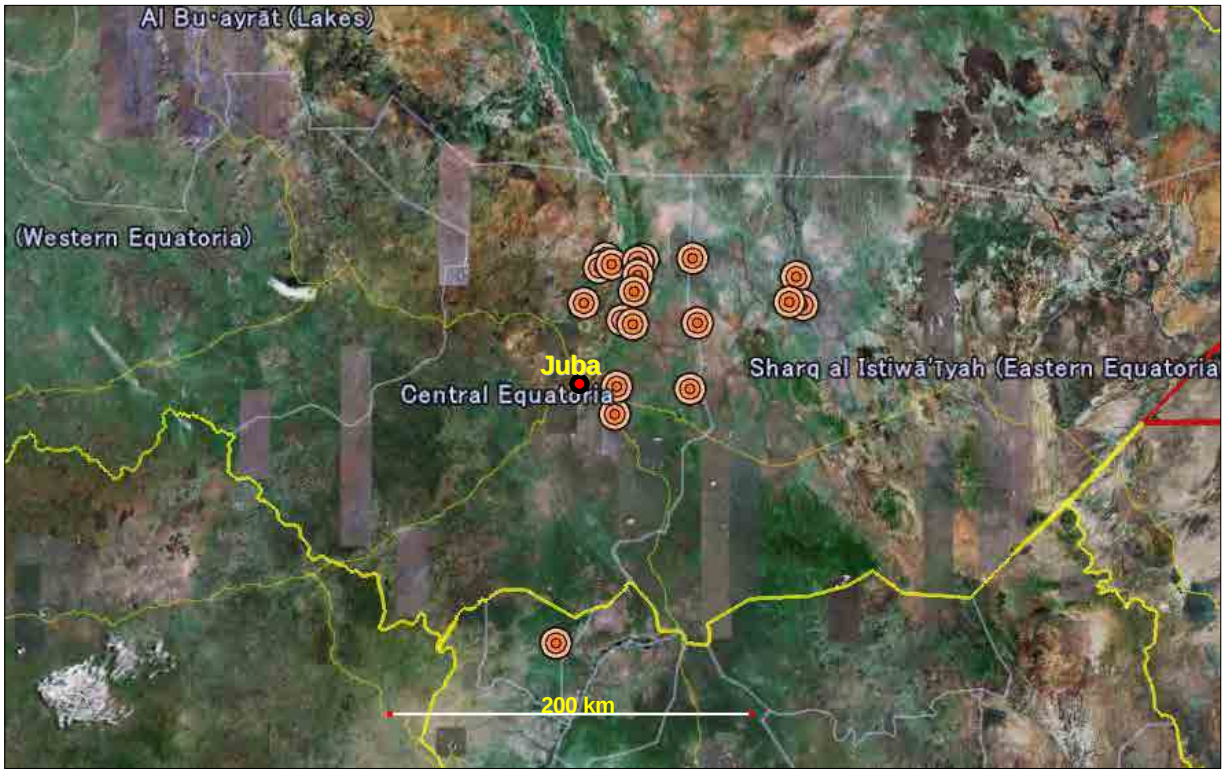


Figure A7-2 Seismic Center around South Sudan

2. Horizontal Peak Ground Acceleration

The design earthquake ground motion at the bridge site is determined in consideration of the information on earthquake histories around the bridge site, geological structures, geotechnical conditions, active faults, earthquakes occurring in the plate-boundaries near the site and existing strong motion earthquake records.

The corresponding peak ground acceleration in Juba from the different earthquake events can be calculated using the attenuation equation recommendations of the Specifications for Highway Bridge - Part V Seismic Design, Japan Road Association (JRA), as shown in **Table A7-2**.

The three types of earthquake attenuation equations given in the JRA are as follows:

Table A7-2 Assumption of Earthquake Acoeleration （gal） at Seismic Plane using Magnitude

Type	Peak Ground Acceleration	Ground Condition
Type I	$\alpha^{H}_{max} = 987.4 \times 10^{0.216M} \times (\Delta + 30)^{-1.218}$	- includes good diluvial ground and rock
Type II	$\alpha^{H}_{max} = 232.5 \times 10^{0.313M} \times (\Delta + 30)^{-1.218}$	- denotes diluvial and alluvial ground other than Types I and III
Type II	$\alpha^{H}_{max} = 403.8 \times 10^{0.265M} \times (\Delta + 30)^{-1.218}$	- includes soft ground of alluvial ground

where: α : peak ground acceleration (gal)
M : earthquake magnitude
Δ : distance from epicenter (km)

Considering earthquakes of Magnitudes M = 6, 7 and 8, the peak ground accelerations as function of earthquake distance from the epicenter is plotted in **Figure A7-3**.

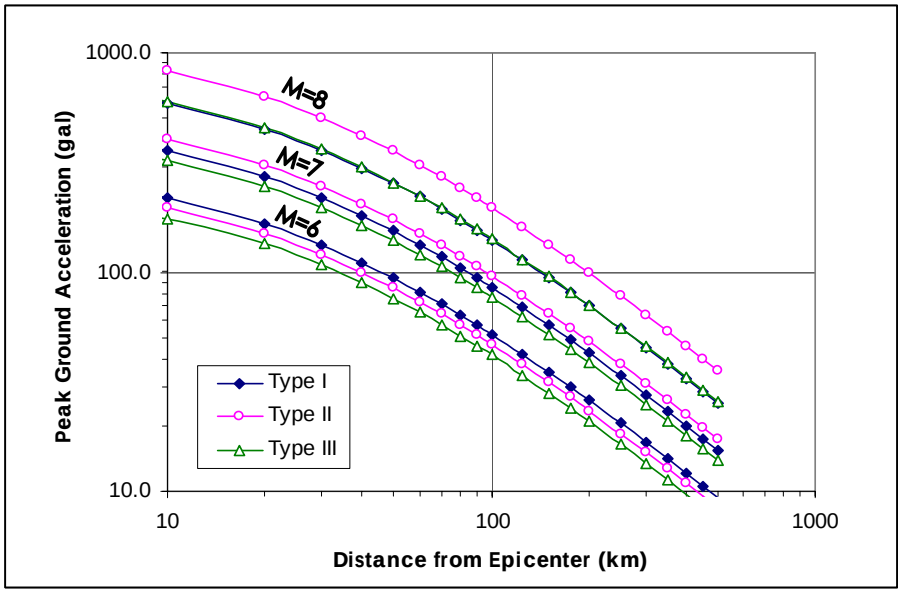
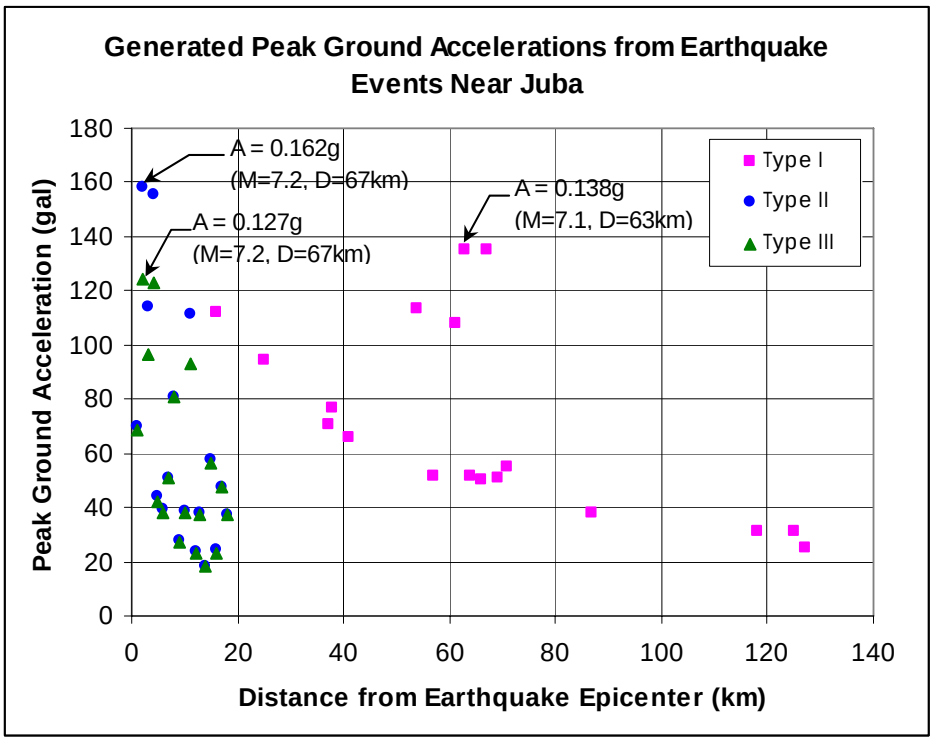


Figure A7-3 Relationship among Earthquake Acceleration at Ground (gal), Magnitude and Distance

The peak ground accelerations generated by the earthquakes given in **Table A7-1** is calculated based on the equations in **Table A7-2** for the three soil type conditions and plotted in **Figure A7-4**. The ground conditions in Juba can be taken as Type I and Type II conditions with shallow rock formations. In this regard, the peak ground accelerations are calculated as 0.162g and 0.138g for soil Types II and I respectively.



g = gravitational acceleration (980.6 cm/sec^2)

Figure A7-4　Largest Earthquake Acceleration at Ground（According to Table A7-1）

3. Design Peak Ground Acceleration

At present, there is no established map for the design peak ground acceleration in Southern Sudan to be used in determining the appropriate response spectrum for earthquake effects. However, the limited available data on earthquake occurrences for the past 30years indicates that the peak ground acceleration in Juba approaches values of 160gals (0.162g) for Type II soil and 140gals (0.138g) for Type I soil.

AASHTO 3.10 stipulates that " bridges shall be designed to have a low probability of collapse but may suffer significant damage and disruption to service when subject to earthquake ground motions that have seven percent probability of exceedance in 75 yrs".

On the other hand, assuming a moderate earthquake with high probability of occurrence, JRA recommends the value of the standard response spectra (So) to be 200 gals (0.1≦T ≦1.1) for Type I and 250 gals (0.2≦T ≦1.3) for Type II under Level 1 seismic performance (bridge level keeping its sound functions during and earthquake).

In this regard, it is recommended that the value of **0.20g be used for the design peak ground acceleration**, which is about 25% higher than the recorded ground accelerations in Juba.

Appendix 8

Hydrological Study Results

Hydrological Study Results

1. River Basin Upper New Nile Bridge

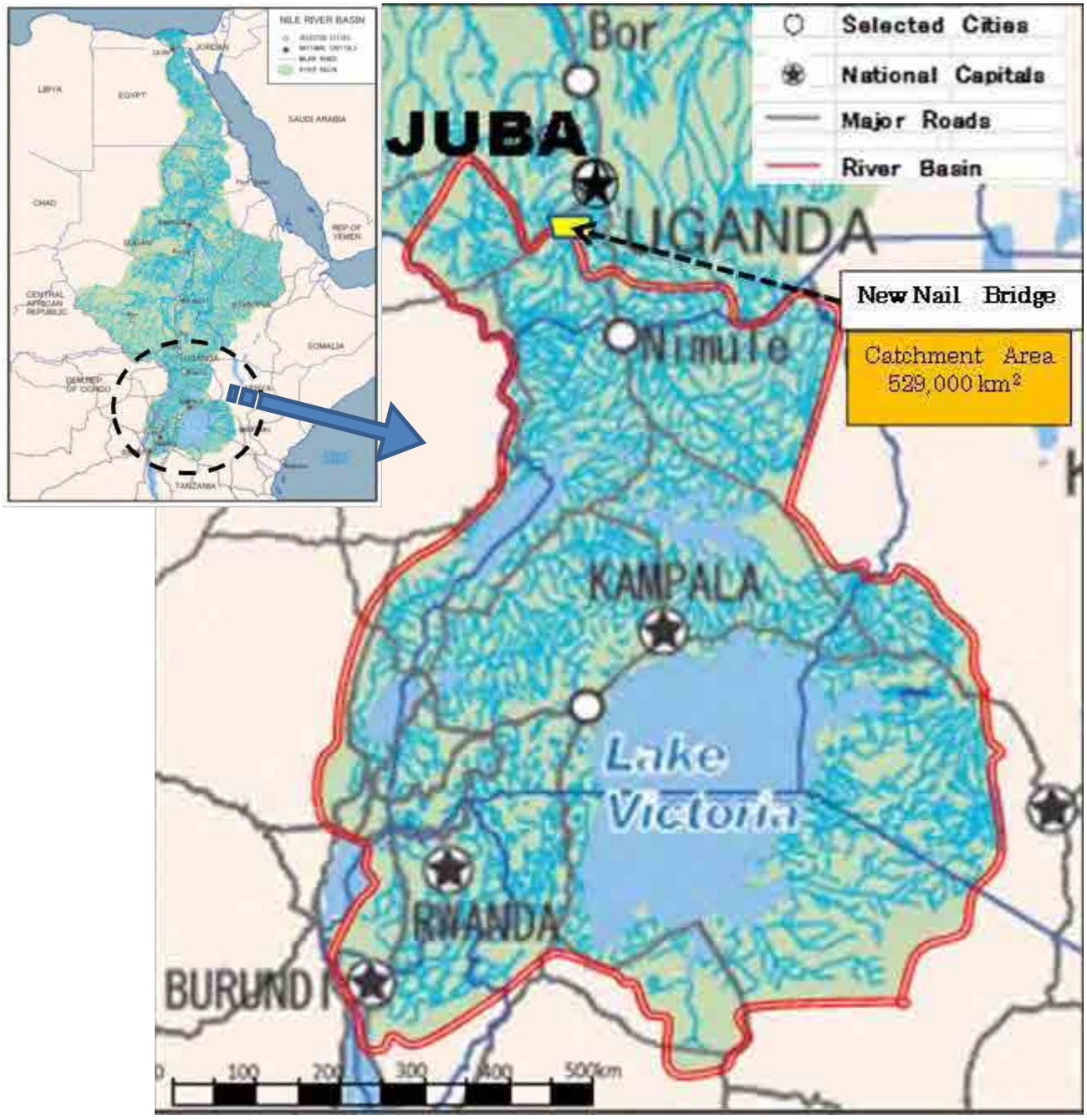
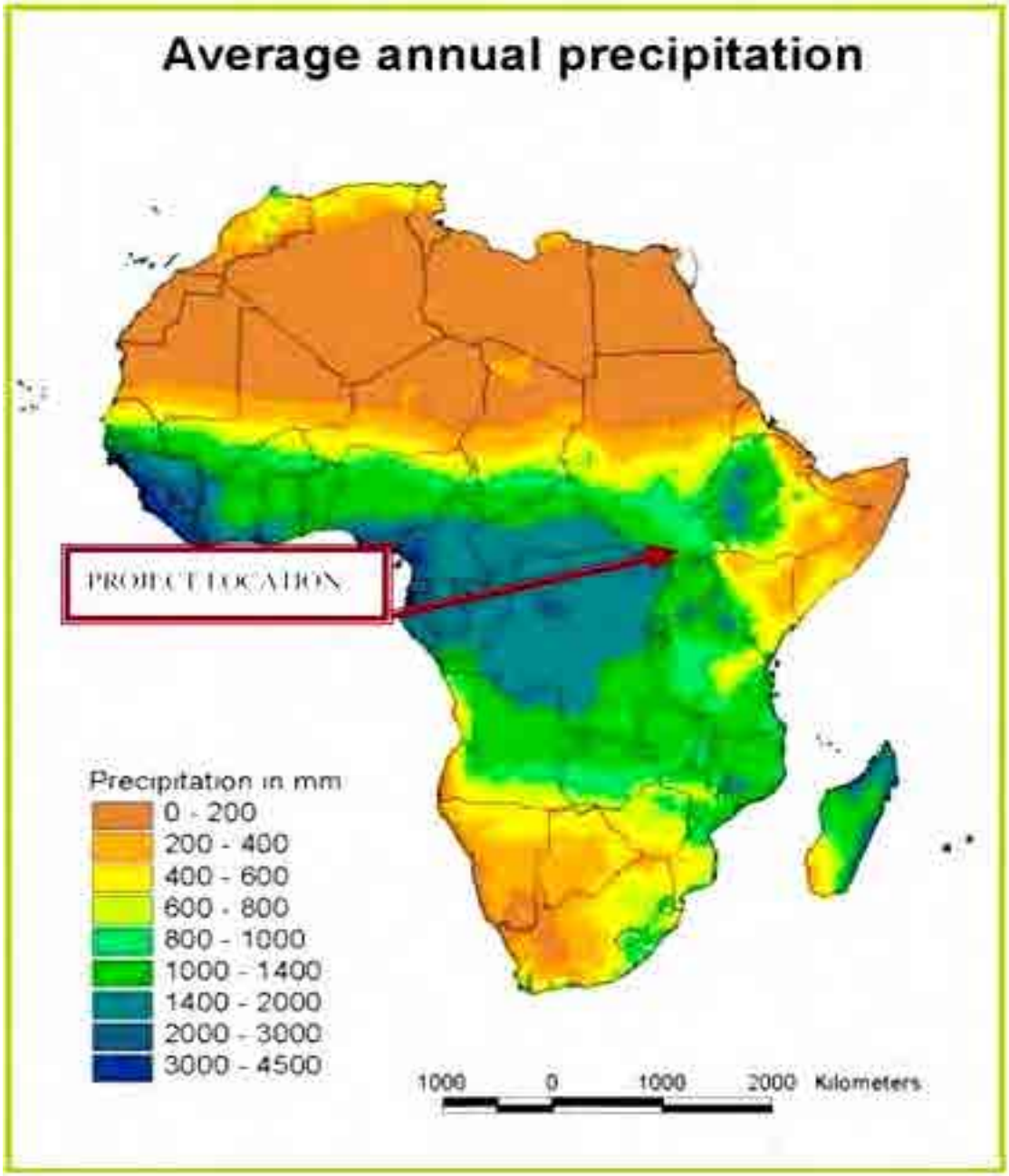


Figure A8-1　River Basin Upstream of New Nile River Bridge

2. Average Annual Precipitation in Africa



Source：EIDCR　CHAPTER 5 Hydrological Condition

Figure A8-2 Average Annual Precipitation

(1) **Characteristics of river channel at site**

① **Characteristics of River Cross-section and Longitudinal Profile**

The result of the river topographic and profile survey in January to March, 2011, is as follows. The survey was done in and around the planned road. According to the result, three things can be said;

- On the left side of the river bank is a 150m flood section which is part of the natural channel,
- Water level during survey was at EL.+455.65m.
- Result of the longitudinal survey indicates river bed slope is 1/3,900.

There is no river channel improvement plan, therefore the location of bridge abutments determines the length of bridge. Maximum river flow discharge and HWL (high water level) points during bridge planning is important to determine the bridge length.

Measurement result at the point of the highest water level during 2010 rainy season, identified by hearing, is shown in Figure A8-3. The average of the two points is EL+456.65m, one meter higher than the elevation of existing road center.

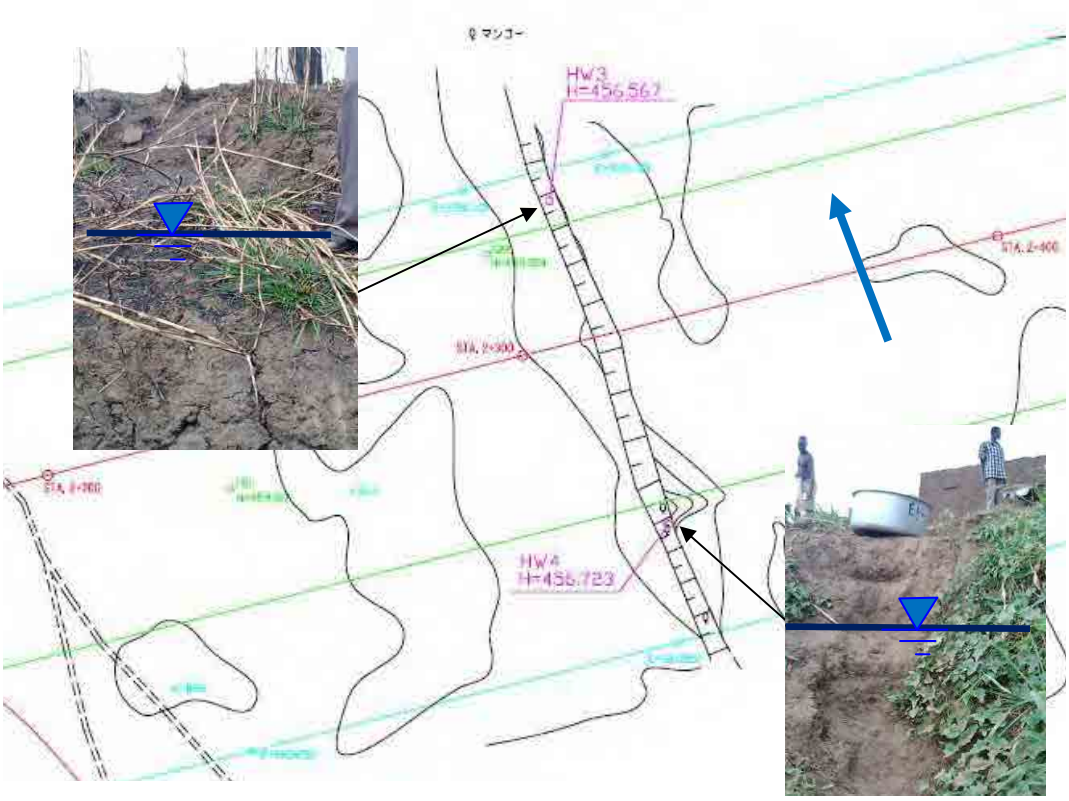


Figure A8-3 The point of highest water level in 2010 (according to hearing study)

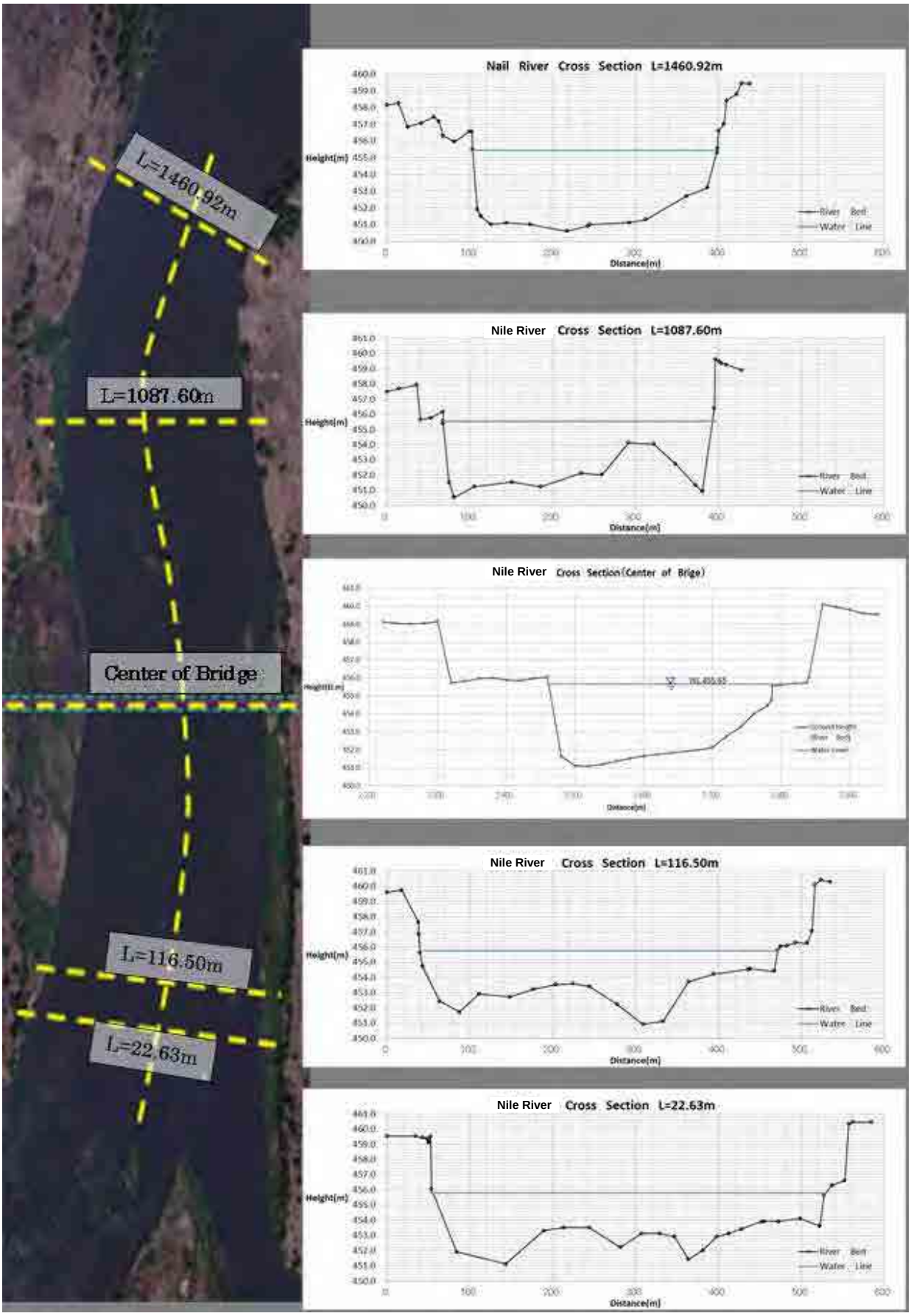
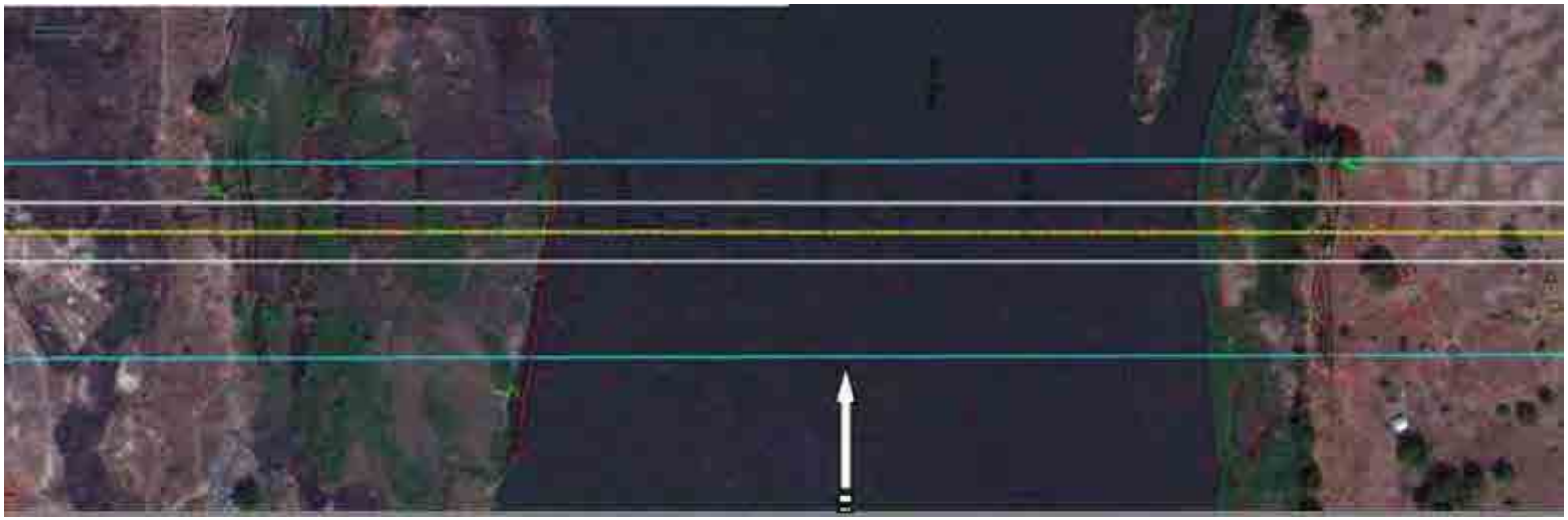


Figure A8-4 River Cross section



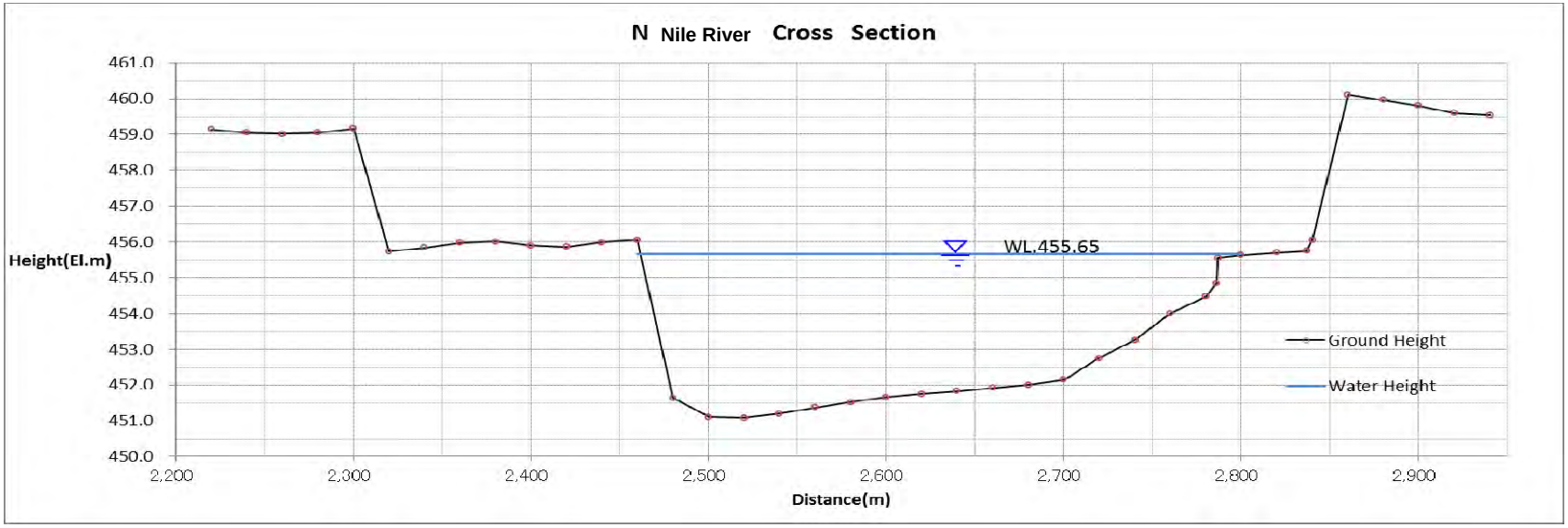


Figure A8-5 River Cross section (proposed road center)

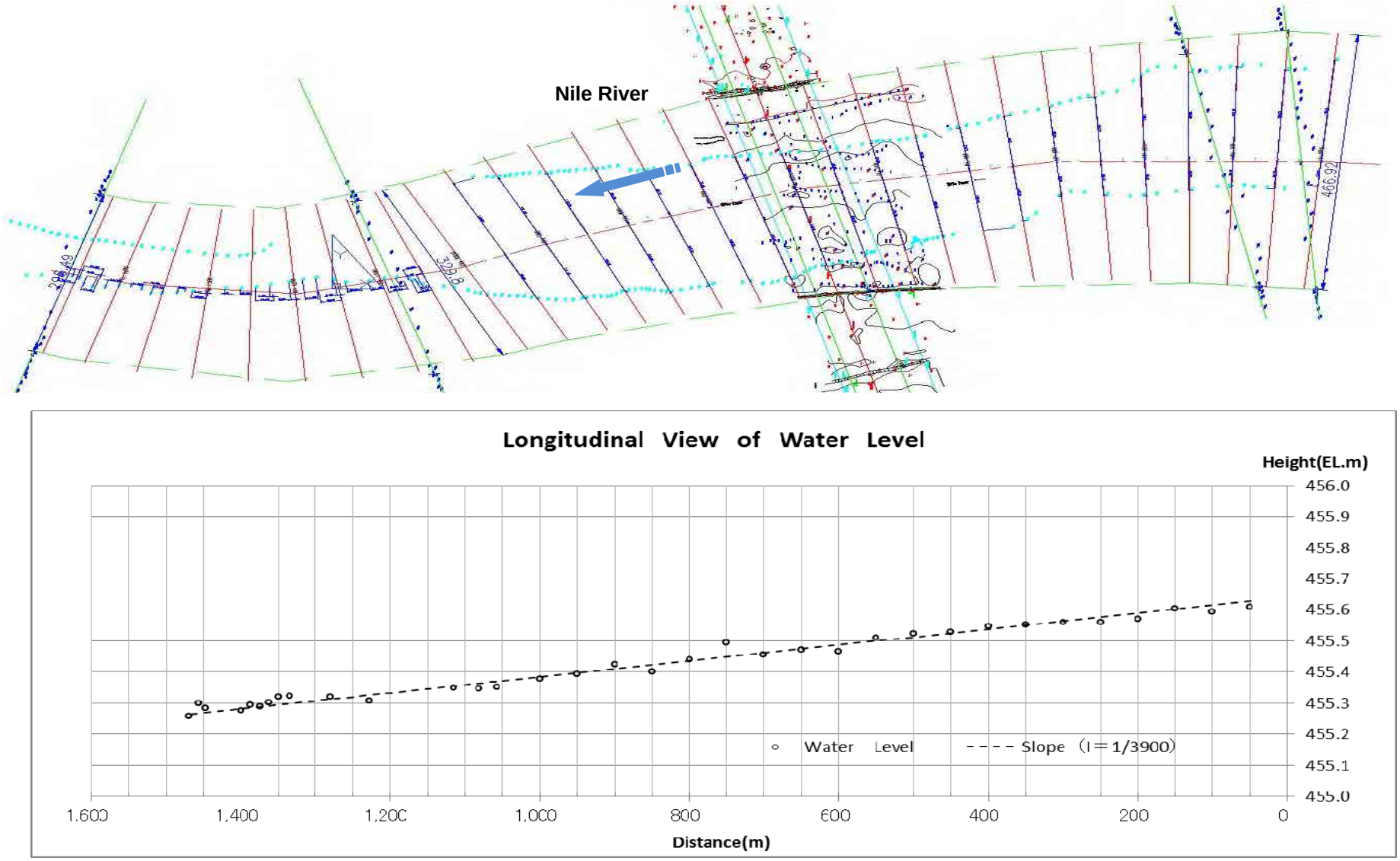


Figure A8-6 River longitudinal profile

② Water Level Around the Bridge Planned Location

The reference data of the water level around the bridge planned location, is taken from the record of water level at the Juba city water authority equipment which is done once a day since cease-fire agreement.

Variation of water level is around 0.5m in rainy season in 2007, while 1.0~1.2m in 2008 and 2009. The measuring point is at approximately 5 km downstream of the bridge planned location, which indicates that the water level of the bridge planned point is assumed lower. The assumption is based on the measured slope of 1/3,900. The measured water level during February 2011 was EL+455.65m, which is almost same as the downstream.

③

Record of Water Level (Proposed Bridge Location)

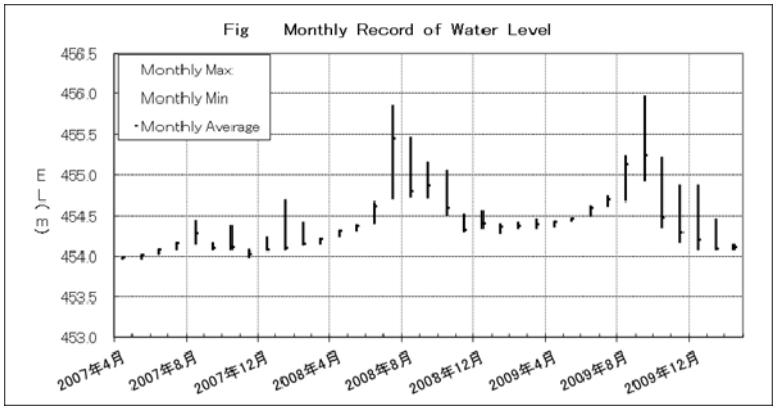
Unit: EL in m

Maximum	Minimum	Average
457.3	455.2	455.7

Monthly Water Elevation （JUBA市内 浄水施設地点）

Unit : EL.m

月	Monthly Max	Monthly Min	Monthly Average	月	Monthly Max	Monthly Min	Monthly Average
2007年4月	454.15	454.07	454.096	2008年10月	455.47	454.72	454.788
2007年5月	454.47	454.07	454.072	2008年11月	455.87	454.7	455.433
2007年6月	454.88	454.07	454.185	2008年12月	454.67	454.4	454.614
2007年7月	454.88	454.16	454.278	2009年1月	454.4	454.3	454.37
2007年8月	455.23	454.34	454.466	2009年2月	454.31	454.23	454.303
2007年9月	455.97	454.92	455.239	2009年3月	454.22	454.14	454.205
2007年10月	455.25	454.67	455.126	2009年4月	454.43	454.13	454.138
2007年11月	454.75	454.61	454.687	2009年5月	454.69	454.07	454.086
2007年12月	454.63	454.49	454.596	2009年6月	454.24	454.07	454.07
2008年1月	454.47	454.43	454.461	2009年7月	454.09	453.98	454.03
2008年2月	454.43	454.36	454.417	2009年8月	454.39	454.07	454.097
2008年3月	454.47	454.33	454.382	2009年9月	454.17	454.07	454.086
2008年4月	454.43	454.33	454.367	2009年10月	454.45	454.14	454.275
2008年5月	454.41	454.27	454.356	2009年11月	454.17	454.07	454.145
2008年6月	454.57	454.33	454.399	2009年12月	454.07	454.03	454.063
2008年7月	454.53	454.29	454.313	2010年1月	454.03	453.96	454.018
2008年8月	455.07	454.5	454.588	2010年2月	453.99	453.96	453.986
2008年9月	455.17	454.71	454.857				



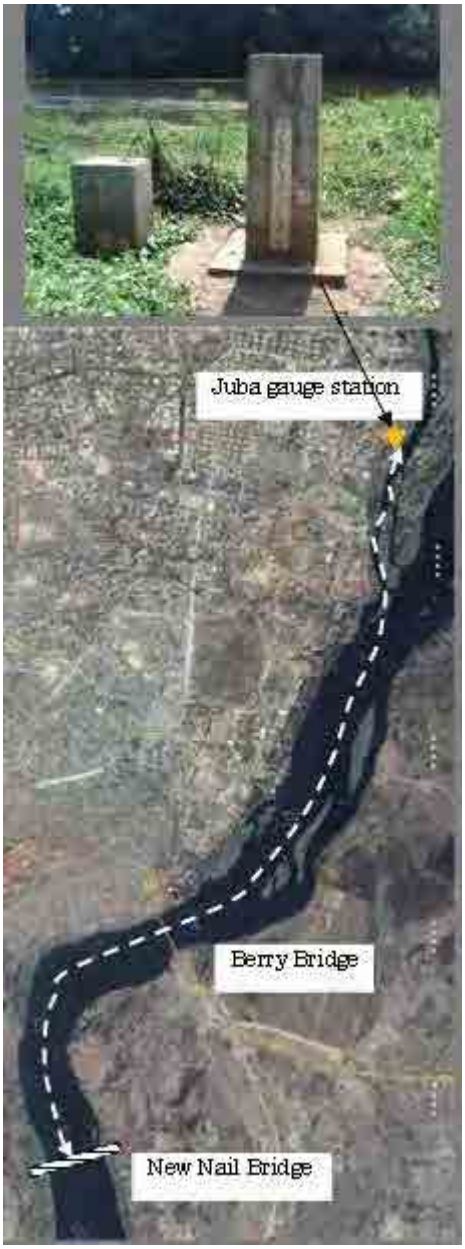
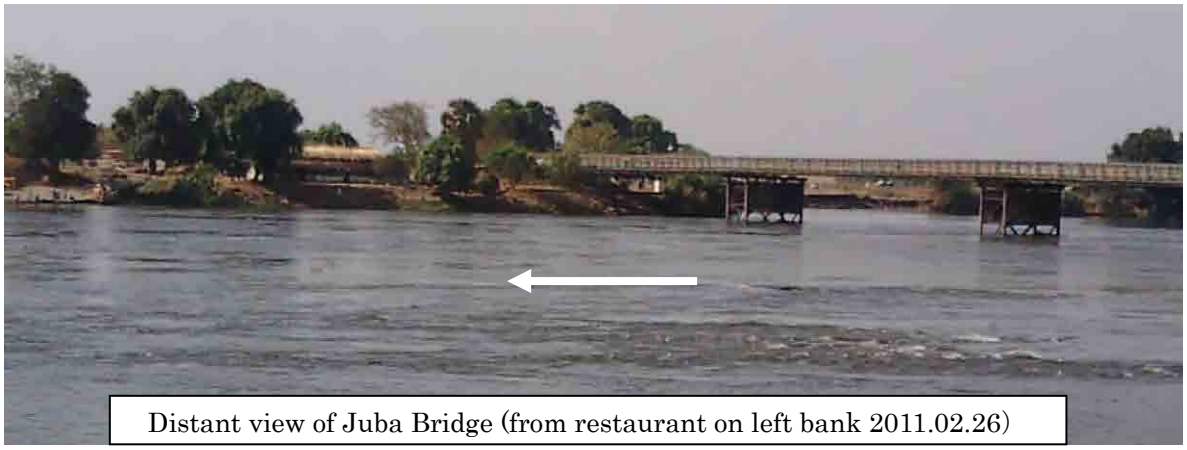


Figure A8-7 Water Level around the Bridge

Freeboard of Existing Juba Bridge



Distant view of Juba Bridge (from restaurant on left bank 2011.02.26)

The study team investigated the freeboard of the existing Juba Bridge to the highest water level by interview.

Pier on the right bank of downstream of Juba Bridge(broken in 2011.03.06)

The first span of Juba Bridge on right bank (2011.03.06)

There is no data of cross-sectional survey at existing Juba Bridge, therefore a rectangle section is assumed with the width of bridge taken as 42m×6 between spans to calculate the level of water from flow discharge. The result of the calculation is shown below.

(The value of slope is the result of the survey in February 2011 and the roughness coefficient is assumed as 0.03, at the bridge location.)

Water Surface Slope (i) = 1/3,900
Roughness Coefficient (n) = 0.03
River Width = 252m (Assumed Rectangle)

Water Depth (m)	Ave. Vel. (m/s)	Discharge (m^3/s)	Remarks
4.0	1.32	1,330	Equivalent to bridge location discharge
5.0	1.52	1,920	Equivalent to bridge location 2010 maximum discharge
9.0	2.21	5,000	Equivalent to bridge location design discharge (1/100)

Highest rise in water level of the previous year is approximately 1.2m from the current water level (according to the hearing survey), while at the bridge location point is 1m. The difference

can be seen as within the limit of error. Using the calculated amount of water flow discharge, the rise in water level is assumed at 5m, which indicates that freeboard of the existing Juba Bridge is approximately 1m.

④ Position of Bridge Abutment and Length of Bridge

The flood channel of left bank, which is flooded every rainy season with 1/100-1/50 probability, has an 80m dead water region from the river bank as indicated in the upstream and downstream plan of the river from the proposed bridge location. The dead water region is not a flood area, which make it possible to construct the road with land fill and the bridge abutment in the area - the minimum length of bridge will be approximately 480m. Although this length can be made advantageous in the construction cost, the abutment should clear the existing river bank for the following reason.

However, although the velocity is slower than the main stream, the suspended soil sediment from the upstream flow is deposited in front of the embankment while the downstream side of the embankment is eroded. After a certain period, as shown in Figure A8-8, the upstream side of the embankment will be filled with sediment while the downstream side eroded.

Figure A8-8 Effect Assumption in Case of Bridge Abutment is Set at Flood Channel

Considering the above, it is difficult to assume the range of impact and the inconvenience it will cause to the users of flood channel if the abutment is built in the flood channel. Moreover, protective measures against erosion will be necessary in this case. That place is also flooded every year even if the velocity is slow and the river channel is formed by nature. It is therefore necessary to construct a minimum artificial structure from the view of saving the natural environment. As a conclusion, the bridge abutment should be constructed at the left bank, which is not flooded with 1/50 probability and the length of the bridge is set at 560m.

The bridge span is decided as below, to cater the basic length of between according to the length of bridge and cross-section of bridge.

Section of flood channel on the left bank：Span 30m x 5 (150m) – Pier width 2m x 5loc
Section of main stream：Span 87.5m x 4 (350m) – Pier width 3m x 3loc
Section of flood channel on the right bank：Span 30m x 2 (60m) – Pier width 2m x 2loc

The velocity of flood channel is slower than the main stream, comparing the flow discharge volume as shown below. For this reason, basic span is set as 30m.

Section of flood channel on the left bank： $540m^{3/}s$ – basic span：23m
Section of main stream： $4{,}220m^{3/}s$ – basic span：45m
Section of flood channel on the right bank：$240m^{3/}s$ – basic span：22m

⑤ Effect of Bridge Pier Constriction to River Cross-section

The effect of constructing the piers in the river to the river cross-section and flow discharge is discussed below.

The effects of the river cross-section constriction by constructing the piers are evaluated using the uniform flow calculations. According to the calculation results, the calculated water level is at EL+459.29m (7cm higher than the planned cross-section) using maximum river discharge of 5,000m3/s. This amount is not over the HWL, therefore the effect of disturbance caused by the bridge pier constriction is almost negligible.

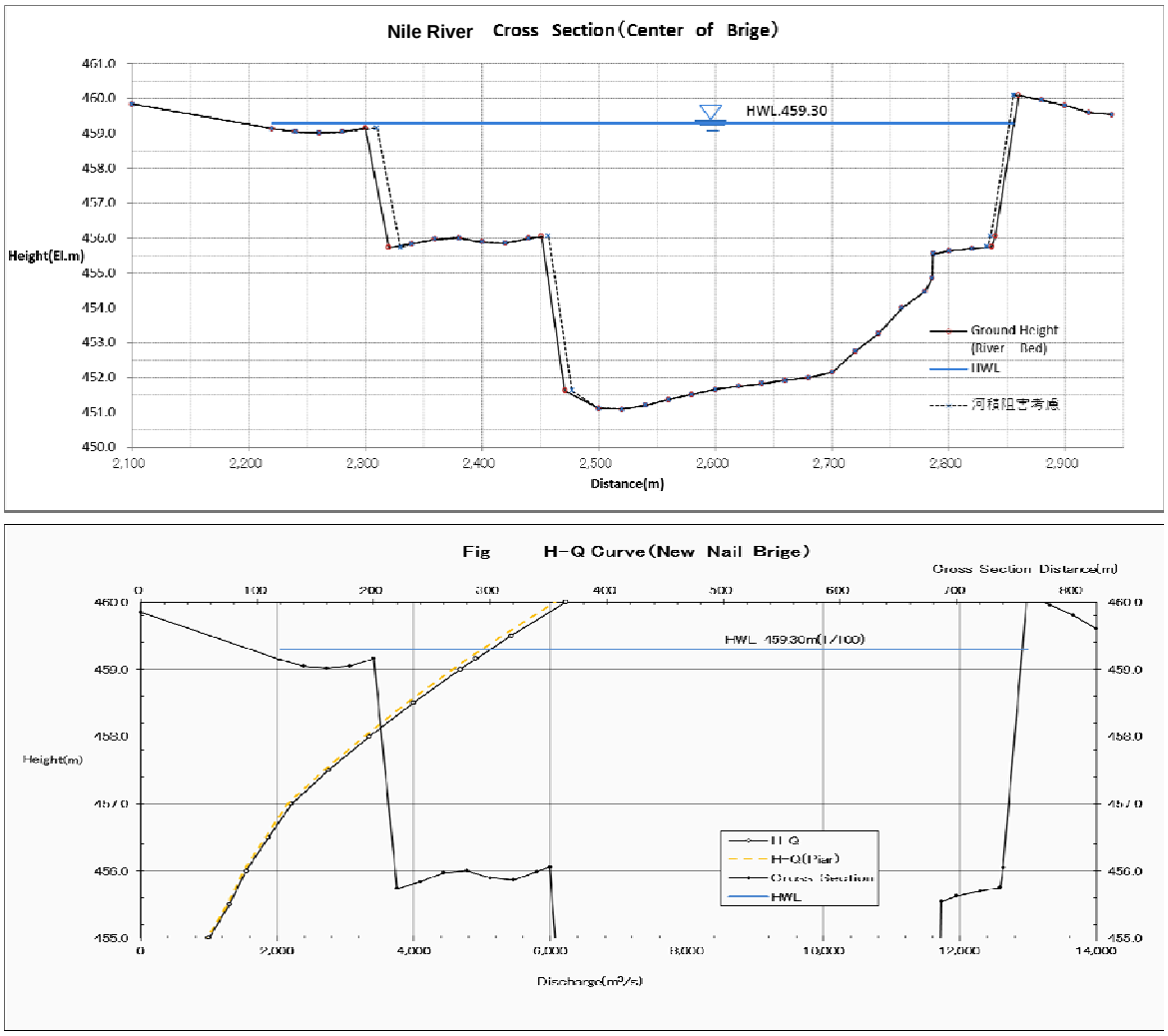


Figure A8-9 Pier Constriction Effects to River Cross-section

⑥ The Result of Uniform Flow Calculation around the Bridge Planned Location

Table A8-1 Result of Uniform Flow Calculation at Cross-section

New Nile Bridge H-Q Calculations
(Design Section: Road Centerline)

	水面勾配(i)=	1/3900	粗度係数(n)=	0.030	
Water EL.	断面積	径深	水面幅	平均流速	H-Q
DL(m)	(m^2)	(m)	(m)	(m/s)	(m^3/s)
451.1	0	0.000	0.0	0.000	0
451.5	24	0.241	99.3	0.207	5
452.0	93	0.555	166.9	0.361	33
452.5	204	0.834	244.6	0.473	97
453.0	331	1.249	265.2	0.619	205
453.5	469	1.650	284.1	0.745	350
454.0	615	2.050	299.7	0.861	530
454.5	771	2.388	322.4	0.954	735
455.0	934	2.824	330.4	1.066	996
455.5	1,100	3.294	333.4	1.182	1,300
456.0	1,296	3.335	507.4	1.192	1,544
456.5	1,558	3.377	526.7	1.201	1,872
457.0	1,823	3.419	532.1	1.211	2,208
457.5	2,090	3.881	537.5	1.318	2,755
458.0	2,360	4.338	542.9	1.420	3,351
458.5	2,633	4.791	548.2	1.517	3,994
459.0	2,908	5.240	553.6	1.610	4,684
459.2	2,996	5.382	555.3	1.639	4,912
459.5	3,186	5.705	557.0	1.704	5,430
460.0	3,465	6.177	559.5	1.797	6,227
460.5	3,745	6.670	560.0	1.891	7,084
461.0	4,025	7.169	560.0	1.985	7,989
461.5	4,305	7.668	560.0	2.076	8,936
462.0	4,585	8.166	560.0	2.165	9,925
462.5	4,865	8.665	560.0	2.252	10,956
463.0	5,145	9.164	560.0	2.338	12,027
463.5	5,425	9.662	560.0	2.422	13,138

New Nile Bridge H-Q Calculations
(Constricted Section: Road Centerline)

	水面勾配(i)=	1/3900	粗度係数(n)=	0.030	
Water EL.	断面積	径深	水面幅	平均流速	Discharge
DL(m)	(m^2)	(m)	(m)	(m/s)	(m^3/s)
451.1	0	0.000	0.0	0.000	0
451.5	23	0.243	94.8	0.208	5
452.0	89	0.552	160.9	0.359	32
452.5	197	0.827	238.6	0.470	93
453.0	322	1.240	259.2	0.616	198
453.5	456	1.640	278.1	0.742	339
454.0	599	2.038	293.7	0.858	514
454.5	752	2.374	316.4	0.950	714
455.0	913	2.809	324.4	1.063	970
455.5	1,076	3.278	327.4	1.178	1,267
456.0	1,265	3.327	488.2	1.190	1,505
456.5	1,520	3.376	512.7	1.201	1,826
457.0	1,777	3.424	518.1	1.213	2,155
457.5	2,038	3.885	523.5	1.319	2,688
458.0	2,301	4.341	528.9	1.420	3,268
458.5	2,567	4.793	534.2	1.517	3,895
459.0	2,835	5.241	539.6	1.611	4,566
459.2	2,921	5.382	541.3	1.639	4,789
459.5	3,106	5.705	543.0	1.704	5,293
460.0	3,378	6.176	545.5	1.797	6,070
460.5	3,651	6.669	546.0	1.891	6,905
461.0	3,924	7.167	546.0	1.984	7,787
461.5	4,197	7.666	546.0	2.075	8,710
462.0	4,470	8.165	546.0	2.164	9,675
462.5	4,743	8.663	546.0	2.252	10,680
463.0	5,016	9.162	546.0	2.337	11,724
463.5	5,289	9.661	546.0	2.421	12,806

⑦ Characteristics of Rain in Juba City

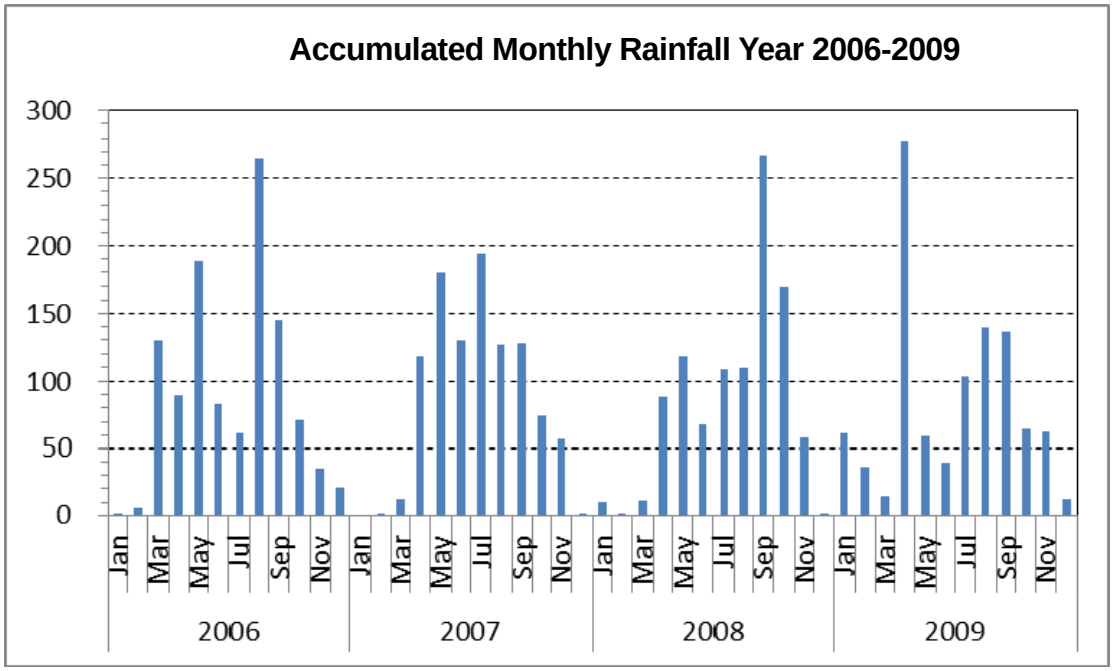


Figure A8-10 Total amount of rain in month (2006～2009)

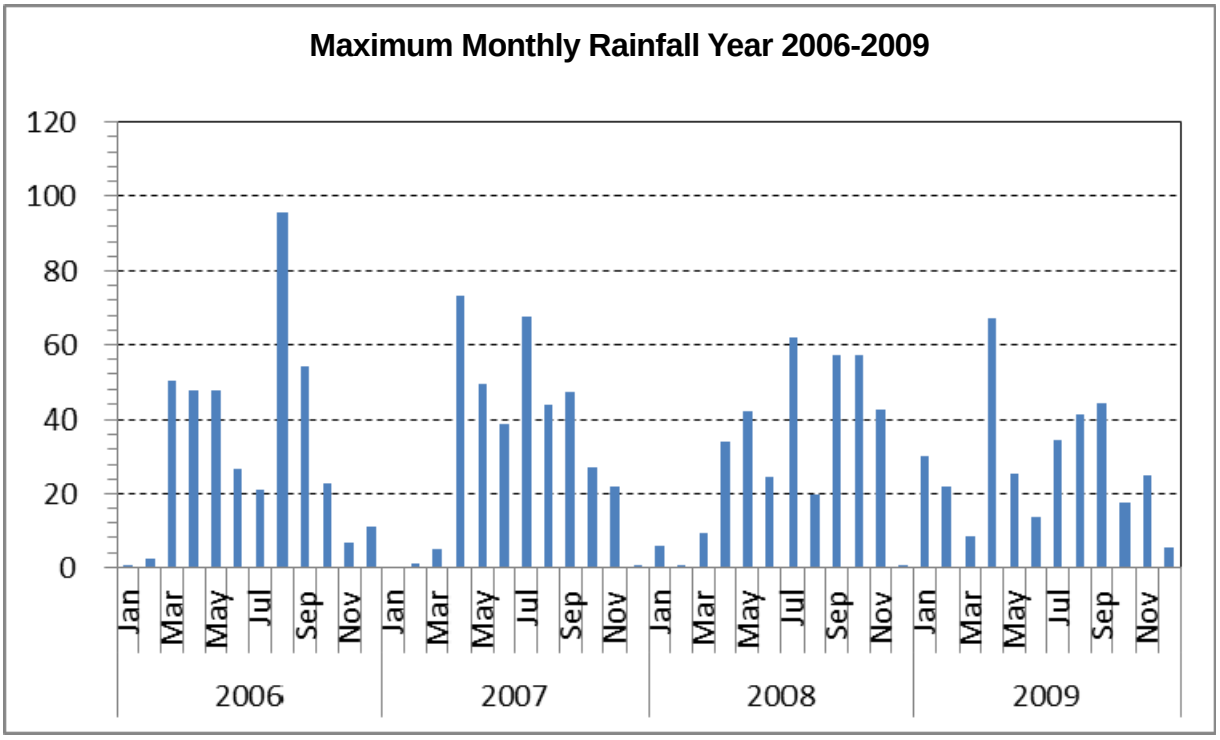


Figure A8-11 The Largest Amount of rain in one day (2006～2009)

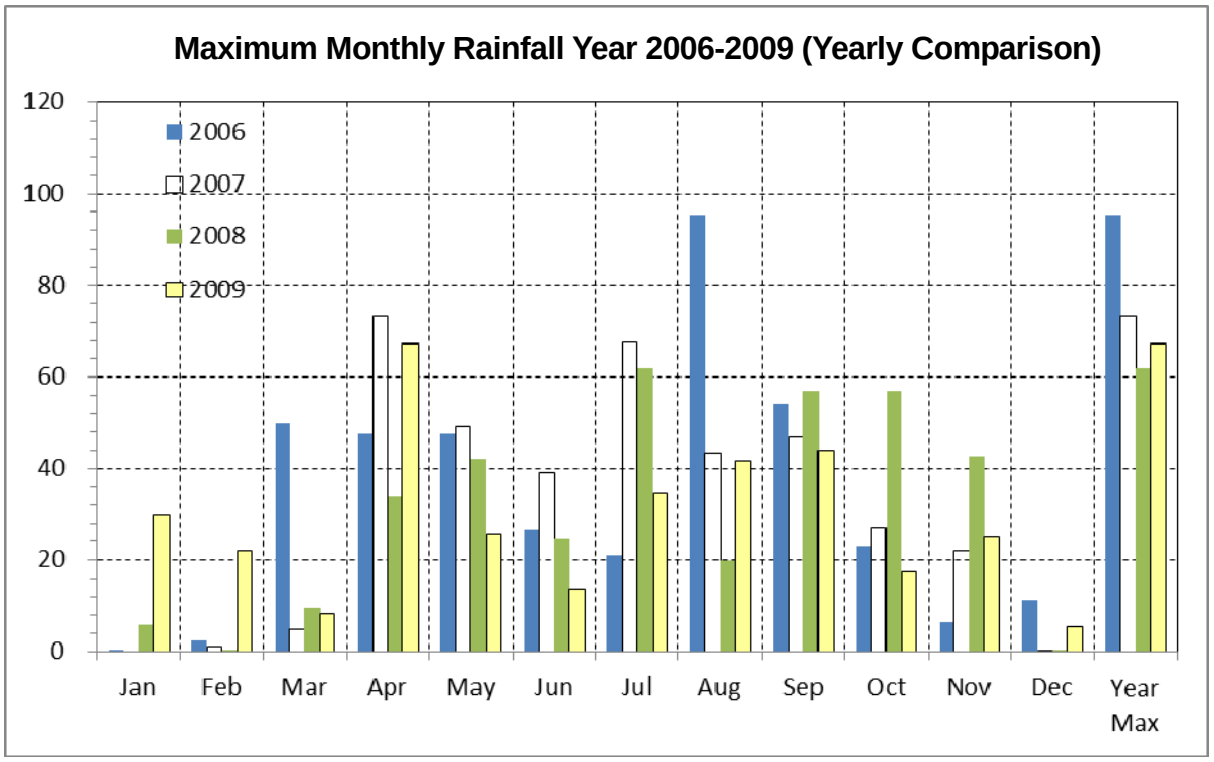


Figure A8-12 The Largest Amount of rain in one day (comparative among 2006～2009)

Table A8-2 The Amount of Rain in one day(2006～2009)

2006年 Annual Daily Rainfall — Juba International Airport

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1					47.5					1.5		
2				0.1	3.0	0.1		0.1				
3				0.1				22.0		1.0		
4						6.5	21.0	25.0				1.0
5				0.1	0.1		0.1	24.5	7.5			4.0
6						1.5		25.0	1.5			11.0
7			1.5					6.0				5.5
8							2.0	95.5		1.5	3.0	
9			45.0	0.1	2.5	0.1		9.0	6.0	6.5		
10			0.5	0.1	6.5	26.5	10.0	15.0	1.0		6.5	
11				0.1	7.5		3.0				4.5	
12		1.0	50.0	0.1	21.0	2.6			1.0		1.5	
13		0.1	1.0	2.7	0.1		1.5	15.0	2.0			
14	0.1			0.1	6.5			0.5			1.5	
15			0.1	0.1		5.5	0.1	0.1			6.0	0.1
16		0.1	1.0	0.1	0.1	4.0		1.0			6.0	
17			18.0	3.5	20.8				41.0		3.5	
18	0.1	0.1	7.0		1.0	0.1	0.1					
19			0.8	1.6		4.5	2.5					
20		0.1				18.0			1.0		2.0	
21		1.0	1.0	1.0				3.0	8.0	12.5	1.0	
22		2.5	0.1		17.6			0.1	54.0	23.0		
23		0.1		21.0	13.5		10.0		8.5	8.5		
24				0.1	17.0		9.5	2.0		0.1		
25				11.0				7.0	0.1	1.5		
26				0.1		0.1		4.5		4.0		
27		1.0	1.5		0.1	0.1				6.5		
28			0.5		23.8			10.0	6.5	3.0		
29		–	2.0			13.0				1.0		
30		–		47.5		–	1.0		6.5	0.1		
31		–	0.1	–	0.1	–	–		–	–		
Monthly Rainfall	0.2	6.0	130.1	89.5	188.7	82.6	60.8	265.3	144.6	70.7	35.5	21.6
Maximum	0.1	2.5	50.0	47.5	47.5	26.5	21.0	95.5	54.0	23.0	6.5	11.0
Average	0.1	0.7	8.1	4.7	10.5	5.9	5.1	14.0	10.3	5.1	3.6	4.3
Days without rain	29	19	15	11	13	15	18	12	16	16	21	26
Days with rain	2	9	16	19	18	15	13	19	14	15	9	5

: No Rainfall
0.1 : Trace
0 : No Record In That Day

2007年 Annual Daily Rainfall — Juba International Airport

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				0.1	0.1		7.0		1.0			
2						12.8	0.1	0.1	17.5			
3					3.5	0.1	9.5	2.5	4.0		22.0	
4					0.1				1.0		1.0	0.1
5			0.1			39.0		20.0	47.0	1.5		
6					6.5		0.1			0.1		
7					22.0	23.0		16.5				
8							5.2				1.0	0.1
9			5.0	0.1	2.5	4.5		43.5				
10			1.8	5.7		20.5		0.1	9.5		20.5	
11				10.5			60.3	0.1	18.0			
12					18.3				14.0			
13				73.5	13.5		5.5	11.5		5.5		0.1
14				4.0	20.0			0.1		8.0		
15			0.1			1.5	0.1	1.0	7.5		3.5	
16				0.1	18.0		67.5	0.1			0.1	
17			0.1		49.3		2.0	0.1	1.0	13.0		
18				0.1	6.5					27.0		
19						1.5		6.5	1.0	10.5		
20						0.1				0.1		
21				4.0		0.1			5.5	6.5		
22			1.5			27.0		8.0		2.5		
23			0.1					0.1		0.1	8.5	
24								0.1				
25		0.1		4.5			10.5	0.1	1.0			
26		1.0						7.0	0.1			
27			0.1	0.1		0.1		1.0				
28			3.5	1.0	3.8		9.5	5.0				
29			0.1		11.5	0.1	13.5			–		
30		–	0.1	14.2	4.5		3.5	0.1	–	–		
31		–	–	–	0.1	–	–	–	–			
Monthly Rainfall	0.0	1.1	12.5	117.9	180.2	130.3	194.3	127.0	128.1	74.8	56.6	0.3
Maximum	0.0	1.0	5.0	73.5	49.3	39.0	67.5	43.5	47.0	27.0	22.0	0.1
Average	0.0	0.6	1.1	9.1	11.3	10.0	13.9	5.8	9.2	6.8	8.1	0.1
Days without rain	31	27	19	17	15	17	16	9	15	17	24	28
Days with rain	0	2	12	13	16	13	15	22	15	14	6	3

: No Rainfall
0.1 : Trace
0 : No Record In That Day

2008年 Annual Daily Rainfall — Juba International Airport

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				1.0		24.5						
2				0.1	10.5	7.0	0.1					
3					1.5		9.0		27.0	2.5	1.0	
4					8.5			0.1		10.0	8.0	
5					11.5			2.5	45.0	1.5		0.1
6				1.5		20.5			12.0	3.0		
7			0.0		1.5			5.0	45.5		42.5	
8			0.0	0.1	0.1			6.0		3.5	3.0	
9			0.0		3.5	5.5		1.0			3.5	
10			0.0			1.0	0.1					
11				1.0				18.5	22.5			
12			0.0	4.5	0.1			1.0	57.0	1.5		
13	1.0		0.0	23.5			14.5	1.0	17.0	40.5		
14	2.5		0.0	2.0	14.0	2.0			3.0	1.5		
15	0.1		0.0	0.1				7.0		0.1		
16			0.0	2.5			62.0	19.0	3.5			
17			0.0		1.0		3.0		0.1			
18	0.1		0.0		42.0			7.5	0.1			
19	6.0		0.0	13.5	0.1			19.8				
20			0.0	0.1	0.1	1.0			7.5			
21			0.0	34.0				1.0				
22			0.0	3.5	0.1		0.1			57.0		
23			0.0		3.0		5.0	2.5		17.0		
24			0.0	1.5	–				7.0			
25			0.0				1.5		15.5			
26		0.1	0.0			1.0	1.5	2.0		1.0		
27			0.0					6.0				
28	–							1.5		29.5		
29		0.1	2.5	0.1	20.0	5.5	11.0	4.0				
30		–	9.3		–			0.1	4.5	–		
31		–	–	–	–	–		4.0	0.1	0.1	–	
Monthly Rainfall	9.7	0.2	11.8	89.0	117.5	68.0	107.8	109.5	267.3	168.7	58.0	0.1
Maximum	6.0	0.1	9.3	34.0	42.0	24.5	62.0	19.8	57.0	57.0	42.5	0.1
Average	1.9	0.1	0.5	5.6	7.3	7.6	9.8	5.5	16.7	12.1	11.6	0.1
Days without rain	25	27	8	14	12	21	20	11	15	16	25	30
Days with rain	6	1	23	16	19	9	11	20	15	15	5	1

: No Rainfall
0.1 : Trace
0 : No Record In That Day

2009年 Annual Daily Rainfall — Juba International Airport

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1			0.1						13.0			
2						0.1		3.0	2.0	5.0		1.5
3				18.0		1.5		1.0			2.0	
4		0.1		1.0					1.0	17.5	1.0	5.5
5							12.0	9.0	0.1		5.0	
6			0.1	4.0			1.0	5.5				
7				9.5		8.5	21.0		1.5	12.5		
8						1.5	3.0		1.5			
9		0.1	1.5	19.6				41.5				
10		0.1	0.1	5.0	0.1				2.5			1.0
11				7.2	16.0		34.5		44.0			
12				35.0	0.1				6.5		2.0	1.0
13						0.1					10.5	0.1
14				1.5			0.1		0.1		4.0	
15				22.0	12.0	1.8		27.0	0.1		25.0	3.0
16			2.5	24.5			1.0			4.0		
17							7.0					
18		5.0		38.0		13.5	1.0		0.1			
19		1.5	0.1	2.5				4.0	5.0			
20		3.0		14.5	25.5					0.1		
21	0.1		1.5	2.5	1.1	6.0		1.5	5.0		6.0	0.1
22			8.5	0.1		0.1	2.0	34.5	0.5			
23			0.1					0.1				
24	0.1	0.1	0.1			0.1	18.0	10.0	25.0	1.0	4.5	
25	30.0		0.1			0.1	1.0	1.0		7.0	0.1	
26	0.1				0.1			2.0	5.5	7.0		
27	1.0	4.0				6.5						
28		22.0		67.2			2.1		13.0	7.0	2.5	
29	19.0	–	0.1	1.0	1.5				10.5	4.0		
30	10.5	–	–	5.0	2.5							
31		–	–	–		–			–		–	
Monthly Rainfall	60.8	35.9	14.8	278.1	58.9	39.8	103.7	140.1	136.8	65.1	62.6	12.2
Maximum	30.0	22.0	8.5	67.2	25.5	13.5	34.5	41.5	44.0	17.5	25.0	5.5
Average	8.7	4.0	1.2	14.6	6.5	3.3	8.0	10.8	7.6	6.5	5.7	1.7
Days without rain	24	19	17	11	22	18	18	18	11	21	19	24
Days with rain	7	9	14	19	9	12	13	13	19	10	11	7

: No Rainfall
0.1 : Trace
0 : No Record In That Day

Appendix 9

Soundness Survey Results of Existing Juba Bridge

Condition of Existing Juba Bridge

9-1 Present State of Existing Bridge

(1) Juba Bridge Overview

The following outlines the bridge and its structure:

Table 9-1 General Features of Juba Bridge

Bridge Length and Width :	Length: 255m (6 spans @ 42.5m) Width: 3.5m x 2 lanes
Construction Year :	Superstructure : October 2008 (Replacement) Original Bridge : 1974 Completion of original bridge
History of Superstructure Replacement :	The original bridge (Mabey and Johnson type) was completed in 1974, but due to constant truck overloading it collapsed in 2006. Repair and replacement of superstructure was completed in October of 2008.
Traffic Regulation :	Max. Load Limit : 45 tons (load not verified) Max. Speed Limit : 20 km/hr
River Condition :	Average water depth is 4m (MRB); major erosion/scour is not present at river banks and piers

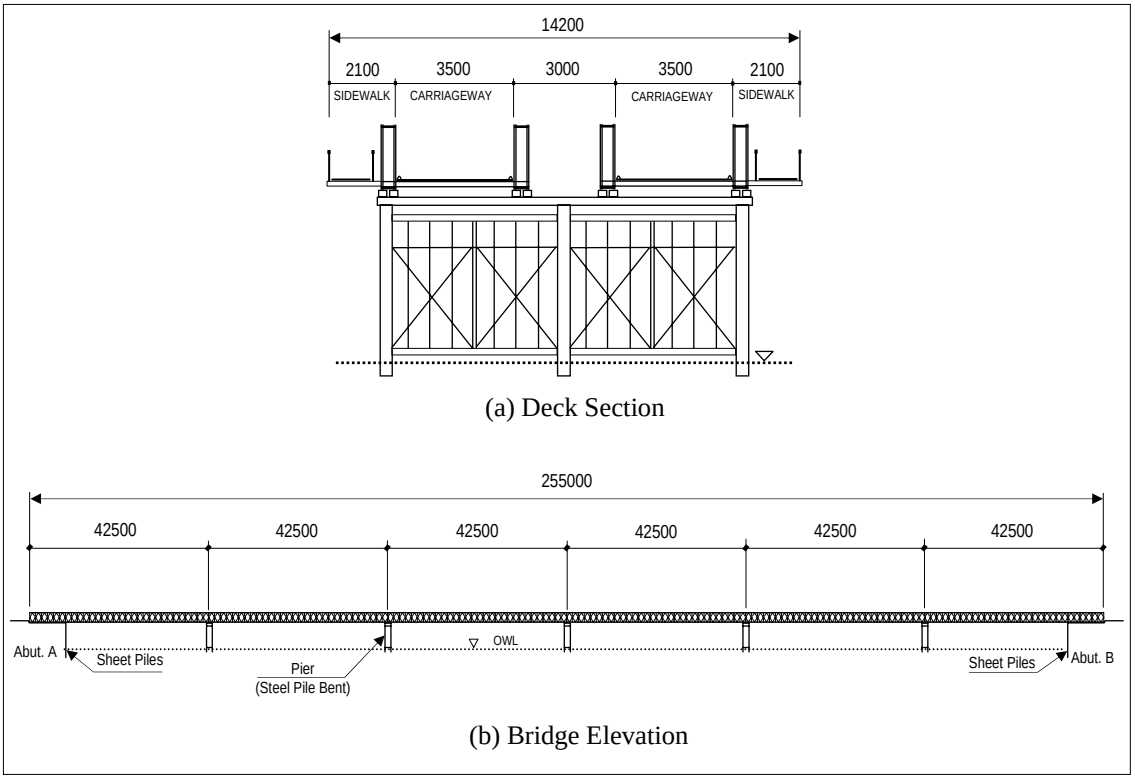


Figure 9-1 General View of Existing Juba Bridge

(2) 2011 Accident Causing Damage on the Superstructure

In August 2010, an overloaded truck transporting a bulldozer struck the truss panels of the downstream bridge lane causing breakage and serious deformations in the members of the truss panels (see Photo 9-1). Because of this damage, the downstream lane is not capable of supporting the 45 tons load limit of the bridge. Heavy vehicles are thus allowed to pass only at the upstream deck lane of the bridges with traffic control on both ends of the bridge.

(3) Impact in Case of Existing Bridge Collapse

A local newspaper[1)], identified the impact of the existing bridge in case of collapse:

- Food and other basic commodities flowing to the city from the south will have to be stored temporarily on the east side causing tremendous increase in prices,
- This effect will not be in Juba alone but also in the 10 million people of the 10 cities of South Sudan,
- There will be a high negative impact in South Sudan's south-north corridor logistics from Nimule to Abyei which connects with the neighboring countries of Kenya, Uganda and Ethiopia.

In addition, the repair of the damaged section of the existing bridge will require a major restoration and replacement of the damaged bridge panels.

(4) Urgent Repair of the Damaged Span

Due to the strategic and economic importance of the Juba Bridge, urgent rehabilitation of the damaged section was undertaken with funding and technical assistance provided by the USAID. The repair works was then implemented and carried-out by the United Nations Office for Project Services (UNOPS) with a local sub-contractor who previously did the bridge restoration in 2008. The superstructure repair works which commenced on December 16, 2011 was completed on January 14, 2011 and the bridge subsequently opened to traffic. The successful repair costing approximately U.S.$ 1,000,000 have saved a possible collapse of the bridge and helped extend its life until the planned new Nile River Bridge is built (see Photo 9-2). However, since the bridge cross-section configuration remains the same there is still a possibility of a similar accident occurring in the future.

[1)] The Citizzen 25th February, 2011

Photo 9-1 Damage on the Juba Bridge After Accident of Mid-2011

January 26, 2012 Opening Ceremony of the Repaired Downstream Lane

JICA Representative Mr. Hanatani giving some remarks during the Opening Ceremony

Repaired panels of the Juba Bridge

Heavy trucks allowed to pass the repaired lane

Photo 9-2 Opening of the Restored Juba Bridge

Photo 9-3 Juba Bridge Collapse in 2006

Appendix 10

Traffic Data / Information

1. Traffic Count Survey Results

Traffic count survey was conducted at the following four (4) locations around the proposed site of the new Nile River Bridge:

① along the Juba-Nimule road, just before the intersection of the propose approach road,
② near the intersection of circumferential road C-2 and the Lologo road,
③ along Lologo road near the intersection with the proposed approach road to the new bridge, and
④ along Juba-Yei road and the intersection with circumferential road C-3.

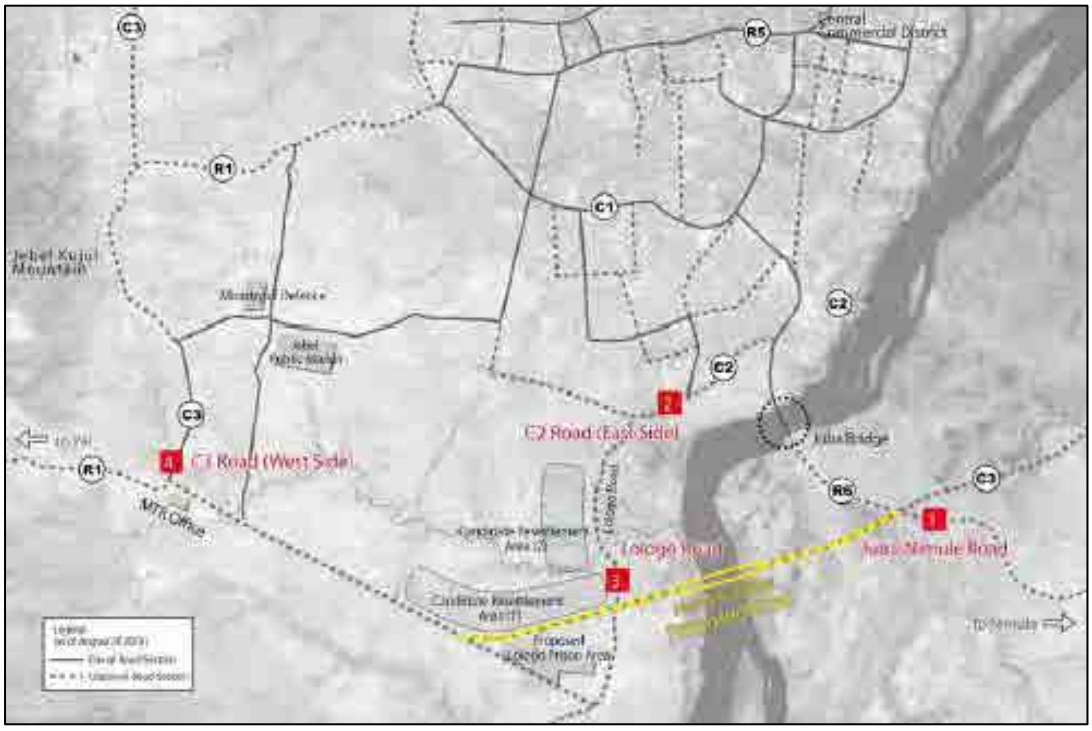


Figure A10-1 Traffic count survey locations

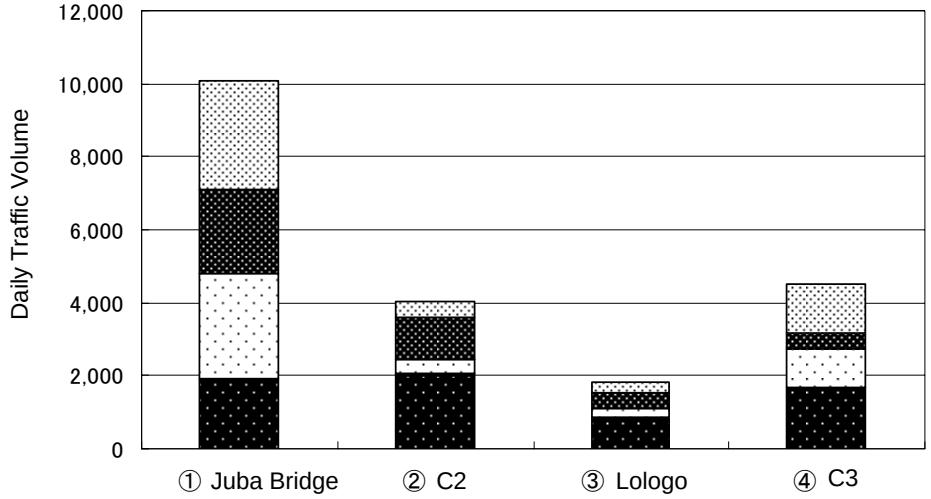
The results of the traffic count survey conducted at locations shown in Figure A10-1 shows:

① Large number of trucks in the Juba-Nimule international road from Uganda is observed. Due to proximity to commercial area, there is also large number of 2-wheeled vehicles and buses.
② Since C-2 road is in the heart of the city, there is large number of buses and 2-wheeled vehicles but less number of trucks.
③ Lologo is basically a residential are such that the total traffic volume is rather low with more buses and 2-wheeled vehicles.
④ This section of C-3 road is part of the international road such that the traffic is basically the Juba-Yei road traffic with large number of trucks. Because the western side is a new residential area, 2-wheel vehicles are mainly used as a means of commuting to the city with the use of buses becoming popular. The buses are basically mini-bus its increase use will be explained later.

2. Logistics Condition

There are two corridors in Juba logistics- the southern route and the northern route. The southern route corridor covers the Kenya (Port of Mombasa) – Uganda (Kampala) – South Sudan (Nimule at Uganda's border) passing thru the existing Juba bridge towards the city (Land route: about 1,600km). The northern route corridor covers the Juba Port - Nile River – North Sudan – Sudan Port (River route: about 1,200k + Land route: about 1,200km). However, due to the political relations of South Sudan with Sudan, this northern logistics route is not being utilized at the moment. Moreover, the southern route of 1,600km is shorter than the 2,400km northern route and with the economic development in East Africa (Uganda and Kenya) it is expected that the movement of good and materials will increase more in this route. For this reason, for a more stable and efficient logistics route it is advantageous to utilize the southern (land based) route.

Cargoes entering Juba city thru the existing Juba Bridge includes machineries, construction materials (cement, steel, etc.), industrial products and equipment and domestic goods like groceries. In addition, livestock, wood and leather, and agricultural products are transported through the Juba Bridge via Uganda. However, the breakdown of these goods is unknown but the volume of truck traffic cargo per day crossing the Juba Bridge is 2,880 units.



	① Juba Bridge		② C2		③ Lologo		④ C3	
Truck	2,964	29%	452	11%	268	15%	1,320	29%
Bus	2,291	23%	1,128	28%	463	25%	465	10%
Pass. Car	2,880	29%	402	10%	212	12%	1,043	23%
2-Wheeled	1,928	19%	2,067	51%	877	48%	1,676	37%
Total	10,063	100%	4,049	100%	1,820	100%	4,504	100%

Figure A10-2 Traffic Survey Count Results

3. Current Status of Public Transportation (Traffic Volume, Fare)

The movement of public transport (mini bus and bus) is shown in Figure A10-3. Basically, the main form of public transport inside Juba city is mini bus and “boda-boda” (motorbike taxi) with a section of the city being used by bus coming from the suburbs. The fare for mini bus is from 1 SSP to 2 SSP (about 30-60 yen) while that of the bus is 1 SSP.

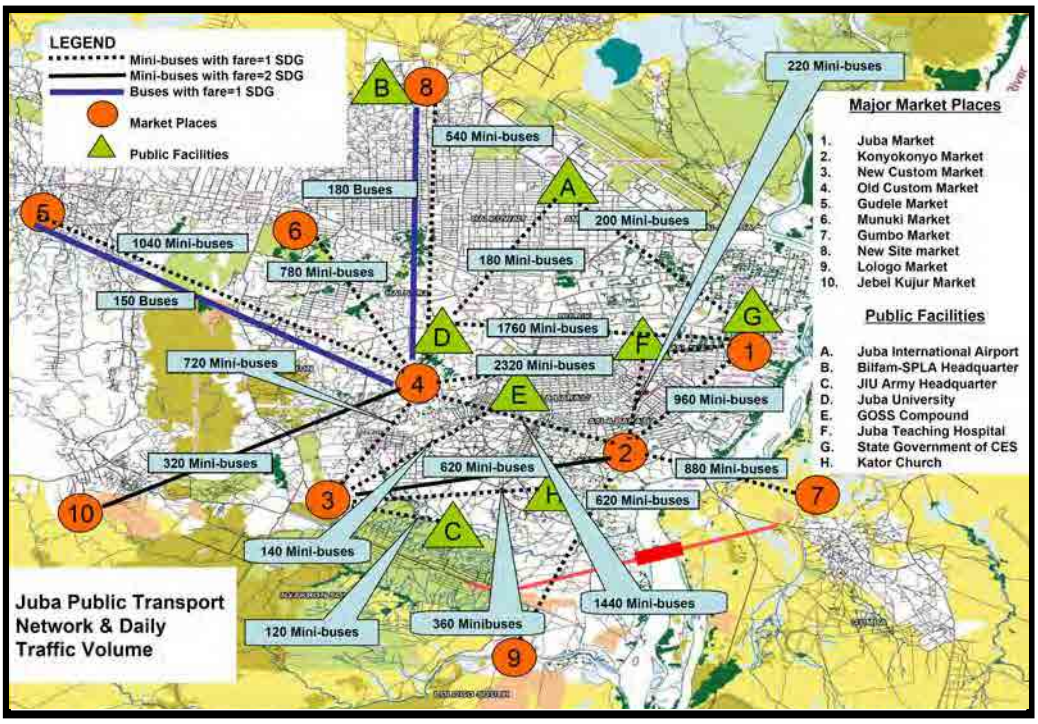
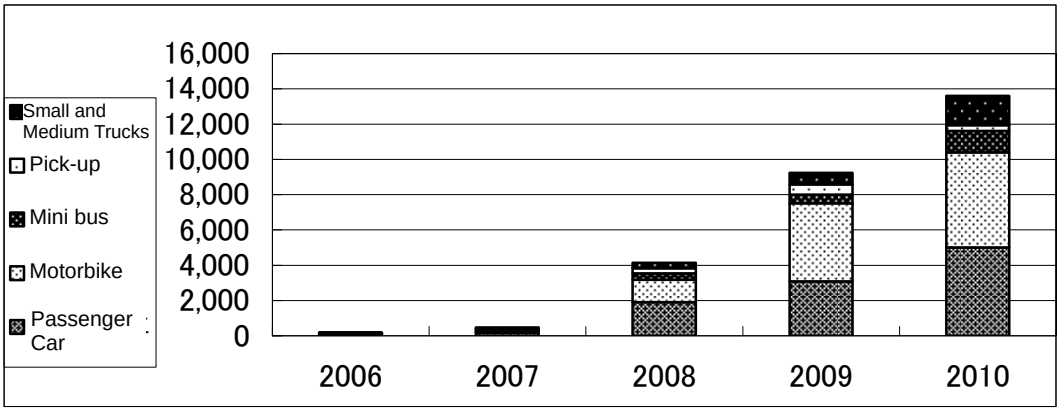


Figure A10-3 Daily Traffic and Fare for Public Transport

4. Vehicle Registration Number

The number of registered vehicle in Juba city from year 2006-2010 is shown in Figure A10-4. Looking at the vehicle registration from year 2008, the number of registered vehicles has doubled from year 2008 to 2009 and tripled from year 2008 to 2009. Passenger car and motorbike accounts for 80% of the number of registered vehicles while trucks and mini bus account of 12% and 9%, respectively.



Small and Medium Trucks	21	53	300	658	1,657
Pick-up	9	55	290	575	334
Mini bus	29	98	371	492	1,220
Motorbike	45	75	1,261	4,434	5,378
Passenger Car	73	189	1,909	3,082	5,010
Sub-total	**177**	**470**	**4,131**	**9,241**	**13,599**
Grand Total	**27,618**				

Source: Central Equatoria State Traffic Department

Figure A10-4 Juba City Number of Vehicle Registration

Appendix 11

Stakeholders' Meeting Records

Stakeholders' Meeting Participants List and Proceedings

Survey	Meeting	Date
1st Site Survey	1st Stake Holder's Meeting	Nov. 9, 2010
2nd Site Survey	2nd Stake Holder's Meeting (TOR Explanation)	Dec. 15, 2010
3rd Site Survey	Group Meeting (Farmers)	Feb. 24-25, 2011
	3rd Stake Holder's Meeting	February 27, 2011
	Joint Site Inspection	March 2-4, 2011
	4th Stake Holder's Meeting	March 17, 2011
	5th Stake Holder's Meeting（概要説明）	March 24, 2011

(1) 1st Stakeholders' Meeting

Report on 1st Stakeholders meeting on 9th November 2010

Report of the 1st Stakeholders Meeting.

Prepared by MTR

9th November 2010

Attachment:

- Minutes of Meeting (3 pages)
- Attendant Lists
  - Original with Signature
  - Typed
- Invitation Letter (2 pages)
- Proposed Participant
- Handout
  - Program (same as 2nd page of invitation letter)
  - Presentation - Project Outline
  - Presentation - Environmental and Social Consideration
- Photos

Minutes of Meeting for the 1st Stakeholders Meeting

Date: 8th November 2010

Venue: Home and Away Business Center

Time: 10:00-12:30

Chaired by: Mr. Otim, Deputy Director, MTR

Opening Speech 10:10:25

Mr. Murice Rahman, Director of Road Safety, Ministry of Transport and Bridge (MTR), GoSS

Stating that the resettlement issue is very important in this project

Mr. Louis Gore George, the 1st Director General of Ministry of Physical Infrastructure (MOPI), CES:

Stating the proposed bridge is critically important. We should follow the findings and recommendation made through the study

Presentation of Project Outline 10:25-10:35 as per Power Point Attached

Mr. Otim Bong, Deputy Director, MTR

Presentation of Environmental and Social Considerations 10:50-11:50 as per Power Point Attached

Mr. Shoji, Social Specialist of JICA Study Team

Discussion:11:50-12:30

Mr. Butrus Apollo, Southern Sudan Land Commission (SSLC), GoSS.:

Presently, there is no proper land policy or act. We are now trying to prepare. However we have a referendum on coming January and are afraid that approval of these new laws will delayed further more.

Mr. Shoji: Study team will fully support you to prepare proper compensation plan.

Mr. Joseph Lam, Ministry of Environment (MOE), GoSS.

The compensation is made one time only or continuously?

Mr. Shoji: Basically one time only and, based on the results of post

Mr. Dorina Keji, MOE: (a) How about impact to global warming? (b) How about the quality of river water since we have a drinking water treatment plant down stream?

Mr. Shoji: (a) Released Carbon Dioxide, green house gas, from vehicles will be reduced due to reduction of consumed fuel since efficiency of traffic flow will be improved by the new bridge. (b) As for river water contamination, we will study the most suitable construction methods to minimize the disturbance of river bed/sediments

Ms Gloria H.Sao, UNHCR: (a) Compensation amount will be replaceable amount? (b) How about treatment of landless people?

Mr. Shoji: Value-Assessment Committee will be set up and determine replaceable prices. A minimum plot will be provided to landless people

Mr. Butrus Appllo, SSLC: A group relocation site, 14 miles west from Juba, is being planned.

Mr. Charls Andrea Joda, Director of Rejaf Payam, Information disclosure to is critically important. Without it, the project can result in failed.

Mr. Otim, MTR: It is impossible to implement the project without notifying to the residents. Please continue to joining to these stakeholders meetings from now on as well.

Ms Cecilia, MOE: How to secure the ROW area after declaring Cut-Off Day, since many people will come back to Southern Sudan after referendum?

Mr.Otim, MTR: It is important that everybody meet together and study various measures for all people.

Closing remark

Mr. Maurice Rahman, MTR

Report on 1st Stakeholders meeting on 9th November 2010

No.		Title	Organisation	Mobile Phone	Signature
1	Maurice Reham	D/G Road Safety	MTR		
2	Peter Makuol	Senior Officer	MTR		
3	Otim Bong	D/Director	MTR		
4	Butrus Apollo	Coordinator	SSLC (GOSS)		
5	Gloria H. Sao	Prof. Asst	UNHCR		
6	Alsushi Nashimoco	Ass. reintegration officer	UNHCR		
7	Emmanuel Matay	D/G Housing CESM	MOPI CESM		
8	Lewis Gore	1st D/G infrastructure	MOPI		
9	Kiyotaka Tamari	Project Fomulation Aduson	JICA		
10	Joseph Lam	Director	MOE		
11	Moses Gogonya	A/Inspector for E/A	MOE		
12	Dorina Keji	A/Inspector for GIS	MOE		
13	Cecilia Mogga Kenyi	S/Insp for Pollution	MOE		
14	Charles Andrea Joda	Director/ Rejaf Payam	L.Govt.CES/Juba		

No.	Name	Title	Organization	Mobile Phone	Signature
1	Maurice Reham	P/G Road Safety	MTR		
2	Peter makuol	Senior officer	MTR		
3	ofim Pang	P/Director	MTR		
4	Butrus APollo	Coordinator	SSLC (GOSS)		
5	Gloria H. Sano	prof - Asst.	UNHCR		
6	Atsushi Nashimoto	Ass. Representative officer	UNHCR		
7	Emmanuel Modingo	DG Heading CESM	MoPI CES		
8	Lesis Gore	1st DG Infrastructure	MoPI		
9	Kiyotaka Tamura	Project Formulation Advisor	JICA		
10	Joseph Lam	Director	MPE		
11	Moses Gayonya	A/Inspector EIA	MOE		
12	Dorina KETI	A/INSP for GIS	MIDE		
13	Cecilia Mogga Kenyi	S/Insp for Pollution	MoE (Goss)		
14	Charles Andrea Jada	Director/Rejaf Payam	Local Govt. ces/Tubalay		
15					
16					
17					
18					
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Date 4th November 2010

Subject: **Invitation for 1st Stakeholders Meeting on Environmental /Social Survey Study Planning for the New Nile River Bridge Project**

Dear Sir /Madam

The Following the Road Network Development Master Plan proposed under the Juba Transport Infrastructure and Capacity Development Study completed by JICA in December 2009.Government of Southern Sudan emphasized on the development of Roads Network and identified the urgent of construction Circumferential road including the New River Nile Bridge with the objective of the following :

1. To improve the International road network and provide direct link to Uganda and Kenya through Juba –Nimule Road.

2. Politically: I will symbolize the fruits of peace and catalyze economic development of Government of Southern Sudan.

Based on this the Government of Japan has entrusted study to be conducted to identify the viability of the Project through the Japan International Cooperation Agency JICA. This is to be done through a Preparatory Survey to be conducted in stages and during this study the existing Environmental and Social Conditions related to the Nile River Bridge will be assessed for planning purposes like the Resettlement Action Plan for people who will be affected by the project in accordance to the Legal frame works of both Japan Guidelines and World Bank. Therefore you are invited to attend the 1st Environmental /Social Consideration Stake holders Meeting to introduce the concept of the project on the 8th November 2010 at 9:30 Am at Home and Away Business Centre the program as attached .Your participation is highly appreciated.

Yours Sincerely;

Eng.Jacob Marial
Director General-Roads and Bridges
Ag.Under Secretary
Ministry of Transport and Roads;
Government of Southern Sudan –GOSS.

Program Outline or the 1st Stakeholders Meeting Environmental /Social Survey Study planning on 8th November 2010 at 9:30Am.

- Date: 8th (Monday) November; 2010.
- Venue: Home and Away Business Centre
- **Program :**

- 9:30 -10.00am Arrival and Registration

- 10:00-10:15am Opening by the D/G Roads and Bridges –Ministry of Transport and Roads Goss
  Opening Remarks by 1ST Director General; Mr. Louis George Gore –MOPI

- 10:15 -11:30am Outline of the Project ,presented by the D/Director Urban Roads Eng.Otim Bong

- 11:45 -11:45Am - Tea Break

- 11:45-12:30Pm Environmental and Social Considerations, Presented by Mr. Shoji /Ms Umiguchi

- 12:30 -12:45Pm Discussions and Observations.

- 12:45-13:00Pm -Closing Remarks by 1ST Director General; Mr. Louis George Gore –MOPI and Lunch

List of Proposed Participant:

- Goss

1) Mr. Jacob, Director General, Ministry of Transport and Road
2) Undersecretary, Ministry of Environment Ministry
3) Chairman, Southern Sudan Land Commission
4) Undersecretary, Ministry of Forest and Agriculture
5) Undersecretary, Ministry of Health
6) Chairman, Commission of Census and Statics
7) Traffic Police, Ministry of Interior
8) Road Safety Officer, Ministry of Transport and Road

- CES

9) Mr. Louis, The First Director General, Ministry of Physical Infrastructure
10) Director General, Road and Bridge, Ministry of Physical Infrastructure
11) Director General, Housing, Ministry of Physical Infrastructure
12) Director General, Land and Survey, Ministry of Physical Infrastructure
13) Director General, Agriculture and Forest
14) Minister, Ministry of Environment
15) Commissioner of Juba County
16) Executive Director of Rajaf, Payam (East bank)
17) Executive Director of Lorogo, Payam (West bank)
18) Paramount Chief of Rajaf
19) Paramount Chief of Loroggo

- Donor

20) UNDP
21) USAID
22) UNEP
23) UNHCR
24) World Bank
25) Tamari, JICA

PREPARATORY SURVEY ON THE PROJECT FOR CONSTRUCTION OF NILE RIVER BRIDGE IN SOUTHERN SUDAN

Ministry of Transport and Roads, GOSS
Ministry of Physical Infrastructure, CES

Japan International Cooperation Agency
CTI Engineering International Co., Ltd.
Eight-Japan Engineering Consultants, Inc.

Location Map

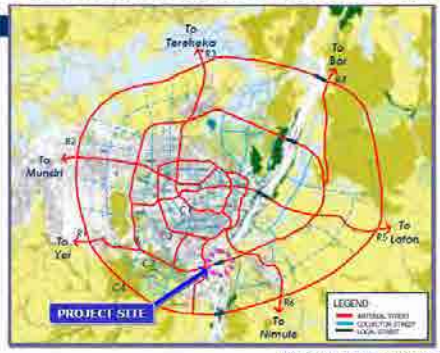
Project Scope

Facility	No. Lanes	Length (m)
Bridge	2	560
Road	2	3,900

Project Objective

The objective of the project is to construct, in close collaboration with GOSS, a new Nile River Bridge and its approach roads to divert and distribute the traffic within and around the city areas without concentrating at the central part of Juba.

Juba Road Network Master Plan



Preparatory Survey Schedule

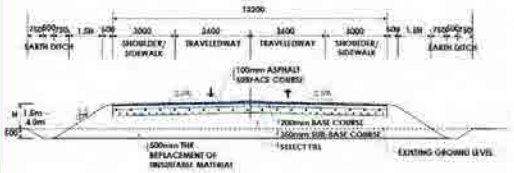
Work Items \ Year/Month	2010												2011											
1) Preparatory Works in Japan																								
2) First Site Survey in Juba																								
3) First Data Analysis in Japan - 1																								
4) Second Site Survey (Social Considerations)																								
5) First Data Analysis in Japan - 2																								
6) Third Site Survey in Juba																								
7) Second Data Analysis/ Preliminary Design in Japan																								
8) Explanation of Preliminary Design Report (Digest)																								
9) Submission of Preparatory Survey Report (Draft & Digest)																								
10) Submission of Preparatory Survey Report (Final)																								

Undertakings by Southern Sudan to Achieve Project Goals/Objectives

- ✓ Dialogues with PAPs and information disclosure
- ✓ Carry-out procedures and obtain approvals for project
- ✓ Expropriation of land for project right-of-way and resettlement of affected persons
- ✓ Securing resettlement site and temporary yard areas for construction
- ✓ Preparation of Resettlement Site
- ✓ Removal of existing structures and other obstructions
- ✓ Obtaining approvals for environmental permits, mining and quarrying, removal of trees, safety and occupational hazards
- ✓ Relocation of utilities
- ✓ Operation and maintenance of the subject facilities
- ✓ Bank handling charges
- ✓ Taxes and duties

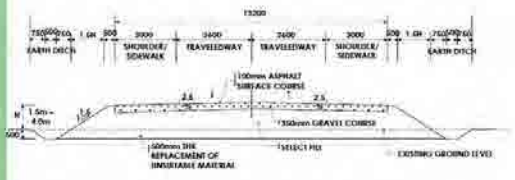
Alternative Alignment/Bridge Locations

Approach Road Section



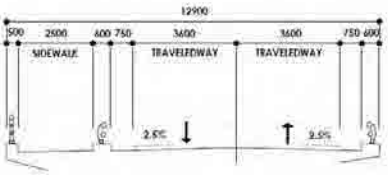
2-Lane Approach Road

Construction Access Road Section



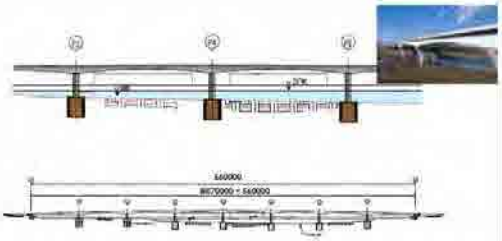
2-Lane Construction Access Road

Bridge Deck Section



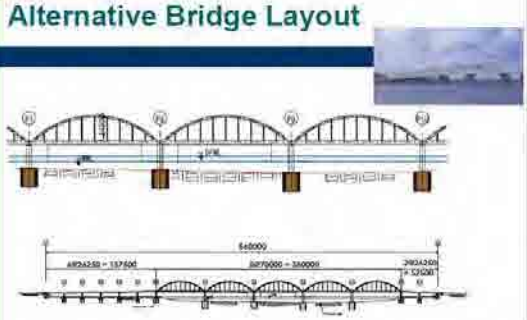
2-Lane Bridge Section

Alternative Bridge Layout

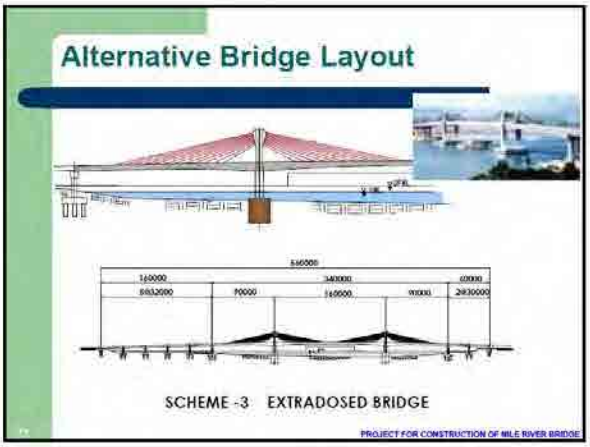


SCHEME -1 8-SPAN CONTINUOUS PC BOX GIRDER BRIDGE

Alternative Bridge Layout



SCHEME – 2 8-SPAN STEEL ARCH BRIDGE


Alternative Bridge Layout
SCHEME -3 EXTRADOSED BRIDGE
PROJECT FOR CONSTRUCTION OF MILE RIVER BRIDGE

THE PROJECT FOR CONSTRUCTION
OF
NILE RIVER BRIDGE
IN
SOUTHERN SUDAN

Environmental and Social Considerations
By Shoji/Umiguchi

Japan International Cooperation Agency
CTI ENGINEERING INTERNATIONAL CO.,LTD
EIGHT-JAPAN ENGINEERING CONSULTANS, INC.

1

Content of Presentation

- A. Terminology
- B. Flow of Grant
- C. Required Policy for EIA/RAP
- D. Content of EIA
- E. Content of RAP

2

A. Terminology

- EIA: Environmental Impact Assessment
- RAP: Resettlement Action Plan
- ROW: Right of Way
- GoSS: Government of Southern Sudan
- CES: Central Equatoria State
- JICA: Japan International Cooperation Agency
- WB: World Bank

3

B. Flow of Grant

Preparation of EIA/RAP by Goss/CES
↓
Approval of EIA/RAP by Stakeholders
↓
Approval of EIA/RAP by Goss
↓
Approval of Grant by Japanese Government

4

B.1 Approval by Stakeholders Meetings

Following Stakeholders Meetings (SHM) are required as the process of EIA/RAP

- 1st Stakeholders Meeting for Project outline (this time meeting)
- 2nd stakeholders meeting for TOR approval (December 2010)
- 3rd Stakeholders Meeting for Study Progress approval (March 2011)
- **4th Stakeholders Meeting for Draft Final Reports Approval (July-August 2011)**
- 5th Stakeholder Meetings for Study Report Explanation (October 2011)

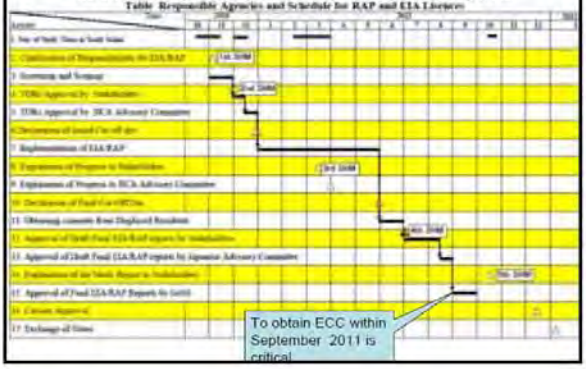
5

B.2 Approval by JICA Environment Advisory Committee

- Approval of TOR
- Approval of Study Progress
- **Approval for Draft Final EIA/RAP Reports**

6

B.3 Detailed Flow of Grant



C. Requirement for EIA/RAP

- To fulfill the laws, policies and practices in Southern Sudan, in addition to that,
- To follow the JICA Environmental and Social Considerations Guideline

8

D. Content of EIA as per JICA Guidelines

D.1 Screening and Scoping
D.2 Understanding of the Project
D.3 Prediction of Environmental Impacts
D.4 Environmental Management Planning
D.5 Monitoring and Evaluation Planning
D.6 Cost Estimation

9

D.1 Screening and Scoping

- The purpose is to determined the necessity of EIA and what items to studies
- To pick up possible items which can be negatively impacted.

10

D.1.1 Natural Environmental Impacts

- Air pollution
- Water pollution
- Soil pollution
- Waste
- Noise and vibrations
- Ground subsidence
- Offensive odors
- Geographical features
- Bottom sediment
- Biota and ecosystems
- Water usage
- Accidents
- Global warming

11

D.1.2 Social Environmental Impacts

- Involuntary resettlement
- Local economies, such as employment, livelihood, etc.
- Land use and utilization of local resources
- Social institutions such as social infrastructure and local decision-making institutions
- Existing social infrastructures and services
- Poor, indigenous, or ethnic people
- Misdistribution of benefits and damages
- Local conflicts of interest
- Gender
- Children's rights
- Cultural heritage
- Infectious diseases such as HIV/AIDS

12

D.2 Understanding of the Project

- Description of the project including,
- Site
- Structure
- Work Period
- Cost
- Labors
- Material used
- Waste generated

13

D.3 Prediction of Environmental Impacts

- Based on the content of project assume the degree of impacts thorough:
- experiences
- hearing
- site surveys
- environmental monitoring
- numerical analysis

14

D.4 Environmental Management Planning

- To propose mitigation measures to each of the negative impacts predicted. For example:
- Resettlement Action Planning for possibly displaced people
- Environmental management planning while construction/after operation
- Safety/Health management planning

15

D.5 Monitoring and Evaluation Planning

- To verify and correct, if necessary, environmental managing activities
- Monitoring shall be basically continued while construction and after operation to be confident that negative impacts have been properly mitigated.

16

D.6 Cost Estimation

- To prepare the budget for the cost to implement environmental mitigation plans, for example:
- Compensation for displaced people
- Spraying of water while earth filling work

17

E. Contents of RAP as per JICA guidelines

E.1 Screening and Scoping
E.2 Understanding project
E.3 Alternative study
E.4 Policy and Legal Framework
E.5 Participation and Consultation
E.6 Socio-economic Survey
E.7 Compensation Policy Planning
E.8 Grievance Redressing
E.9 Monitoring and Evaluation

18

Continued:

E.10 Implementation Schedule Planning
E.11 Replacement Cost Survey
E.12 Compensation Matrix Planning
E.13 Income Restoration Planning
E.14 Declaration of Cut-Off Day
E.15 Demarcation
E.16 Census
E.17 Asset Inventory
E.18 Cost Estimation

19

E.1 Screening and Scoping

- Same as D.1

20

E.2 Understanding project

- Same as D.2

21

E.3 Alternative study

- To select the most feasible option with the minimum negative environmental impact, for example;
- Comparison of Possible Routes 1,2,3,4,5 by number of displaced people/construction cost
- Zero option, in case of without project, shall be considered together

22

E3.1 Alternative routes

E.4 Policy and Legal Framework

- To understand the present laws, sub-laws and practices of recipient government
- To clarify the responsible/mandated agencies for environmental management activities
- By these, to propose what rules and organizations shall have to be established, if necessary, to fulfill the requirement of JICA Environmental and Social Considerations Guidelines

24

E.5 Participation and Consultation

- To incorporate the opinion, request, desire of Project Affected Peoples as much possible
- Stakeholders meetings (4 times more)
- Small group discussion for vulnerable people (aged, poor, landless, widowed, handicapped)

25

E.6 Socio-economic Survey

- To know the response to the project
- To clarify the levels of life, livelihood/income of affected peoples so that the level of compensation/assistance can be properly determined
- The maximum numbers of 500 households shall be door to door interviewed including directly and indirectly affected people.

26

E.7 Compensation Policy Planning

- The levels of life, livelihood/incomes of affected people shall be maintained or improved by the project (digging of tube well?)
- Compensation prices shall be replaceable/purchasable amount to regain the lost assets, as is determined by the Value-Assessment Committee
- Additional assistants (money, in kind) to those, if their life level/livelihood are not restored.

27

E.8 Grievance Redressing

- Fair, impartial and quick responded grievance committee shall be established, if necessary, to take immediate action to resolve the grieves raised
- The committee member shall includes representatives of affected people and NGOs.

28

E.9 Monitoring and Evaluation

- To verify if resettlement activities are properly implemented such as:
  - Asset inventory was properly done
  - Compensation was paid as per agreed
  - Relocation plot is allocated beforehand
  - Life level/livelihood are restored as before

29

E.10 Implementation Schedule Planning

- To propose the detailed time table of resettlement activities

30

E.11 Replacement Cost Survey

- To establish the replaceable/purchasable compensation unit prices for the lost assets by the project, Value-assessment Committee including not only government agencies but also representatives of displaced people/communities and human-right NGO shall be established
- Based on the committee, compensation unit prices are finalized, to which prices every affected people shall follow.

31

E.12 Compensation Matrix Planning

Loss type	Application	Entitled Person	Entitlement
1 Land	Land in the 25-m AQ-4 corridor or the relocation area site o titled land o squatted land	- Owner of titled land (0) - Resident informal settlers occupying land used for o residence (170) o commerce (30) o community services (1)	Compensation at replacement cost Relocation assistance for loss of buildings plots, 3 OPTIONS o P15,000 rehabilitation in self-relocation cases, o 1 40 sq/m. plot considered on a lease agreement if AP is not willing to pay the land titling. In such a case the AP will have to pay a monthly P100 rent
2 Rents or loss use of buildings	Both with Residential and commercial purposes	- Renters (35 AFs) - Rent-free (20 AFs)	o As above
3 Structures	Residential and commercial structures	- Owners of o residential structures (341) o commercial structures (33) o ancillary structures (52)	Compensation at replacement cost of affected structures Movable structures will not be compensated but owners will get

E.13 Income Restoration Planning

- To provide the program for those whose income level can be deteriorated.
- Generally program includes:
  - Provision of allowances
  - Micro finance
  - Job training (agriculture, etc)
  - Priority provision of work at construction site

33

E.14 Declaration of Cut-Off Day

- To prevent the encroacher into the possible project area
- To prohibit new development (building construction, new cultivation of farm)
- To freeze the transaction of lands to prevent speculation

34

E.15 Demarcation

- To install the pegs on ground surface to indicate the boundary of ROW, within which, all properties shall be cleared before construction work

35

E.16 Census

- To confirm the number, type, entitlement etc of people with in the ROW to be displaced

36

E.17 Asset Inventory

- To estimated the assets with in the ROW based on the prices determined by Value-assessment Committee
- Note that if the remaining portion out of ROW is too less, all the assets outside ROW shall be compensated as well

37

E.18 Cost Estimation

- To estimate the total cost for above resettlement activities

38

End

- Thank you very much

39

Venue of the 1st Stakeholders Meeting
(Home and Away Business Center)

Participants

Presentation made by MTR

Photo The 1st Stakeholders Meeting held on 8th November 2010