Bridge Inventory **(4 Luwadzi Bridge)**

Photo			
General Information	Name of Bridge		Luwadzi Bridge
	Name of Road		Main Road 5 (M5)
	Chainage (km)		122.343 (M5/M1@Balaka turnoff on M5)
	Location (District)		Salima
	Degrees of latitude / longitude (Measured by GPS)		S 13°57.460' E 34°29.430'
	Road Elevation (Measured by GPS)		Approx. 500m
	Administrator		National Road Authority (NRA)
	Year of Construction		1984
	Donor		Ministry of Works and Supplies
	Design Report		Not Available
Bridge	Type of Bridge	Superstructure	3-Span Steel Girder Bridge with Concrete Slab
		Substructure	Concrete Wall
		Foundation	Unknown
	Applied Design Specification		Unknown
	Design Live Load		Unknown
	Regulated Traffic Load		50 tons
	Bridge Length	(m)	42.90
	Span Length	(m)	3 @14.30
	Skew	(°)	90°
	Girder Height	(m)	0.85
	Width	Full Width (m)	8.30
		Carriageway (m)	5.80
		Pedestrian way (m)	1.25
	Type of Pavement		DBST (Double Bitumen Surface Treatment)
	Affixed Articles and Buried Article (Items, Administrator)		Non
	Repair Works by NRA (National Road Authority) (Items、Year)		Temporally Bridge L=55.20m (Jan. 2002) Masonry (Year Unknown) Gabion Works (Year Unknown) Gabion Groyne (Year Unknown)
River	Name of River		Luwadzi
	Station (River)		Unknown
	Administrator		Ministry of Water Development
	Information of River Conditions		Non
	Information of Flood Damage		Bridge had been washed away due to Flood in January 2002
	River Improvement Works		Non
Others	Topographic Survey		Available 1:50,000 Scale Map Available 1:25,000 Scale Air photo (Year 1982)
	Geological Investigation		No Data
	Navigation		No Operation

Damage of Bridges (4 Luwadzi Bridge)

Name of Bridge:	Luwadzi Bridge
Description	The original bridge of 3-span steel girder bridge had been impassable due to settlement of bridge pier by the flood in January 2002. The single-lane baily bridge had erected as a temporary bridge.
Date of Survey:	July 24, 2004
Surveyor:	Takayuki Tsuchida, Kelvin N. Mphonda

Items		Damage Level					Remarks
		N/A	No Damage	Low Damage	Medium Damage	High Damage	
Road Surface (including Approach Road)	Pavement			X			Temporally Br.
	Crack (Concrete Slab)	X					
Accessories ==>Temporally Bridge	Handrails	X					
	Lighting Facilities	X					
	Bearing					X	
	Expansion Joint	X					
	Drainage Facilities	X					
	Traffic Signboard		X				
	Affixed Articles	X					
	Buried Articles	X					
Concrete Slab	Crack		X				
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb			X			
	Others	X					
Concrete Girder	Crack	X					
	Free Lime	X					
	Corrosion of Re-bar	X					
	Spalling	X					
	Honeycomb	X					
	Others	X					
Steel Girder	Lacking	X					Washed away
	Deformation	X					
	Rust or Corrosion	X					
	Painting	X					
	Others	X					
Substructure	Deformation					X	
	Settlement					X	
	Crack					X	
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb		X				
	Others	X					
Foundation	Settlement					X	
	Deformation					X	
	Scouring					X	
	Others	X					
Flood Protection (Gabion Works, Embankment, etc)	Settlement				X		
	Deformation				X		
	Destruction			X			
	Scouring				X		
	Erosion		X				
	Others	X					

Results of Schmidt Hammer Test

Name of Bridge : *Luwadzi Bridge*
Route : *Main Road 5*
Date of Survey : *Takayuki Tsuchida, Kelvin N. Mphonda*
Date of Survey : *July 24, 2004*

Location	*Rebound Value*									*Fc*
North Bridge Pier	42	48	52	56	58	*Max 1 :*	58	*Number*	*α (deg.)*	**465.4**
	45	48	55	38	46	*Max 2 :*	56	25	0	
	44	46	40	52	52	*Min 1 :*	38	*Number'*	*ΔR*	*(kgf/cm²)*
	52	53	54	55	49	*Min 2 :*	40	20	0.0	**45.4**
	50	54	50	48	46	*Min 3 :*	42	*R*	*R₀*	
	Total :				1,233	*Balance :*	999	**50.0**	**50.0**	*(N/mm²)*
						Max 1 :	0	*Number*	*α (deg.)*	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	*Number'*	*ΔR*	*(kgf/cm²)*
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	*R*	*R₀*	
	Total :				0	*Balance :*	0	**0.0**	**0.0**	*(N/mm²)*
						Max 1 :	0	*Number*	*α (deg.)*	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	*Number'*	*ΔR*	*(kgf/cm²)*
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	*R*	*R₀*	
	Total :				0	*Balance :*	0	**0.0**	**0.0**	*(N/mm²)*
						Max 1 :	0	*Number*	*α (deg.)*	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	*Number'*	*ΔR*	*(kgf/cm²)*
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	*R*	*R₀*	
	Total :				0	*Balance :*	0	**0.0**	**0.0**	*(N/mm²)*

Remarks: *R :* Average of Rebound Value — *α :* Degree of Impact Angale
ΔR : Calibration — *Fc :* Compressive Strength
R_0 : Rebound Value — *Fd :* Design Strength

Observations and Diagnosis ;

Bridge Inventory **(5 Lifyodzi Bridge)**

Photo			
General Information	Name of Bridge		Lifyodzi Bridge
	Name of Road		Main Road 5 (M5)
	Chainage (km)		57.586 (M5/M14@Salima turnoff on M5)
	Location (District)		Nkhotakota
	Degrees of latitude / longitude (Measured by GPS)		S 13°19.290' E 34°16.539'
	Road Elevation (Measured by GPS)		Approx. 487m
	Administrator		National Road Authority (NRA)
	Year of Construction		1973
	Donor		Ministry of Works and Supplies
	Design Report		Not Available
Bridge	Type of Bridge	Superstructure	3-Span Continuous Concrete Girder Bridge
		Substructure	Concrete Wall
		Foundation	Unknown
	Applied Design Specification		Unknown
	Design Live Load		Unknown
	Regulated Traffic Load		-
	Bridge Length	(m)	31.00
	Span Length	(m)	9.00 + 12.00 + 9.00
	Skew	(°)	90°
	Girder Height	(m)	0.55～1.00
	Width	Full Width (m)	4.90
		Carriageway (m)	4.40
		Pedestrian way (m)	-
	Type of Pavement		Unpaved
	Affixed Articles and Buried Article (Items, Administrator)		Non
	Repair Works by NRA (National Road Authority) (Items、Year)		Pavement (Year Unknown) Masonry and Gabion Works (Year Unknown) Handrail (Unknown)
River	Name of River		Lifyodzi
	Station (River)		Unknown
	Administrator		Ministry of Water Development
	Information of River Conditions		Non
	Information of Flood Damage		Overflow once or twice a year during heavy rain
	River Improvement Works		Non
Others	Topographic Survey		Available 1:50,000 Scale Map Available 1:25,000 Scale Air photo (Year 1995)
	Geological Investigation		No Data
	Navigation		No Operation

Damage of Bridges (5 Lifyodzi Bridge)

Name of Bridge:	Lifyodzi Bridge
Description	During peek periods of the floods, the water flows on the top of the road. The major damages include cracks of the concrete girder. The river banks are well maintained.
Date of Survey:	July 21, 2004
Surveyor:	Takayuki Tsuchida, Kelvin N. Mphonda

Items		Damage Level					Remarks
		N/A	No Damage	Low Damage	Medium Damage	High Damage	
Road Surface (including Approach Road)	Pavement	X					
	Crack (Concrete Slab)	X					
Accessories	Handrails			X			
	Lighting Facilities	X					
	Bearing		X				
	Expansion Joint	X					
	Drainage Facilities	X					
	Traffic Signboard		X				
	Affixed Articles	X					
	Buried Articles	X					
Concrete Slab	Crack				X		
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling			X			
	Honeycomb			X			
	Others	X					
Concrete Girder	Crack				X		
	Free Lime			X			
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb			X			
	Others	X					
Steel Girder	Lacking	X					
	Deformation	X					
	Rust or Corrosion	X					
	Painting	X					
	Others	X					
Substructure	Deformation		X				
	Settlement		X				
	Crack		X				
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb		X				
	Others	X					
Foundation	Settlement		X				
	Deformation		X				
	Scouring		X				
	Others	X					
Flood Protection (Gabion Works, Embankment, etc)	Settlement		X				
	Deformation		X				
	Destruction		X				
	Scouring			X			
	Erosion		X				
	Others	X					

Results of Schmidt Hammer Test

Name of Bridge : *Lifyodzi Bridge*

Route : *Main Road 5*

Date of Survey : *Takayuki Tsuchida, Kelvin N. Mphonda*

Date of Survey : *July 21, 2004*

Location	*Rebound Value*									*Fc*
North Abutment	44	49	45	49	48	*Max 1 :*	60	*Number*	*α (deg.)*	**466.0**
	44	54	60	47	58	*Max 2 :*	58	25	0	
	55	58	52	53	58	*Min 1 :*	31	*Number'*	*Δ R*	*(kgf/cm²)*
	44	43	55	55	50	*Min 2 :*	40	20	0.0	**45.5**
	40	31	44	43	53	*Min 3 :*	43	*R*	R_0	
	Total :				1,232	*Balance :*	1,000	**50.0**	**50.0**	*(N/mm²)*
Concrete Girder	58	61	53	56	48	*Max 1 :*	62	*Number*	*α (deg.)*	**521.9**
	50	53	56	45	49	*Max 2 :*	61	25	0	
	56	58	54	56	42	*Min 1 :*	42	*Number'*	*Δ R*	*(kgf/cm²)*
	62	58	50	50	52	*Min 2 :*	45	20	0.0	**51.0**
	49	58	57	60	53	*Min 3 :*	48	*R*	R_0	
	Total :				1,344	*Balance :*	1,086	**54.3**	**54.3**	*(N/mm²)*
Concrete Slab	40	40	43	43	42	*Max 1 :*	56	*Number*	*α (deg.)*	**417.3**
	45	42	43	44	39	*Max 2 :*	50	25	-90	
	48	50	42	40	38	*Min 1 :*	32	*Number'*	*Δ R*	*(kgf/cm²)*
	44	45	32	46	44	*Min 2 :*	32	20	3.3	**40.7**
	42	56	42	46	32	*Min 3 :*	38	*R*	R_0	
	Total :				1,068	*Balance :*	860	**43.0**	**46.3**	*(N/mm²)*
						Max 1 :	0	*Number*	*α (deg.)*	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	*Number'*	*Δ R*	*(kgf/cm²)*
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	*R*	R_0	
	Total :				0	*Balance :*	0	**0.0**	**0.0**	*(N/mm²)*

Remarks: *R* : Average of Rebound Value — *α* : Degree of Impact Angale

Δ R : Calibration — *Fc* : Compressive Strength

R_0 : Rebound Value — *Fd* : Design Strength

Observations and Diagnosis ;

Bridge Inventory **(6 Navikoko Bridge)**

Photo			
General Information	Name of Bridge		Navikoko Bridge
	Name of Road		Main Road 5 (M5)
	Chainage (km)		60.912 (M5/M14@Salima turnoff on M5)
	Location (District)		Nkhotakota
	Degrees of latitude / longitude (Measured by GPS)		S 13°17.600' E 34°17.001'
	Road Elevation (Measured by GPS)		Approx. 480m
	Administrator		National Road Authority (NRA)
	Year of Construction		1973
	Donor		Ministry of Works and Supplies
	Design Report		Not Available
Bridge	Type of Bridge	Superstructure	3-Span Continuous Concrete Girder with 2-Hinge
		Substructure	Concrete Wall
		Foundation	Unknown
	Applied Design Specification		Unknown
	Design Live Load		Unknown
	Regulated Traffic Load		-
	Bridge Length	(m)	25.00+α
	Span Length	(m)	(5.00+α) + 15.00 + (5.00+α)
	Skew	(°)	90°
	Girder Height	(m)	0.90
	Width	Full Width (m)	4.90
		Carriageway (m)	4.40
		Pedestrian way (m)	-
	Type of Pavement		Unpaved
	Affixed Articles and Buried Article (Items, Administrator)		Non
	Repair Works by NRA (National Road Authority) (Items、Year)		Pavement (Year Unknown) Masonry and Gabion Works (Year Unknown) Handrail (Unknown)
River	Name of River		Navikoko
	Station (River)		Unknown
	Administrator		Ministry of Water Development
	Information of River Conditions		Non
	Information of Flood Damage		Overflow once or twice a year during heavy rain
	River Improvement Works		Non
Others	Topographic Survey		Available 1:50,000 Scale Map Available 1:25,000 Scale Air photo (Year 1995)
	Geological Investigation		No Data
	Navigation		No Operation

Damage of Bridges (6 Navikoko Bridge)

Name of Bridge:	Navikoko Bridge
Description	During peek periods of the floods, the water flows on the top of the road. The major damages include settlement of concrete slab on the side spans. The inadequate repair works of embankment had reduced the river flow area.
Date of Survey:	July 22, 2004
Surveyor:	Takayuki Tsuchida, Kelvin N. Mphonda

Items		Damage Level					Remarks
		N/A	No Damage	Low Damage	Medium Damage	High Damage	
Road Surface (including Approach Road)	Pavement					X	Approach
	Crack (Concrete Slab)					X	
Accessories	Handrails				X		
	Lighting Facilities	X					
	Bearing	X					
	Expansion Joint	X					
	Drainage Facilities	X					
	Traffic Signboard		X				
	Affixed Articles	X					
	Buried Articles	X					
Concrete Slab	Crack				X		
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling			X			
	Honeycomb		X				
	Others					X	Side Span Settled
Concrete Girder	Crack		X				
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb		X				
	Others	X					
Steel Girder	Lacking	X					
	Deformation	X					
	Rust or Corrosion	X					
	Painting	X					
	Others	X					
Substructure	Deformation		X				
	Settlement		X				
	Crack		X				
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb		X				
	Others	X					
Foundation	Settlement						Unknown
	Deformation						Unknown
	Scouring						Unknown
	Others						Unknown
Flood Protection (Gabion Works, Embankment, etc)	Settlement			X			
	Deformation			X			
	Destruction		X				
	Scouring			X			
	Erosion		X				
	Others	X					

Results of Schmidt Hammer Test

Name of Bridge : *Navikoko Bridge*

Route : *Main Road 5*

Date of Survey : *Takayuki Tsuchida, Kelvin N. Mphonda*

Date of Survey : *July 22, 2004*

Location	*Rebound Value*									*Fc*
Concrete Slab	40	38	42	42	37	*Max 1 :*	46	*Number*	α *(deg.)*	**355.9**
	34	34	46	28	44	*Max 2 :*	44	25	-90	
	32	42	37	32	40	*Min 1 :*	28	*Number'*	ΔR	*(kgf/cm^2)*
	35	43	43	40	38	*Min 2 :*	30	20	3.4	**34.7**
	35	40	30	34	36	*Min 3 :*	32	R	R_0	
	Total :				942	*Balance :*	762	**38.1**	**41.5**	*(N/mm^2)*
						Max 1 :	0	*Number*	α *(deg.)*	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	*Number'*	ΔR	*(kgf/cm^2)*
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	R	R_0	
	Total :				0	*Balance :*	0	**0.0**	**0.0**	*(N/mm^2)*
						Max 1 :	0	*Number*	α *(deg.)*	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	*Number'*	ΔR	*(kgf/cm^2)*
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	R	R_0	
	Total :				0	*Balance :*	0	**0.0**	**0.0**	*(N/mm^2)*
						Max 1 :	0	*Number*	α *(deg.)*	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	*Number'*	ΔR	*(kgf/cm^2)*
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	R	R_0	
	Total :				0	*Balance :*	0	**0.0**	**0.0**	*(N/mm^2)*

Remarks: R : Average of Rebound Value α : Degree of Impact Angale

ΔR : Calibration Fc : Compressive Strength

R_0 : Rebound Value Fd : Design Strength

Observations and Diagnosis ;

Bridge Inventory **(7 Kanjamwano Bridge)**

Photo			
General Information	Name of Bridge		Kanjamwano Bridge
	Name of Road		Main Road 5 (M5)
	Chainage (km)		98.436 (M5/M14@Salima turnoff on M5)
	Location (District)		Nkhotakota
	Degrees of latitude / longitude (Measured by GPS)		S 12°58.973' E 34°18.005'
	Road Elevation (Measured by GPS)		Approx. 480m
	Administrator		National Road Authority (NRA)
	Year of Construction		1973
	Donor		Ministry of Works and Supplies
	Design Report		Not Available
Bridge	Type of Bridge	Superstructure	2-Span Continuous Concrete Slab x 2
		Substructure	Concrete Column
		Foundation	Unknown
	Applied Design Specification		Unknown
	Design Live Load		Unknown
	Regulated Traffic Load		-
	Bridge Length	(m)	24.00
	Span Length	(m)	4 @6.00
	Skew	(°)	90°
	Girder Height	(m)	0.25
	Width	Full Width(m)	4.90
		Carriageway(m)	3.60
		Pedestrian way(m)	0.50
	Type of Pavement		Unpaved
	Affixed Articles and Buried Article (Items, Administrator)		Non
	Repair Works by NRA (National Road Authority) (Items、Year)		Pavement (Year Unknown) Masonry and Gabion Works (Year Unknown) Handrail (Unknown)
River	Name of River		Kanjamwano
	Station (River)		Unknown
	Administrator		Ministry of Water Development
	Information of River Conditions		Non
	Information of Flood Damage		Overflow once or twice a year during heavy rain
	River Improvement Works		Non
Others	Topographic Survey		Available 1:50,000 Scale Map Available 1:25,000 Scale Air photo (Year 1995)
	Geological Investigation		No Data
	Navigation		No Operation

Damage of Bridges (7 Kanjamwano Bridge)

Name of Bridge:	Kanjamwano Bridge
Description	During peek periods of the floods, the water flows on the top of the road. There is no major damages except the scouring of downstream of the bridge.
Date of Survey:	July 22, 2004
Surveyor:	Takayuki Tsuchida, Kelvin N. Mphonda

Items		Damage Level					Remarks
		N/A	No Damage	Low Damage	Medium Damage	High Damage	
Road Surface (including Approach Road)	Pavement				X		Approach
	Crack (Concrete Slab)		X				
Accessories	Handrails		X				
	Lighting Facilities	X					
	Bearing	X					
	Expansion Joint	X					
	Drainage Facilities	X					
	Traffic Signboard					X	Collapsed
	Affixed Articles	X					
	Buried Articles	X					
Concrete Slab	Crack		X				
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling			X			
	Honeycomb		X				
	Others	X					
Concrete Girder	Crack	X					
	Free Lime	X					
	Corrosion of Re-bar	X					
	Spalling	X					
	Honeycomb	X					
	Others	X					
Steel Girder	Lacking	X					
	Deformation	X					
	Rust or Corrosion	X					
	Painting	X					
	Others	X					
Substructure	Deformation		X				
	Settlement		X				
	Crack		X				
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb		X				
	Others	X					
Foundation	Settlement		X				
	Deformation		X				
	Scouring		X				
	Others	X					
Flood Protection (Gabion Works, Embankment, etc)	Settlement			X			
	Deformation			X			
	Destruction		X				
	Scouring		X				
	Erosion		X				
	Others	X					

Results of Schmidt Hammer Test

Name of Bridge : Kanjamwano Bridge

Route : Main Road 5

Date of Survey : Takayuki Tsuchida, Kelvin N. Mphonda

Date of Survey : July 22, 2004

Location	Rebound Value									Fc
South Bridge Pier	44	40	40	42	47	Max 1 :	60	Number	α (deg.)	**482.9**
	52	53	60	51	50	Max 2 :	60	25	0	
	58	57	57	58	48	Min 1 :	38	Number'	Δ R	(kgf/cm^2)
	48	58	60	54	52	Min 2 :	40	20	0.0	**47.2**
	52	40	50	55	38	Min 3 :	40	R	R_0	
	Total :				1,264	Balance :	1,026	**51.3**	**51.3**	(N/mm^2)
Concrete Slab	45	37	37	40	50	Max 1 :	52	Number	α (deg.)	**414.2**
	43	52	44	48	40	Max 2 :	50	25	-90	
	38	38	40	44	45	Min 1 :	34	Number'	Δ R	(kgf/cm^2)
	45	35	44	42	48	Min 2 :	35	20	3.3	**40.4**
	34	50	42	38	44	Min 3 :	37	R	R_0	
	Total :				1,063	Balance :	855	**42.8**	**46.0**	(N/mm^2)
						Max 1 :	0	Number	α (deg.)	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	Number'	Δ R	(kgf/cm^2)
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	R	R_0	
	Total :				0	Balance :	0	**0.0**	**0.0**	(N/mm^2)
						Max 1 :	0	Number	α (deg.)	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	Number'	Δ R	(kgf/cm^2)
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	R	R_0	
	Total :				0	Balance :	0	**0.0**	**0.0**	(N/mm^2)

Remarks: R : Average of Rebound Value — α : Degree of Impact Angale

ΔR : Calibration — Fc : Compressive Strength

R_0 : Rebound Value — Fd : Design Strength

Observations and Diagnosis ;

Bridge Inventory **(8 Chamakuwa Bridge)**

Photo			
General Information	Name of Bridge		Chamakuwa Bridge
	Name of Road		Main Road 5 (M5)
	Chainage (km)		99.060 (M5/M14@Salima turnoff on M5)
	Location (District)		Nkhotakota
	Degrees of latitude / longitude (Measured by GPS)		S 12°58.689' E 34°17.890'
	Road Elevation (Measured by GPS)		Approx. 475m
	Administrator		National Road Authority (NRA)
	Year of Construction		1973
	Donor		Ministry of Works and Supplies
	Design Report		Not Available
Bridge	Type of Bridge	Superstructure	2-Span Continuous Concrete Slab
		Substructure	Concrete Column
		Foundation	Concrete Piles
	Applied Design Specification		Unknown
	Design Live Load		Unknown
	Regulated Traffic Load		-
	Bridge Length	(m)	12.00
	Span Length	(m)	2 @6.00
	Skew	(°)	90°
	Girder Height	(m)	0.25
	Width	Full Width(m)	4.90
		Carriageway(m)	3.60
		Pedestrian way(m)	0.50
	Type of Pavement		Unpaved
	Affixed Articles and Buried Article (Items, Administrator)		Non
	Repair Works by NRA (National Road Authority) (Items、Year)		Pavement (Year Unknown) Masonry and Gabion Works (Year Unknown) Handrail (Unknown)
River	Name of River		Chamakuwa
	Station (River)		Unknown
	Administrator		Ministry of Water Development
	Information of River Conditions		Non
	Information of Flood Damage		Overflow once or twice a year during heavy rain
	River Improvement Works		Non
Others	Topographic Survey		Available 1:50,000 Scale Map Available 1:25,000 Scale Air photo (Year 1995)
	Geological Investigation		No Data
	Navigation		No Operation

Damage of Bridges (8 Chamakuwa Bridge)

Name of Bridge:	Chamakuwa Bridge
Description	During peek periods of the floods, the water flows on the top of the road. Major damages include the exposed foundation piles of the both abutment and the scouring of downstream of the bridge.
Date of Survey:	July 22, 2004
Surveyor:	Takayuki Tsuchida, Kelvin N. Mphonda

Items		Damage Level					Remarks
		N/A	No Damage	Low Damage	Medium Damage	High Damage	
Road Surface (including Approach Road)	Pavement	X					
	Crack (Concrete Slab)		X				
Accessories	Handrails		X				
	Lighting Facilities	X					
	Bearing	X					
	Expansion Joint	X					
	Drainage Facilities	X					
	Traffic Signboard		X				
	Affixed Articles	X					
	Buried Articles	X					
Concrete Slab	Crack		X				
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb		X				
	Others	X					
Concrete Girder	Crack	X					
	Free Lime	X					
	Corrosion of Re-bar	X					
	Spalling	X					
	Honeycomb	X					
	Others	X					
Steel Girder	Lacking	X					
	Deformation	X					
	Rust or Corrosion	X					
	Painting	X					
	Others	X					
Substructure	Deformation			X			
	Settlement		X				
	Crack		X				
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb		X				
	Others	X					
Foundation	Settlement		X				
	Deformation		X				
	Scouring					X	Exposed Pile
	Others	X					
Flood Protection (Gabion Works, Embankment, etc)	Settlement					X	
	Deformation					X	
	Destruction					X	
	Scouring				X		
	Erosion			X			
	Others	X					

Results of Schmidt Hammer Test

Name of Bridge : *Chamakuwa Bridge*

Route : *Main Road 5*

Date of Survey : *Takayuki Tsuchida, Kelvin N. Mphonda*

Date of Survey : *July 22, 2004*

Location	*Rebound Value*									*Fc*
Concrete Slab	44	44	40	43	46	*Max 1 :*	48	*Number*	*α (deg.)*	**406.1**
	44	48	44	38	40	*Max 2 :*	47	25	-90	
	38	38	44	44	44	*Min 1 :*	34	*Number'*	ΔR	*(kgf/cm^2)*
	34	44	47	45	42	*Min 2 :*	37	20	3.3	**39.6**
	40	38	42	37	38	*Min 3 :*	38	*R*	R_0	
	Total :				1,046	*Balance :*	842	**42.1**	**45.4**	*(N/mm^2)*
						Max 1 :	0	*Number*	*α (deg.)*	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	*Number'*	ΔR	*(kgf/cm^2)*
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	*R*	R_0	
	Total :				0	*Balance :*	0	**0.0**	**0.0**	*(N/mm^2)*
						Max 1 :	0	*Number*	*α (deg.)*	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	*Number'*	ΔR	*(kgf/cm^2)*
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	*R*	R_0	
	Total :				0	*Balance :*	0	**0.0**	**0.0**	*(N/mm^2)*
						Max 1 :	0	*Number*	*α (deg.)*	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	*Number'*	ΔR	*(kgf/cm^2)*
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	*R*	R_0	
	Total :				0	*Balance :*	0	**0.0**	**0.0**	*(N/mm^2)*

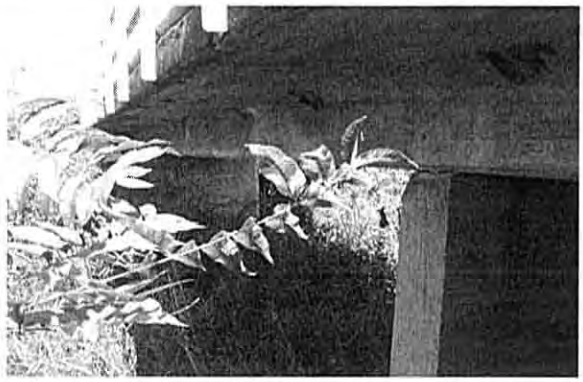
Remarks: *R :* Average of Rebound Value — *α :* Degree of Impact Angale

ΔR : Calibration — *Fc :* Compressive Strength

R_0 : Rebound Value — *Fd :* Design Strength

Observations and Diagnosis ;

Bridge Inventory **(9 Ling'ona Bridge)**

Photo			
General Information	Name of Bridge		Ling'ona Bridge
	Name of Road		Main Road 5 (M5)
	Chainage (km)		101.554 (M5/M14@Salima turnoff on M5)
	Location (District)		Nkhotakota
	Degrees of latitude / longitude (Measured by GPS)		S 12°57.308' E 34°17.746'
	Road Elevation (Measured by GPS)		Approx. 476m
	Administrator		National Road Authority (NRA)
	Year of Construction		1973
	Donor		Ministry of Works and Supplies
	Design Report		Not Available
Bridge	Type of Bridge	Superstructure	3-Span Continuous Concrete Girder with 2-Hinge
		Substructure	Concrete Wall
		Foundation	Concrete Piles
	Applied Design Specification		Unknown
	Design Live Load		Unknown
	Regulated Traffic Load		-
	Bridge Length	(m)	19.50+α
	Span Length	(m)	(4.00+α) + 11.5 + (4.00+α)
	Skew	(°)	90°
	Girder Height	(m)	0.55
	Width	Full Width (m)	4.90
		Carriageway (m)	4.40
		Pedestrian way (m)	-
	Type of Pavement		Unpaved
	Affixed Articles and Buried Article (Items, Administrator)		Water Supply φ120mm (Downstream) Water Supply φ50mm (Upstream, Underneath)
	Repair Works by NRA (National Road Authority) (Items、Year)		Pavement (Year Unknown) Masonry and Gabion Works (Year Unknown) Handrail (Unknown)
River	Name of River		Ling'ona
	Station (River)		Unknown
	Administrator		Ministry of Water Development
	Information of River Conditions		Non
	Information of Flood Damage		Overflow once or twice a year during heavy rain
	River Improvement Works		Non
Others	Topographic Survey		Available 1:50,000 Scale Map Available 1:10,000 Scale Air photo (Year 1988)
	Geological Investigation		No Data
	Navigation		No Operation

Damage of Bridges (9 Ling'ona Bridge)

Name of Bridge:	Ling'ona Bridge
Description	During peek periods of the floods, the water flows on the top of the road. The major damages include settlement of concrete slab on the side spans and exposed foundation piles of bridge piers.
Date of Survey:	July 23, 2004
Surveyor:	Takayuki Tsuchida, Kelvin N. Mphonda

Items		Damage Level					Remarks
		N/A	No Damage	Low Damage	Medium Damage	High Damage	
Road Surface (including Approach Road)	Pavement					X	Approach
	Crack (Concrete Slab)				X		
Accessories	Handrails			X			
	Lighting Facilities	X					
	Bearing	X					
	Expansion Joint	X					
	Drainage Facilities	X					
	Traffic Signboard		X				
	Affixed Articles		X				
	Buried Articles	X					
Concrete Slab	Crack				X		
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb			X			
	Others					X	Side Span Settled
Concrete Girder	Crack		X				
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb		X				
	Others	X					
Steel Girder	Lacking	X					
	Deformation	X					
	Rust or Corrosion	X					
	Painting	X					
	Others	X					
Substructure	Deformation		X				
	Settlement		X				
	Crack			X			
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb		X				
	Others	X					
Foundation	Settlement		X				
	Deformation		X				
	Scouring					X	Exposed Pile
	Others	X					
Flood Protection (Gabion Works, Embankment, etc)	Settlement			X			
	Deformation				X		
	Destruction				X		
	Scouring				X		
	Erosion			X			
	Others	X					

Results of Schmidt Hammer Test

Name of Bridge : *Ling'ona Bridge*

Route : *Main Road 5*

Date of Survey : *Takayuki Tsuchida, Kelvin N. Mphonda*

Date of Survey : *July 23, 2004*

Location	*Rebound Value*									*Fc*
North Bridge Pier	46	52	46	42	52	*Max 1 :*	54	*Number*	*α (deg.)*	**404.3**
	50	34	34	38	40	*Max 2 :*	52	25	0	
	47	54	44	45	45	*Min 1 :*	34	*Number'*	*Δ R*	*(kgf/cm²)*
	52	38	50	48	42	*Min 2 :*	34	20	0.0	**39.5**
	48	50	44	36	38	*Min 3 :*	36	*R*	R_0	
	Total :				1,115	*Balance :*	905	**45.3**	**45.3**	*(N/mm²)*
Concrete Slab	40	35	30	45	25	*Max 1 :*	60	*Number*	*α (deg.)*	**381.6**
	55	56	44	20	28	*Max 2 :*	56	25	-90	
	34	45	30	44	38	*Min 1 :*	20	*Number'*	*Δ R*	*(kgf/cm²)*
	42	32	44	45	20	*Min 2 :*	20	20	3.4	**37.3**
	48	40	60	40	44	*Min 3 :*	25	*R*	R_0	
	Total :				984	*Balance :*	803	**40.2**	**43.5**	*(N/mm²)*
						Max 1 :	0	*Number*	*α (deg.)*	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	*Number'*	*Δ R*	*(kgf/cm²)*
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	*R*	R_0	
	Total :				0	*Balance :*	0	**0.0**	**0.0**	*(N/mm²)*
						Max 1 :	0	*Number*	*α (deg.)*	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	*Number'*	*Δ R*	*(kgf/cm²)*
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	*R*	R_0	
	Total :				0	*Balance :*	0	**0.0**	**0.0**	*(N/mm²)*

Remarks: *R :* Average of Rebound Value — *α :* Degree of Impact Angale

Δ R : Calibration — *Fc :* Compressive Strength

R_0 : Rebound Value — *Fd :* Design Strength

Observations and Diagnosis ;

Bridge Inventory **(10 Mchandilo Culvert)**

Photo			
General Information	Name of Bridge		Mchandilo Culvert
	Name of Road		Main Road 5 (M5)
	Chainage (km)		102.698 (M5/M14@Salima turnoff on M5)
	Location (District)		Nkhotakota
	Degrees of latitude / longitude (Measured by GPS)		S 12°56.772' E 34°17.610'
	Road Elevation (Measured by GPS)		Approx. 479m
	Administrator		National Road Authority (NRA)
	Year of Construction		1973(Original)
	Donor		Ministry of Works and Supplies
	Design Report		Not Available
Bridge	Type of Bridge	Superstructure	2-Cell Concrete Box Culvert
		Substructure	-
		Foundation	Unknown
	Applied Design Specification		Unknown
	Design Live Load		Unknown
	Regulated Traffic Load		-
	Bridge Length	(m)	6.80
	Span Length	(m)	W=3.00, H=3.50 x 2Cells
	Skew	(°)	90°
	Girder Height	(m)	0.30 (Slab)
	Width	Full Width(m)	4.55
		Carriageway(m)	3.65
		Pedestrian way(m)	0.45
	Type of Pavement		Unpaved
	Affixed Articles and Buried Article (Items, Administrator)		Water Supply φ120mm (Downstream) Water Supply φ70mm (Upstream)
	Repair Works by NRA (National Road Authority) (Items、Year)		Pavement (Year Unknown) Masonry and Gabion Works (Year Unknown) Handrail (Unknown)
River	Name of River		Mchandilo
	Station (River)		Unknown
	Administrator		Ministry of Water Development
	Information of River Conditions		Non
	Information of Flood Damage		No overflow record
	River Improvement Works		Non
Others	Topographic Survey		Available 1:50,000 Scale Map Available 1:10,000 Scale Air photo (Year 1988)
	Geological Investigation		No Data
	Navigation		No Operation

Damage of Bridges (10 Mchandilo Culvert)

Name of Bridge:	Mchandilo Culvert
Description	The major damages include scouring of apron of downstream of the box culvert.
Date of Survey:	July 23, 2004
Surveyor:	Takayuki Tsuchida, Kelvin N. Mphonda

Items		Damage Level					Remarks
		N/A	No Damage	Low Damage	Medium Damage	High Damage	
Road Surface (including Approach Road)	Pavement	X					
	Crack (Concrete Slab)		X				
Accessories	Handrails		X				
	Lighting Facilities	X					
	Bearing	X					
	Expansion Joint	X					
	Drainage Facilities		X				
	Traffic Signboard		X				
	Affixed Articles		X				
	Buried Articles	X					
Concrete Slab	Crack		X				
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb		X				
	Others	X					
Concrete Girder	Crack	X					
	Free Lime	X					
	Corrosion of Re-bar	X					
	Spalling	X					
	Honeycomb	X					
	Others	X					
Steel Girder	Lacking	X					
	Deformation	X					
	Rust or Corrosion	X					
	Painting	X					
	Others	X					
Substructure ==>Concrete Wall	Deformation		X				
	Settlement		X				
	Crack		X				
	Free Lime		X				
	Corrosion of Re-bar		X				
	Spalling		X				
	Honeycomb		X				
	Others	X					
Foundation	Settlement		X				
	Deformation		X				
	Scouring		X				
	Others	X					
Flood Protection (Gabion Works, Embankment, etc)	Settlement		X				
	Deformation		X				
	Destruction					X	Apron
	Scouring				X		Riverbed
	Erosion			X			
	Others	X					

Results of Schmidt Hammer Test

Name of Bridge : *Mchandilo Bridge*
Route : *Main Road 5*
Date of Survey : *Takayuki Tsuchida, Kelvin N. Mphonda*
Date of Survey : *July 23, 2004*

Location	Rebound Value									Fc
Concrete Slab	40	36	30	34	44	Max 1 :	60	Number	α (deg.)	**403.6**
	40	36	48	28	46	Max 2 :	54	25	-90	
	42	60	36	42	42	Min 1 :	28	Number'	ΔR	(kgf/cm^2)
	50	42	44	40	42	Min 2 :	30	20	3.3	**39.4**
	54	44	44	40	40	Min 3 :	34	R	R_0	
	Total :				1,044	Balance :	838	**41.9**	**45.2**	(N/mm^2)
						Max 1 :	0	Number	α (deg.)	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	Number'	ΔR	(kgf/cm^2)
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	R	R_0	
	Total :				0	Balance :	0	**0.0**	**0.0**	(N/mm^2)
						Max 1 :	0	Number	α (deg.)	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	Number'	ΔR	(kgf/cm^2)
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	R	R_0	
	Total :				0	Balance :	0	**0.0**	**0.0**	(N/mm^2)
						Max 1 :	0	Number	α (deg.)	**0.0**
						Max 2 :	0	0		
						Min 1 :	0	Number'	ΔR	(kgf/cm^2)
						Min 2 :	0		0.0	**0.0**
						Min 3 :	0	R	R_0	
	Total :				0	Balance :	0	**0.0**	**0.0**	(N/mm^2)

Remarks: R : Average of Rebound Value — α : Degree of Impact Angale
ΔR : Calibration — Fc : Compressive Strength
R_0 : Rebound Value — Fd : Design Strength

Observations and Diagnosis ;