

## ANNEX J5.1.1 IMPLEMENTATION COST

In accordance with the middle term countermeasure in **Table J5.1.1**, the protection method to reduce sedimentation could either be river bank protection or slope protection. River bank protection aims at sectional bank protection especially at the meandering and narrowing portions of the main river channel. Slope protection is implemented to protect the slope against landslide damage and control sediment flow into the river channel.

### (1) Bank Protection

Based on the site survey, there are some riverbanks in the Musi River Basin that had been damaged by scouring and piping, causing damage to other infrastructures. Especially, damage of major roads will further increase the serious traffic problem as well as the economy of the region.

The feasible bank protection methods are summarised into four cases, as follows:

- Case 1      Concrete Block Type Revetment + Gabion Mattress
- Case 2      Wet Stone Masonry Type Revetment + Gabion Mattress
- Case 3      Concrete Sheet Pile Revetment
- Case 4      Wooden Fence

A comparison of the above four cases of bank protection method is given in **Table JA5.1** below.

**Table JA5.1 Comparison of Bank Protection Methods**

Case	Soil Condition	Protection Level	Necessary Land Acquisition	Advantage and Disadvantage of Method	Cost per Unit Length (Rp.)
1	Not applicable for weak soil	Middle Priority	Need a large area, but smaller than in Case 2	Less construction period than in Case 2, but longer than in Case 3	1,875,000
2	Not applicable for weak soil	Middle Priority	Need a large area	Construction method is easy and inexpensive	1,728,000
3	Not applicable for rock and boulder foundations	High Priority Structure	Need a small area	Construction period is short but expensive.	3,346,000
4	Applicable for weak soil	Low Priority	Land acquisition is not needed	Cost is most inexpensive but construction is on water.	1,153,000

For cost estimation, the following conditions are assumed: Bank height is 3.0 m and top width of bank is 2.0 m. Bank slopes for concrete block and wet stone masonry are 1:0.5 and 1:2, respectively. Moreover, Cases 1 and 2 need to consider coffering and dewatering works.

## (2) Slope Protection

Slope protection works for landsliding areas could either be sodding or sprigging. Sodding is applied for the protection of weak topsoil at slope surfaces and steep slope areas. Sprigging is suitable for the long-term protection or stability of soil. Unit costs for sodding and sprigging works are Rp. 16,500 per m<sup>2</sup> and Rp. 24,400 per m<sup>2</sup>, respectively. Cost estimation is based on the basic cost survey at the site and result is shown in **Tables JA5.2-JA5.4**.

**Table JA5.2 BASIC COST LABOUR AND COMPUTATION OF LABOUR COST IN PALEMBANG**

Unit : Rupiah

No	Qualification	Basic Wage (1) Daily		Additional Cost (Monthly Base)								Cost per Day		Rounded	
				(2) Overtime		(3) Leave		(4) Bonus		(5) Others					
		1	2	1	2	1	2	1	2	1	2	1	2		
1	Foreman	32,500	32,500	16,250	16,250	2,708	2,708	2,708	2,708	8,125	8,125	62,292	62,292	62,300	62,300
2	Operator	30,900	30,000	15,450	15,000	2,575	2,500	2,575	2,500	7,725	7,500	59,225	57,500	59,200	57,500
3	Electrician	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
4	Mechanic	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
5	Welder	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
6	Driver	21,000	20,000	10,500	10,000	1,750	1,667	1,750	1,667	5,250	5,000	40,250	38,333	40,300	38,300
7	Mason	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
8	Carpenter	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
9	Scaffolding Man	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
10	Plumber	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
11	Steel Worker	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
12	Concrete Worker	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
13	Painter	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
14	Plasterer	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
15	Asphalt Worker	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
16	Skilled Labour	22,500	20,000	11,250	10,000	1,875	1,667	1,875	1,667	5,625	5,000	43,125	38,333	43,100	38,300
17	Command Labour	18,900	15,000	9,450	7,500	1,575	1,250	1,575	1,250	4,725	3,750	36,225	28,750	36,200	28,800
18	Engineer	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
19	Inspector	36,000	35,000	18,000	17,500	3,000	2,917	3,000	2,917	9,000	8,750	69,000	67,083	69,000	67,100
20	Park Ranger	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
21	Plantsman	27,000	25,000	13,500	12,500	2,250	2,083	2,250	2,083	6,750	6,250	51,750	47,917	51,800	47,900
22	Watchman	18,900	15,000	9,450	7,500	1,575	1,250	1,575	1,250	4,725	3,750	36,225	28,750	36,200	28,800

(1) Resource 1. Bappeda South Sumatera Province, 2002

2. Contractor

(2) 7 Basic Working Hours + 2 Hours Overtime + 1 Hour Rest

- overtime , 1st hour, Basic Wage /7\*1.5

- overtime , 2nd hour, Basic Wage /7\*2.0

(3) Vacation and Sick Leave Basic Wage/12

(4) Bonus or 13th month pa Basic Wage/12

(5) Food, Transportation and other allowance + Taxes and Insurances

((1)+(2)+(3)+(4))x0.15

**Table JA5.3 BASIC UNIT COST OF CONSTRUCTION EQUIPMENT**

No	Construction Equipment	Capacity / specification	Power	Type	Economic Life (year)	Yearly Working (Hour)	Basic Price (Rp/Hour)
1	Bulldozer A	15 ton	145 PS	D7	5	2,000	235,000
2	Bulldozer B	12 ton	100 PS	D6	5	2,000	180,000
3	Bulldozer C	6 ton	71 PS	D5	5	2,000	155,000
4	Bulldozer with Ripper	21 ton	225 PS	D53A-17	5	2,000	280,000
5	Backhoe / Excavator A	0.6 m3	120 PS	PC 200-5	4	2,000	295,000
6	Backhoe / Excavator A	0.4 m3	88 PS	PC 100-5	4	2,000	260,000
7	Crawler - Type Loader	1.2 m3	93 PS	951 PC	5	2,000	320,000
8	Wheel Type Loader	1.2 m3	81 PS	920	5	2,000	300,000
9	Dump Truck A	8 ton	253 PS	TDZ-60	5	2,000	286,000
10	Dump Truck A	6 ton	188 PS	TSD-6	5	2,000	212,000
11	Ordinary Truck	4 ton	180 PS	TE-100	5	2,000	55,000
12	Wheel Crane A	10 ton	100 PS	KB-122	5	2,000	230,000
13	Wheel Crane B	4.9 ton	50 PS	TSD-45	5	2,000	216,000
14	Truck with Crane A	6 ton	190 PS	TX0-60	5	2,000	86,000
15	Truck with Crane B	4 ton	162 PS	TS-3	5	2,000	82,000
16	Trailer A	35 ton	320 PS	V0Z-441	5	2,000	210,000
17	Trailer B	20 ton	320 PS	F-2100	5	2,000	198,000
18	Truck Mixer	4.5 ton	290 PS	TDJ-50	5	2,000	175,000
19	Concrete Pump Truck	55 m3/hr	164 PS	NCP-900	4	2,000	230,000
20	Water Tanker	4 m3	-	4862-WD	5	2,000	25,000
21	Tamper	80/100 kg	4 PS	BS-60Y	3	1,600	13,000
22	Vibrator Roller A	1 ton	8 PS	SV-10	5	1,600	54,000
23	Vibrator Roller B	4 ton	27.3 PS	SV-25	5	1,600	60,000
24	Vibrator Roller C	12 ton	91 PS	SV-900	6	2,000	247,000
25	Tire Roller	8/12 ton	99 PS	TS-150	7	1,600	160,000
26	Tandem Roller	8/12 ton	99 PS		5	2,000	320,000
27	Motor Grader	2.8 m	94 PS	GD510R-1	6	2,000	380,000
28	Crawler Crane A	50 ton	156 PS	TG-500	6	1,400	260,000
29	Crawler Crane B	35 ton	117 PS	DH-350	6	1,400	245,000
30	Crawler Crane C	15 ton	96 PS	421 D	6	1,400	230,000
31	Portable Engine Compressor	3.5 m3/min	36 PS	EC-50 Hz	6	1,200	14,000
32	Diesel Engine Generator A	100 KVA	120 PS	3304	6	1,600	18,000
33	Diesel Engine Generator B	35 KVA	42 PS	DCA-35	6	1,600	12,500
34	Diesel Engine Generator C	15 KVA	20 PS	DCA-21	6	1,600	8,000
35	Diesel Pile Hammer	2.5 ton	102 PS	335-A	4	1,400	65,000
36	Vibro Hammer	23/24 ton	30 KW	-	4	1,400	45,000
37	Drop Hammer	0.5 ton	9 PS	-	4	1,400	30,000
38	Concrete Vibrator	-	1 KW	Dia 0-13	3	1,600	16,000
39	Portable Concrete Mixer A	0.5 m3	-	SM-500	3	1,600	55,000
40	Portable Concrete Mixer B	0.2 m3	-	KNP-7 US	3	1,600	48,000
41	Asphalt Plant	30 ton/hr	110 KW	BDM-50	5	1,400	1,075,000
42	Asphalt Finisher	2.4 m	33 PS	MP-30-2	5	1,600	145,000
43	Asphalt Sprayer	Lit./min	5.5 PS	BAD-200L	3	800	142,000
44	Concrete Breaker A	600 kg	108 PS	HB-700	3	1,200	115,000
45	Concrete Breaker B	1,300 kg	-	-	3	1,200	150,000
46	Pneumatic Hand Breaker	20 kg	8/10 PS	CB-21	3	1,200	60,000
47	Submergible Pump A	D 150 mm	7.5 KW	-	5	1,200	150,000
48	Submergible Pump B	D 50mm	0.75 KW	-	5	1,200	175,000
49	Engine Welder	250 AMP	19.1 PS	250MK	6	1,200	60,000
50	Chain Saw	-	0.7 PS	-	6	1,200	22,000
51	Drag Line	0.8 m3	-	-	5	2,000	83,000
52	Boring Machine	G=390 kg	10 PS	-	8	2,000	28,000
53	Bar Cutting Machine	-	-	-	6	-	6,000
54	Bar Bending Machine	-	-	-	6	-	8,000

Source : Supplier Cosindo (Sept, 2002)  
 Contractor Wijaya Karya (Sept,2002)  
 Public Work Bina Marga, Sept 2002

**Table JA5.4 BASIC UNIT COSTS OF CONSTRUCTION MATERIALS (1/3)**

No	Materials	Unit	Fuel Station
A.	Combustibles		
1	Gasoline	ltr	<b>1,750</b>
2	Light Oil (Diesel Oil)	ltr	<b>1,400</b>
3	Kerosene	ltr	<b>900</b>
4	Propane Gas	kg	<b>2,000</b>
5	Oxygen	m3	<b>50,000</b>
6	Grease	kg	<b>30,000</b>

No	Sand and Stones	Unit	Supplier
B. 1	Fine Aggregate (Washed sand)* (Average Delivery distance 15 km)	m3	<b>40,000</b>
2	Sand for filling and Base Course** (Average Delivery distance 15 km)	m3	<b>35,000</b>
3	Cobble Stone (Average Delivery Distance 10 km)***	m3	<b>83,500</b>
4	Crusher Run (Average Delivery Distance 10 km)****	m3	<b>90,000</b>
5	River Gravel (Average Delivery Distance 10 km)*****	m3	<b>77,500</b>
6	Boulder (Average Delivery Distance 10 km)*****	m3	<b>86,000</b>
7	Sand	m3	<b>35,000</b>

No	Concretes and Asphalt*	Unit	Contractor "GBS"	Public Work Bina Marga	WIKA
C. 1	Portland cement	bag	<b>30,000</b>	26,500	26,500
2	Cut- back asphalt (Average Delivery distance 15 km)	kg	<b>4,000</b>		
3	Asphalt Concrete (Hot Mix)	ton	<b>500,000</b>		
4	Asphalt Tack Coat	lit	<b>12,500</b>		
5	Asphalt Prime Coat	lit	<b>7,500</b>		
7	Ready Mixed Concrete; 350 kg/cm <sup>2</sup> .25mm	m3		<b>860,000</b>	820,000
8	Ready Mixed Concrete; 210 kg/cm <sup>2</sup> .25mm	m3		<b>779,000</b>	775,000
10	Ready Mixed Concrete; 170 kg/cm <sup>2</sup> .25mm	m3		<b>435,000</b>	480,000
11	Ready Mixed Concrete; 120 kg/cm <sup>2</sup> .25mm	m3		<b>360,000</b>	325,000
12	Prestressed Concrete Pile 0.30x0.30	lm		<b>300,000</b>	260,000
13	Prestressed Concrete Pile 040x0.40	lm		<b>375,000</b>	350,000
14	Reinforced Concrete Pile Dia.. 300mm	lm		<b>260,000</b>	225,000
15	Reinforced Concrete Pile Da.400mm	lm		<b>325,000</b>	300,000
16	Reinforced Concrete Pile Dia.. 500mm	lm		<b>400,000</b>	375,000
17	Reinforced Concrete Pile Dia.. 600mm	lm		<b>470,000</b>	435,000
18	Reinforced Concrete Pile Dia.. 800mm	lm		<b>600,000</b>	575,000
19	Reinforced Concrete Pile Da.1000mm	lm		<b>725,000</b>	700,000
20	Precast Concrete Sheet Pile 400mm	lm			<b>186,800</b>
21	Precast Concrete Sheet Pile600mm	lm			<b>367,000</b>
22	Precast Concrete Sheet Pile800mm	lm			<b>373,000</b>
23	Precast Concrete Sheet Pile 1000mm	lm			<b>462,000</b>
24	Precast Concrete Sheet Pile 1200mm	lm			<b>552,000</b>
25	Concrete Block for Pavement : 21*10.5*8cm	pc			
26	Concrete Hollow Block : 40*20*10	pc			
27	Form Tie	pc		<b>23,000</b>	
28	Non Shrinkage Mortal	m3		<b>412,000</b>	
29	Sealant ( asphalt type)	m3			
30	Sealant ( Elastomeric type)	m3			

Note: Cost of concretes and asphalt are including form works, placing works and others

**Table JA5.4 BASIC UNIT COSTS OF CONSTRUCTION MATERIALS (2/3)**

No	Log and Timber	Unit	Supplier
D. 1	Log Pile , Dia. 15 cm	m	<b>7,000</b>
2	Log Pile , Dia. 10 cm	m	<b>3,000</b>
3	Timber, class II	m3	<b>1,095,000</b>
4	Timber, class III	m3	<b>825,000</b>
5	Timber, class IV	m3	<b>588,000</b>
6	Plywood, t=12mm	m2	<b>137,000</b>
7	Form Timber (2x10)	m2	<b>137,000</b>
8	Coconut Pile, dia:25 cm, 10-12m	m	<b>12,000</b>

min.                      max.  
 990,000      1,200,000  
 750,000      900,000  
 525,000      650,000

No	Iron	Unit	Supplier Muara Dua	Contractor	Supplier: Timur Jaya
E. 1	Reinforcing Bars, Round (6m long;Grade33,<25mm dia	kg	<b>2,800</b>		
2	Reinforcing Bars, Round (6m long; Grade 40,<25mm dia	kg	<b>3,200</b>		
3	Structural Steel	kg	<b>6,000</b>		
4	Steel Pipe, Dia 350mm incl. Coating and Lining	m	<b>886,000</b>		
5	Steel Pipe, Dia 300mm excl. Coating and Lining	m	<b>728,000</b>		
6	Steel Pipe, Dia 200mm excl. Coating and Lining	m	<b>416,000</b>		
7	Steel Pipe, Dia 150mm excl. Coating and Lining	m	<b>287,000</b>		
8	Steel Pipe, Dia 125mm excl. Coating and Lining	m	<b>253,000</b>		
9	Steel Pipe, Dia 100mm excl. Coating and Lining	m	<b>221,000</b>		
10	Steel Pile Dia.38mm (1.5 inch)	m	<b>156,000</b>		
11	Steel Pipe Pile, Dia 600mm(spiral welded)	m	<b>367,000</b>		
12	Steel Pipe Pile, Dia 400mm(spiral welded)	m	<b>186,000</b>		
13	Galvanized Steel Pipe, Dia.40mm	m	<b>37,500</b>		
14	Galvanized Steel Pipe, Dia.50mm	m	<b>56,000</b>		
15	Galvanized Steel Pipe, Dia.75mm	m	<b>90,000</b>		
16	Galvanized Steel Pipe, Dia.100mm	m	<b>141,500</b>		
17	Bolt and Nut	kg	<b>40,000</b>		40,000
18	Welding Rod	kg	<b>60,000</b>		
19	Galvanized steel Fence, H=1.75m	m			
20	Gabion Mattress;4 mm, 1.5*3.0*0.5m	pc		<b>440,000</b>	
21	Gabion Cylinder, 4mm, Dia=50cm, 10m long	pc		<b>480,000</b>	
22	Zinc Roof	m2			<b>26,000</b>
23	Checked Steel Plate, 6mm thick	kg			<b>23,000</b>
24	Live and Anchorage	kg			

No	Valves	Unit	Contractor
F. 1	Flap gate 1000mm Dia	set	<b>45,000,000</b>
2	Flap gate 600mm Dia	set	<b>17,500,000</b>
3	Steel Gate 2.0*2.0m*2 (Slide Gate Type)	set	
4	Steel Gate 2.0*1.5m (Slide Gate Type)	set	
5	Steel Gate 1.5*1.5m (Slide Gate Type)	set	
6	Steel Gate 1.5*1.25*2 (Slide Gate Type)	set	
7	Steel Gate 1.0*1.25m(Slide Gate Type)	set	
8	Steel Gate 1.0*1.0m(Slide Gate Type)	set	

**Table JA5.4 BASIC UNIT COSTS OF CONSTRUCTION MATERIALS (3/3)**

No	Chemicals	Unit	Supplier Muara Dua
G.			
1	PVC Pipe, Dia 200mm	m	<b>175,600</b>
2	PVC Pipe, Dia 150mm	m	<b>102,850</b>
3	PVC Pipe, Dia 100mm	m	<b>45,100</b>
4	PVC Pipe, Dia 75mm	m	<b>27,150</b>
5	PVC Pipe, Dia 50mm	m	<b>13,500</b>
6	PVC Pipe, Dia 16mm	m	<b>4,450</b>
7	Elastic Joint Filler 10mm thick	m2	<b>161,000</b>
8	Geotextile	m2	
9	Watershop;300mm	m	
10	Elastomeric Bearing Pads	pc	

No	Others	Unit	Contractor
H.			
1	Palm Fiber, 20mm thick	m2	
2	Sand Bag	pc	<b>1,000</b>
3	Staff Gauge(5.0mm)	pc	
4	Asbestos Cement	m2	<b>30,000</b>
5	Aluminum Frame	m2	<b>20,000</b>
6	Cast-iron Cover, Dia.60cm	pc	
7	Nails	kg	<b>8,500</b>
8	Maintenance Post Marker	pc	<b>30,000</b>
9	Name Plate (marble)300mmx400mm	pc	
10	Bench(wooded)0.5mx3m	pc	<b>54,000</b>
11	Bench(steel)0.5mx3m	pc	<b>57,000</b>
12	Sodding Grass	m2	<b>6,000</b>
13	Acacia Magnum	tree	<b>12,000</b>
14	Peronema Canescens	tree	<b>12,000</b>
15	Ketapang	tree	<b>35,000</b>
16	Cemara Gunung	tree	<b>28,000</b>
17	Boat with 40 person 1,500 hp wooden	ship	<b>20,000,000</b>

\* Bangka

\*\* Bangka

\*\*\* Ogan Komering Ilir

\*\*\*\* Lahat

\*\*\*\*\* Ogan Komering Ulu

\*\*\*\* Lahat