

**Table 5.8.3 DAMAGEABLE PROPERTY AND FLOOD DAMAGE
IN BENEFICIAL AREAS OF TAMALATE FLOODWAY PROJECT
UNDER PRESENT SOCIO-ECONOMIC CONDITIONS**

Item	Return Period (Year)				
	2	5	10	20	50
I. Affected Population and Area					
1 Affected Population (1000)	1	2	5	10	19
2 Area Inundated (km2)	1	1	1	2	4
II. Inundated Property					
1 Buildings (Nos)	232	546	1,505	3,148	5,909
a. Housing Units	190	444	1,260	2,590	4,812
b. Manufacturing	22	39	98	205	392
c. Trading	20	59	130	322	656
d. Educational	1	5	13	22	36
e. Medical	0	0	5	9	14
2 Agricultural Land (ha)	17	17	24	36	62
a. Irrigated Field	17	17	24	36	62
b. Rainfed Field	0	0	0	0	0
c. Fishpond	0	0	0	0	0
III Estimated Value of Damaged Property (Rp. Million in Economic Terms)					
1. Direct Damage	513	1,830	4,907	16,030	42,731
(1) Facilities	347	1,348	3,692	12,205	32,676
a. Housing Units	100	775	2,106	6,946	20,350
b. Manufacturing	103	189	444	1,494	3,666
c. Trading	30	70	192	772	2,040
f. Education	73	219	667	2,065	4,437
g. Health	0	0	20	51	130
h. Other Facilities	41	96	264	876	2,054
(2) Agricultural Productio	48	59	82	126	194
a. Irrigated Field	48	59	82	126	194
b. Rainfed Field	0	0	0	0	0
c. Fishpond	0	0	0	0	0
(3) Infrastructure	118	422	1,132	3,699	9,861
2. Indirect Damage	62	212	563	1,837	4,884
(1) Household	2	11	28	94	279
(2) Business Losses	10	18	44	139	332
(3) Other Damages	51	183	491	1,603	4,273
3. Total	576	2,042	5,470	17,867	47,615
IV Annualized Damage Value under Present Conditions (Rp. Million in Economic					
1,622					

**Table 5.8.4 DAMAGEABLE PROPERTY AND FLOOD DAMAGE
IN BENEFICIAL AREAS OF TAMALATE FLOODWAY PROJECT
UNDER FUTURE SOCIO-ECONOMIC CONDITIONS**

Item	Return Period (Year)				
	2	5	10	20	50
I. Affected Population and Area					
1 Affected Population (1000)	1	2	6	12	22
2 Area Inundated (km2)	1	1	1	2	4
II. Inundated Property					
1 Buildings (Nos)	276	648	1,787	3,736	7,013
a. Housing Units	225	527	1,496	3,074	5,710
b. Manufacturing	26	46	116	244	466
c. Trading	23	70	154	382	778
d. Educational	1	5	15	26	42
e. Medical	0	0	5	11	16
2 Agricultural Land (ha)	17	17	24	36	62
a. Irrigated Field	17	17	24	36	62
b. Rainfed Field	0	0	0	0	0
c. Fishpond	0	0	0	0	0
III. Estimated Value of Damaged Property (Rp. Million in Economic Terms)					
1. Direct Damage	1,508	5,660	15,371	50,573	135,171
(1) Facilities	1,101	4,281	11,722	38,746	103,739
a. Housing Units	318	2,460	6,685	22,051	64,604
b. Manufacturing	326	601	1,408	4,742	11,639
c. Trading	94	222	610	2,452	6,475
f. Education	231	694	2,116	6,556	14,086
g. Health	0	0	63	162	412
h. Other Facilities	130	303	839	2,783	6,522
(2) Agricultural Productio:	59	73	101	156	239
a. Irrigated Field	59	73	101	156	239
b. Rainfed Field	0	0	0	0	0
c. Fishpond	0	0	0	0	0
(3) Infrastructure	348	1,306	3,547	11,671	31,193
2. Indirect Damage	186	657	1,768	5,800	15,459
(1) Household	5	33	90	300	888
(2) Business Losses	30	58	141	443	1,054
(3) Other Damages	151	566	1,537	5,057	13,517
3. Total	1,694	6,317	17,139	56,373	150,630
IV Annualized Damage Value under Future Conditions (Rp. Million in Economic Terms)					
					5,066

Table 5.8.5 FINANCIAL COST AND ECONOMIC COST

Work Item	(Unit: Rp. Billion)			
	Financial Cost		Economic Cost	
	BBT River Improvement	Tamalate Floodway	BBT River Improvement	Tamalate Floodway
I. Direct Cost	92.43	16.25	85.09	15.01
1. Preparatory Works	8.40	1.48	7.56	1.33
2. Channel Works	38.97	9.01	35.87	8.35
(1) Earth Works	18.44	5.14	17.35	4.91
(2) Stone Works	10.04	3.09	8.95	2.74
(3) Concrete Works	7.82	0.00	7.17	0.00
(4) Sluice, Drainage Sluic	1.54	0.68	1.39	0.61
(5) Miscellaneous	1.14	0.10	1.02	0.09
3. Weir Works	29.99	0.83	27.63	0.75
(1) Earth Works	1.19	0.19	1.14	0.18
(2) Stone Works	0.47	0.54	0.42	0.47
(3) Concrete Works	8.68	0.08	8.20	0.08
(4) Pile Works	4.50	0.00	4.24	0.00
(5) Rubber Gate	13.73	0.00	12.35	0.00
(6) Miscellaneous	1.43	0.02	1.29	0.02
4. Appurtenant Works	11.07	4.23	10.42	3.95
(1) Bridge Works	10.54	3.26	9.95	3.08
(2) Waterway	0.00	0.85	0.00	0.76
(3) Miscellaneous	0.53	0.12	0.47	0.11
5. Miscellaneous Works	4.00	0.70	3.60	0.63
II. Land Acquisition and Compei	2.54	0.91	0.82	0.29
1. Compensation (Houses)	0.79	0.27	0.71	0.24
2. Land Acquisition				
Residential Land	0.13	0.05	0.11	0.05
Agricultural Land	1.62	0.59	- *1	- *1
III. Administration Cost	4.75	0.86	4.30	0.77
IV. Engineering Service Cost	9.24	1.63	9.24	1.63
V. Physical Contingency	10.90	1.96	9.94	1.77
Total	119.85	21.61	109.39	19.46

Note: *1 Counted as negative benefit.

**Table 5.8.6 ECONOMIC COSTS AND BENEFITS STREAM
OF BBT RIVER IMPROVEMENT PROJECT
UNDER PRESENT SOCIO-ECONOMIC CONDITIONS**

(Unit: Rp. Billion)

Year	Cost			Total	Benefit		Total	Balance	
	Const- ruction Facilities	O&M River Rubber Gate			Flood Control Benefit	Negative Benefit			
1	2003	2.98		2.98		0.00	0.00	-2.98	
2	2004	3.25		3.25		0.20	-0.20	-3.45	
3	2005	31.37		31.37		0.43	-0.43	-31.80	
4	2006	36.05	0.13	36.18	3.18	0.66	2.53	-33.65	
5	2007	35.74	0.28	36.01	6.90	0.66	6.24	-29.77	
6	2008		0.43	0.43	10.61	0.66	9.95	9.53	
7	2009		0.43	0.43	10.61	0.66	9.95	9.53	
8	2010		0.43	0.43	10.61	0.66	9.95	9.53	
9	2011		0.43	0.43	10.61	0.66	9.95	9.53	
10	2012		0.43	0.14	0.57	10.61	0.66	9.95	9.39
11	2013		0.43		0.43	10.61	0.66	9.95	9.53
12	2014		0.43		0.43	10.61	0.66	9.95	9.53
13	2015		0.43		0.43	10.61	0.66	9.95	9.53
14	2016		0.43		0.43	10.61	0.66	9.95	9.53
15	2017		0.43	0.14	0.57	10.61	0.66	9.95	9.39
16	2018		0.43		0.43	10.61	0.66	9.95	9.53
17	2019		0.43		0.43	10.61	0.66	9.95	9.53
18	2020		0.43		0.43	10.61	0.66	9.95	9.53
19	2021		0.43		0.43	10.61	0.66	9.95	9.53
20	2022		0.43	0.14	0.57	10.61	0.66	9.95	9.39
21	2023		0.43		0.43	10.61	0.66	9.95	9.53
22	2024		0.43		0.43	10.61	0.66	9.95	9.53
23	2025		0.43		0.43	10.61	0.66	9.95	9.53
24	2026		0.43		0.43	10.61	0.66	9.95	9.53
25	2027		0.43	0.14	0.57	10.61	0.66	9.95	9.39
26	2028		0.43		0.43	10.61	0.66	9.95	9.53
27	2029		0.43		0.43	10.61	0.66	9.95	9.53
28	2030		0.43		0.43	10.61	0.66	9.95	9.53
29	2031		0.43		0.43	10.61	0.66	9.95	9.53
30	2032		0.43	0.14	0.57	10.61	0.66	9.95	9.39
31	2033		0.43		0.43	10.61	0.66	9.95	9.53
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42	2044		0.43		0.43	10.61	0.66	9.95	9.53
43	2045		0.43		0.43	10.61	0.66	9.95	9.53
44	2046		0.43		0.43	10.61	0.66	9.95	9.53
45	2047		0.43	0.14	0.57	10.61	0.66	9.95	9.39
46	2048		0.43		0.43	10.61	0.66	9.95	9.53
47	2049		0.43		0.43	10.61	0.66	9.95	9.53
48	2050		0.43		0.43	10.61	0.66	9.95	9.53
49	2051		0.43		0.43	10.61	0.66	9.95	9.53
50	2052		0.43	0.14	0.57	10.61	0.66	9.95	9.39
51	2053		0.43		0.43	10.61	0.66	9.95	9.53
52	2054		0.43		0.43	10.61	0.66	9.95	9.53
53	2055		0.43		0.43	10.61	0.66	9.95	9.53
54	2056		0.43		0.43	10.61	0.66	9.95	9.53
55	2057		0.43	0.14	0.57	10.61	0.66	9.95	9.39

B/C: 0.71 NPV: -21.5 Rp. Billion EIRR: 8.3%

**Table 5.8.7 ECONOMIC COSTS AND BENEFITS STREAM
OF BBT RIVER IMPROVEMENT PROJECT
UNDER FUTURE SOCIO-ECONOMIC CONDITIONS**

(Unit: Rp. Billion)

Year	Cost			Total	Benefit		Total	Balance	
	Const- ruction Facilities	O&M River Rubber Gate			Flood Control Benefit	Negative Benefit			
1	2003	2.98		2.98			0.00	-2.98	
2	2004	3.25		3.25		0.21	-0.21	-3.45	
3	2005	31.37		31.37		0.45	-0.45	-31.82	
4	2006	36.05	0.13	36.18	4.23	0.70	3.53	-32.65	
5	2007	35.74	0.28	36.01	9.71	0.71	9.00	-27.02	
6	2008		0.43	0.43	15.82	0.72	15.09	14.67	
7	2009		0.43	0.43	16.74	0.73	16.01	15.58	
8	2010		0.43	0.43	17.73	0.74	16.98	16.56	
9	2011		0.43	0.43	18.77	0.75	18.01	17.59	
10	2012		0.43	0.14	0.57	19.87	0.76	19.10	18.54
11	2013		0.43		0.43	21.03	0.77	20.26	19.83
12	2014		0.43		0.43	22.27	0.79	21.48	21.05
13	2015		0.43		0.43	23.57	0.80	22.78	22.35
14	2016		0.43		0.43	24.95	0.81	24.15	23.72
15	2017		0.43	0.14	0.57	26.42	0.82	25.60	25.03
16	2018		0.43		0.43	27.97	0.83	27.14	26.71
17	2019		0.43		0.43	29.61	0.84	28.77	28.34
18	2020		0.43		0.43	31.35	0.85	30.49	30.07
19	2021		0.43		0.43	31.35	0.85	30.49	30.07
20	2022		0.43	0.14	0.57	31.35	0.85	30.49	29.93
21	2023		0.43		0.43	31.35	0.85	30.49	30.07
22	2024		0.43		0.43	31.35	0.85	30.49	30.07
23	2025		0.43		0.43	31.35	0.85	30.49	30.07
24	2026		0.43		0.43	31.35	0.85	30.49	30.07
25	2027		0.43	0.14	0.57	31.35	0.85	30.49	29.93
26	2028		0.43		0.43	31.35	0.85	30.49	30.07
27	2029		0.43		0.43	31.35	0.85	30.49	30.07
28	2030		0.43		0.43	31.35	0.85	30.49	30.07
29	2031		0.43		0.43	31.35	0.85	30.49	30.07
30	2032		0.43	0.14	0.57	31.35	0.85	30.49	29.93
31	2033		0.43		0.43	31.35	0.85	30.49	30.07
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42	2044		0.43		0.43	31.35	0.85	30.49	30.07
43	2045		0.43		0.43	31.35	0.85	30.49	30.07
44	2046		0.43		0.43	31.35	0.85	30.49	30.07
45	2047		0.43	0.14	0.57	31.35	0.85	30.49	29.93
46	2048		0.43		0.43	31.35	0.85	30.49	30.07
47	2049		0.43		0.43	31.35	0.85	30.49	30.07
48	2050		0.43		0.43	31.35	0.85	30.49	30.07
49	2051		0.43		0.43	31.35	0.85	30.49	30.07
50	2052		0.43	0.14	0.57	31.35	0.85	30.49	29.93
51	2053		0.43		0.43	31.35	0.85	30.49	30.07
52	2054		0.43		0.43	31.35	0.85	30.49	30.07
53	2055		0.43		0.43	31.35	0.85	30.49	30.07
54	2056		0.43		0.43	31.35	0.85	30.49	30.07
55	2057		0.43	0.14	0.57	31.35	0.85	30.49	29.93

B/C: 1.54 NPV: 39.4 Rp. Billion EIRR: 17.0%

**Table 5.8.8 ECONOMIC COSTS AND BENEFITS STREAM
OF TAMALATE FLOODWAY PROJECT
UNDER PRESENT SOCIO-ECONOMIC CONDITIONS**

(Unit: Rp. Billion)

Year	Cost			Benefit		Total	Balance	
	Construction	O&M	Total	Flood Control Benefit	Negative Benefit			
1	2005	0.49		0.49		0.00	0.00	-0.49
2	2006	0.59		0.59		0.07	-0.07	-0.66
3	2007	5.50		5.50		0.16	-0.16	-5.66
4	2008	6.32	0.02	6.34	0.49	0.24	0.25	-6.09
5	2009	6.21	0.05	6.26	1.05	0.24	0.82	-5.44
6	2010		0.07	0.07	1.62	0.24	1.38	1.31
7	2011		0.07	0.07	1.62	0.24	1.38	1.31
8	2012		0.07	0.07	1.62	0.24	1.38	1.31
9	2013		0.07	0.07	1.62	0.24	1.38	1.31
10	2014		0.07	0.07	1.62	0.24	1.38	1.31
11	2015		0.07	0.07	1.62	0.24	1.38	1.31
12	2016		0.07	0.07	1.62	0.24	1.38	1.31
13	2017		0.07	0.07	1.62	0.24	1.38	1.31
14	2018		0.07	0.07	1.62	0.24	1.38	1.31
15	2019		0.07	0.07	1.62	0.24	1.38	1.31
16	2020		0.07	0.07	1.62	0.24	1.38	1.31
17	2021		0.07	0.07	1.62	0.24	1.38	1.31
18	2022		0.07	0.07	1.62	0.24	1.38	1.31
19	2023		0.07	0.07	1.62	0.24	1.38	1.31
20	2024		0.07	0.07	1.62	0.24	1.38	1.31
21	2025		0.07	0.07	1.62	0.24	1.38	1.31
22	2026		0.07	0.07	1.62	0.24	1.38	1.31
23	2027		0.07	0.07	1.62	0.24	1.38	1.31
24	2028		0.07	0.07	1.62	0.24	1.38	1.31
25	2029		0.07	0.07	1.62	0.24	1.38	1.31
26	2030		0.07	0.07	1.62	0.24	1.38	1.31
27	2031		0.07	0.07	1.62	0.24	1.38	1.31
28	2032		0.07	0.07	1.62	0.24	1.38	1.31
29	2033		0.07	0.07	1.62	0.24	1.38	1.31
30	2034		0.07	0.07	1.62	0.24	1.38	1.31
31	2035		0.07	0.07	1.62	0.24	1.38	1.31
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42	2046		0.07	0.07	1.62	0.24	1.38	1.31
43	2047		0.07	0.07	1.62	0.24	1.38	1.31
44	2048		0.07	0.07	1.62	0.24	1.38	1.31
45	2049		0.07	0.07	1.62	0.24	1.38	1.31
46	2050		0.07	0.07	1.62	0.24	1.38	1.31
47	2051		0.07	0.07	1.62	0.24	1.38	1.31
48	2052		0.07	0.07	1.62	0.24	1.38	1.31
49	2053		0.07	0.07	1.62	0.24	1.38	1.31
50	2054		0.07	0.07	1.62	0.24	1.38	1.31
51	2055		0.07	0.07	1.62	0.24	1.38	1.31
52	2056		0.07	0.07	1.62	0.24	1.38	1.31
53	2057		0.07	0.07	1.62	0.24	1.38	1.31
54	2058		0.07	0.07	1.62	0.24	1.38	1.31
55	2059		0.07	0.07	1.62	0.24	1.38	1.31
B/C:		0.55	NPV:		-5.8 Rp. Billion	EIRR:		6.3%

**Table 5.8.9 ECONOMIC COSTS AND BENEFITS STREAM
OF TAMALATE FLOODWAY PROJECT
UNDER FUTURE SOCIO-ECONOMIC CONDITIONS**

(Unit: Rp. Billion)

Year	Cost			Benefit		Total	Balance	
	Construction	O&M	Total Flood	Flood Control Benefit	Negative Benefit			
1	2005	0.49		0.49		0.00	0.00	-0.49
2	2006	0.59	0.00	0.59	0.00	0.08	-0.08	-0.66
3	2007	5.50	0.00	5.50	0.00	0.17	-0.17	-5.67
4	2008	6.32	0.02	6.34	0.74	0.26	0.48	-5.86
5	2009	6.21	0.05	6.26	1.70	0.27	1.44	-4.82
6	2010		0.07	0.07	2.78	0.27	2.51	2.44
7	2011		0.07	0.07	2.95	0.27	2.68	2.61
8	2012		0.07	0.07	3.14	0.28	2.86	2.78
9	2013		0.07	0.07	3.33	0.28	3.05	2.97
10	2014		0.07	0.07	3.54	0.29	3.25	3.18
11	2015		0.07	0.07	3.75	0.29	3.46	3.39
12	2016		0.07	0.07	3.99	0.29	3.69	3.62
13	2017		0.07	0.07	4.23	0.30	3.93	3.86
14	2018		0.07	0.07	4.49	0.30	4.19	4.12
15	2019		0.07	0.07	4.77	0.31	4.47	4.39
16	2020		0.07	0.07	5.07	0.31	4.76	4.68
17	2021		0.07	0.07	5.07	0.31	4.76	4.68
18	2022		0.07	0.07	5.07	0.31	4.76	4.68
19	2023		0.07	0.07	5.07	0.31	4.76	4.68
20	2024		0.07	0.07	5.07	0.31	4.76	4.68
21	2025		0.07	0.07	5.07	0.31	4.76	4.68
22	2026		0.07	0.07	5.07	0.31	4.76	4.68
23	2027		0.07	0.07	5.07	0.31	4.76	4.68
24	2028		0.07	0.07	5.07	0.31	4.76	4.68
25	2029		0.07	0.07	5.07	0.31	4.76	4.68
26	2030		0.07	0.07	5.07	0.31	4.76	4.68
27	2031		0.07	0.07	5.07	0.31	4.76	4.68
28	2032		0.07	0.07	5.07	0.31	4.76	4.68
29	2033		0.07	0.07	5.07	0.31	4.76	4.68
30	2034		0.07	0.07	5.07	0.31	4.76	4.68
31	2035		0.07	0.07	5.07	0.31	4.76	4.68
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42	2046		0.07	0.07	5.07	0.31	4.76	4.68
43	2047		0.07	0.07	5.07	0.31	4.76	4.68
44	2048		0.07	0.07	5.07	0.31	4.76	4.68
45	2049		0.07	0.07	5.07	0.31	4.76	4.68
46	2050		0.07	0.07	5.07	0.31	4.76	4.68
47	2051		0.07	0.07	5.07	0.31	4.76	4.68
48	2052		0.07	0.07	5.07	0.31	4.76	4.68
49	2053		0.07	0.07	5.07	0.31	4.76	4.68
50	2054		0.07	0.07	5.07	0.31	4.76	4.68
51	2055		0.07	0.07	5.07	0.31	4.76	4.68
52	2056		0.07	0.07	5.07	0.31	4.76	4.68
53	2057		0.07	0.07	5.07	0.31	4.76	4.68
54	2058		0.07	0.07	5.07	0.31	4.76	4.68
55	2059		0.07	0.07	5.07	0.31	4.76	4.68
B/C:		1.44	NPV:	5.7	Rp. Billion		EIRR:	16.2%

**Table 5.8.10 ECONOMIC COSTS AND BENEFITS STREAM
OF ENTIRE PRIORITY PROJECTS
UNDER PRESENT SOCIO-ECONOMIC CONDITIONS**

(Unit: Rp. Billion)

Year	Cost			Total	Benefit		Total	Balance
	Const- ruction	O&M			Flood Control Benefit	Negative Benefit		
		River Facilities	Rubber Gate					
1 2003	2.98			2.98			0.00	-2.98
2 2004	3.25			3.25		0.20	-0.20	-3.45
3 2005	31.86			31.86		0.43	-0.43	-32.29
4 2006	36.64	0.13		36.77	3.18	0.73	2.45	-34.31
5 2007	41.24	0.28		41.52	6.90	0.81	6.08	-35.43
6 2008	6.32	0.45		6.77	11.10	0.90	10.20	3.43
7 2009	6.21	0.47		6.68	11.67	0.90	10.77	4.09
8 2010		0.50		0.50	12.23	0.90	11.34	10.84
9 2011		0.50		0.50	12.23	0.90	11.34	10.84
10 2012		0.50	0.14	0.64	12.23	0.90	11.34	10.70
11 2013		0.50		0.50	12.23	0.90	11.34	10.84
12 2014		0.50		0.50	12.23	0.90	11.34	10.84
13 2015		0.50		0.50	12.23	0.90	11.34	10.84
14 2016		0.50		0.50	12.23	0.90	11.34	10.84
15 2017		0.50	0.14	0.64	12.23	0.90	11.34	10.70
16 2018		0.50		0.50	12.23	0.90	11.34	10.84
17 2019		0.50		0.50	12.23	0.90	11.34	10.84
18 2020		0.50		0.50	12.23	0.90	11.34	10.84
19 2021		0.50		0.50	12.23	0.90	11.34	10.84
20 2022		0.50	0.14	0.64	12.23	0.90	11.34	10.70
21 2023		0.50		0.50	12.23	0.90	11.34	10.84
22 2024		0.50		0.50	12.23	0.90	11.34	10.84
23 2025		0.50		0.50	12.23	0.90	11.34	10.84
24 2026		0.50		0.50	12.23	0.90	11.34	10.84
25 2027		0.50	0.14	0.64	12.23	0.90	11.34	10.70
26 2028		0.50		0.50	12.23	0.90	11.34	10.84
27 2029		0.50		0.50	12.23	0.90	11.34	10.84
28 2030		0.50		0.50	12.23	0.90	11.34	10.84
29 2031		0.50		0.50	12.23	0.90	11.34	10.84
30 2032		0.50	0.14	0.64	12.23	0.90	11.34	10.70
31 2033		0.50		0.50	12.23	0.90	11.34	10.84
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42 2045		0.50		0.50	12.23	0.90	11.34	10.84
43 2046		0.50		0.50	12.23	0.90	11.34	10.84
44 2047		0.50	0.14	0.50	12.23	0.90	11.34	10.84
45 2048		0.50		0.50	12.23	0.90	11.34	10.84
46 2049		0.50		0.50	12.23	0.90	11.34	10.84
47 2050		0.50		0.50	12.23	0.90	11.34	10.84
48 2051		0.50		0.50	12.23	0.90	11.34	10.84
49 2052		0.50	0.14	0.64	12.23	0.90	11.34	10.70
50 2053		0.50		0.50	12.23	0.90	11.34	10.84
51 2054		0.50		0.50	12.23	0.90	11.34	10.84
52 2055		0.50		0.50	12.23	0.90	11.34	10.84
53 2056		0.50		0.50	12.23	0.90	11.34	10.84
54 2057		0.50	0.14	0.64	12.23	0.90	11.34	10.70
55 2058		0.50		0.50	12.23	0.90	11.34	10.84
56 2059		0.50		0.50	12.23	0.90	11.34	10.84
B/C: 0.69				NPV: -26.1	Rp. Billion		EIRR: 8.1%	

**Table 5.8.11 ECONOMIC COSTS AND BENEFITS STREAM
OF ENTIRE PRIORITY PROJECTS
UNDER FUTURE SOCIO-ECONOMIC CONDITIONS**

(Unit: Rp. Billion)

Year	Cost			Total	Benefit			Balance
	Const- ruction	O&M			Flood Control Benefit	Negative Benefit	Total	
		River Facilities	Rubber Gate					
1 2003	2.98			2.98			0.00	-2.98
2 2004	3.25			3.25		0.21	-0.21	-3.45
3 2005	31.86			31.86		0.45	-0.45	-32.31
4 2006	36.64	0.13		36.77	4.23	0.78	3.45	-33.31
5 2007	41.24	0.28		41.52	9.71	0.88	8.83	-32.69
6 2008	6.32	0.45		6.77	16.56	0.99	15.57	8.80
7 2009	6.21	0.47		6.68	18.45	1.00	17.45	10.77
8 2010		0.50		0.50	20.51	1.01	19.49	18.99
9 2011		0.50		0.50	21.72	1.03	20.69	20.19
10 2012		0.50	0.14	0.64	23.00	1.04	21.96	21.32
11 2013		0.50		0.50	24.36	1.06	23.31	22.81
12 2014		0.50		0.50	25.80	1.07	24.73	24.23
13 2015		0.50		0.50	27.33	1.09	26.24	25.74
14 2016		0.50		0.50	28.94	1.10	27.84	27.34
15 2017		0.50	0.14	0.64	30.65	1.12	29.54	28.89
16 2018		0.50		0.50	32.46	1.13	31.33	30.83
17 2019		0.50		0.50	34.38	1.15	33.23	32.73
18 2020		0.50		0.50	36.41	1.16	35.25	34.75
19 2021		0.50		0.50	36.41	1.16	35.25	34.75
20 2022		0.50	0.14	0.64	36.41	1.16	35.25	34.61
21 2023		0.50		0.50	36.41	1.16	35.25	34.75
22 2024		0.50		0.50	36.41	1.16	35.25	34.75
23 2025		0.50		0.50	36.41	1.16	35.25	34.75
24 2026		0.50		0.50	36.41	1.16	35.25	34.75
25 2027		0.50	0.14	0.64	36.41	1.16	35.25	34.61
26 2028		0.50		0.50	36.41	1.16	35.25	34.75
27 2029		0.50		0.50	36.41	1.16	35.25	34.75
28 2030		0.50		0.50	36.41	1.16	35.25	34.75
29 2031		0.50		0.50	36.41	1.16	35.25	34.75
30 2032		0.50	0.14	0.64	36.41	1.16	35.25	34.61
31 2033		0.50		0.50	36.41	1.16	35.25	34.75
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42 2045		0.50		0.50	36.41	1.16	35.25	34.75
43 2046		0.50		0.50	36.41	1.16	35.25	34.75
44 2047		0.50	0.14	0.64	36.41	1.16	35.25	34.61
45 2048		0.50		0.50	36.41	1.16	35.25	34.75
46 2049		0.50		0.50	36.41	1.16	35.25	34.75
47 2050		0.50		0.50	36.41	1.16	35.25	34.75
48 2051		0.50		0.50	36.41	1.16	35.25	34.75
49 2052		0.50	0.14	0.64	36.41	1.16	35.25	34.61
50 2053		0.50		0.50	36.41	1.16	35.25	34.75
51 2054		0.50		0.50	36.41	1.16	35.25	34.75
52 2055		0.50		0.50	36.41	1.16	35.25	34.75
53 2056		0.50		0.50	36.41	1.16	35.25	34.75
54 2057		0.50	0.14	0.64	36.41	1.16	35.25	34.61
55 2058		0.50		0.50	36.41	1.16	35.25	34.75
56 2059		0.50		0.50	36.41	1.16	35.25	34.75

B/C: 1.53

NPV: 44.0 Rp. Billion

EIRR: 16.9%

Table 5.8.12 SENSITIVITY TEST OF BBT RIVER IMPROVEMENT PROJECT

		Benefit		
		0%	-5%	-10%
EIRR (%)				
Cost	0%	17.0%	16.3%	15.6%
	5%	16.4%	15.7%	15.0%
	10%	15.8%	15.1%	14.5%
B/C				
Cost	0%	1.54	1.46	1.39
	5%	1.47	1.39	1.32
	10%	1.40	1.33	1.26
NPV (Rp. Billion)				
Cost	0%	39.4	33.8	28.2
	5%	35.8	30.2	26.5
	10%	32.1	26.5	20.9

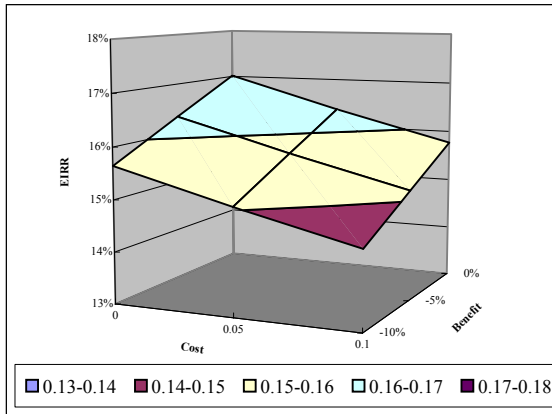


Table 5.8.13 SENSITIVITY TEST OF TAMALATE FLOODWAY PROJECT

		Benefit		
		0%	-5%	-10%
EIRR (%)				
Cost	0%	16.2%	15.5%	14.9%
	5%	15.6%	14.9%	14.3%
	10%	15.0%	14.4%	13.8%
B/C				
Cost	0%	1.44	1.37	1.30
	5%	1.37	1.31	1.24
	10%	1.31	1.25	1.18
NPV (Rp. Billion)				
Cost	0%	5.7	4.7	3.8
	5%	5.0	4.1	3.2
	10%	4.4	3.5	2.5

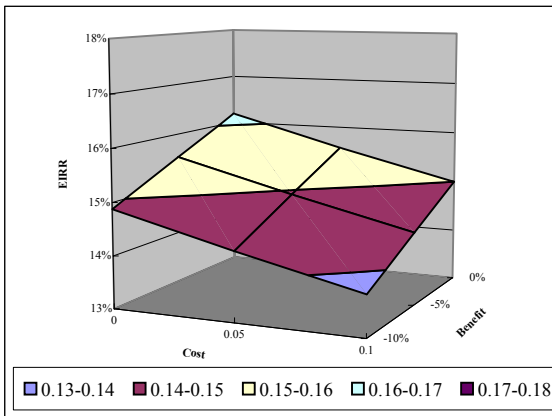
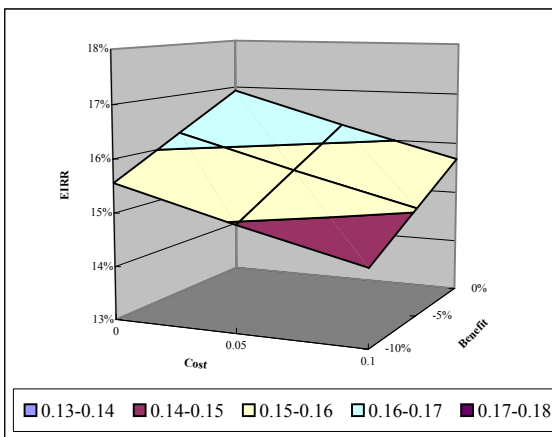


Table 5.8.14 SENSITIVITY TEST OF ENTIRE PRIORITY PROJECT

		Benefit		
		0%	-5%	-10%
EIRR (%)				
Cost	0%	16.9%	16.3%	15.6%
	5%	16.3%	15.6%	15.0%
	10%	15.7%	15.1%	14.4%
B/C				
Cost	0%	1.53	1.45	1.38
	5%	1.46	1.38	1.31
	10%	1.39	1.32	1.25
NPV (Rp. Billion)				
Cost	0%	44.0	37.7	31.3
	5%	39.9	33.5	27.1
	10%	35.7	29.4	23.0



**Table 5.8.15 IMPACT ACTIVITIES INVOLVED
IN THE PRIORITY PROJECTS**

<i>Project component</i>	<i>Phase*</i>	<i>Main impact activities involved</i>
Tapodu river improvement with Tapodu gate.	PC	<ul style="list-style-type: none"> • Land acquisition for project site. • Land acquisition for relocation site. • Relocation site development. • Residential transfer and change of living environment and possibility of vocational change.
	C	<ul style="list-style-type: none"> • Vegetation clearance. • Excavation, widening and dredging for river channel. • Embankment for dike construction. • Construction of control gate, equipped with rubber dam. • Bank protection with gabion and concrete. • Bridge construction. • Mobilization of machinery and materials, etc. • Employment of local people as construction workers.
	O/M	<ul style="list-style-type: none"> • Water level control at Tapodu gate, including sluice gates of drainage channels. • Existence of constructed structures.
Tamalate floodway.	PC	<ul style="list-style-type: none"> • Same as the case of Tapodu river improvement.
	C	<ul style="list-style-type: none"> • Construction of Tamalate weir, equipped with sluice gate. • The rest is the same as Tapodu river improvement.
	O/M	<ul style="list-style-type: none"> • Run-off control at Tamalate weir. • Existence of constructed structures.
River improvement on Bolango and Bone rivers.	PC	<ul style="list-style-type: none"> • Same as the case of Tapodu river improvement, but in smaller magnitude.
	C	<ul style="list-style-type: none"> • Same as Tapodu river improvement except for the construction of the control gate.
	O/M	<ul style="list-style-type: none"> • Existence of constructed structures.
Realignment of Alo-Pohu and Biyonga.	PC	<ul style="list-style-type: none"> • Same as the case of Tapodu river improvement, but in smaller magnitude.
	C	<ul style="list-style-type: none"> • Vegetation clearance. • Excavation, widening and dredging for river channel. • Embankment for dike construction. • Mobilization of machinery and materials, etc. • Employment of local people as construction workers.
	O/M	<ul style="list-style-type: none"> • Existence of realignment channels.
Sediment trap.	C	<ul style="list-style-type: none"> • Construction of sediment trap. • Mobilization of machinery and materials, etc. • Employment of local people as construction workers.
	O/M	<ul style="list-style-type: none"> • Existence of sediment trap. • Utilization of sediment load within the sediment trap.

* PC: Pre-Construction phase, C: Construction phase, O/M: Operation and Maintenance phase.

Table 5.8.16 DESCRIPTION OF IMPACTS ON NATURAL ENVIRONMENTAL COMPONENT (1/3)

<i>Environmental components</i>	<i>Phase*</i>	<i>Description of direct impact</i>	<i>Negative/Positive</i>	<i>Spatial extent/ Area to be affected</i>	<i>Conditions of impacts to occur</i>	<i>Quantitative magnitude</i>	<i>Secondary impacts/effects</i>
1. Geology (erosion and sedimentation)	C	None	-	-	-	-	-
	M/O	Erosion presently occurring along rivers during floods will be reduced owing to river improvement works such as bank protection. Consequently, the entailing sedimentation phenomenon in the downstream of rivers will be alleviated.	Positive	Downstream of each work site on Bolango, Tapodu, Bone rivers and Tamalate rivers.	Original and much bigger source of sedimentation is supplied from upstream area of LBB basin. In this sense, the effectiveness is canceled unless proper watershed management is undertaken.	Basically, erosion will not occur on bank protected reaches.	Improvement of land safety living condition along river banks.
2. Groundwater and land subsidence	C	Excavation work for Tamalate floodway, Tapodu rivers and Tenda Cutoff channel will lower groundwater level along these channels because the excavation are planned to be deeper than the current groundwater level. This may cause groundwater level lowering or depletion of well water along the channels. The drawdown of groundwater level may cause consolidation phenomenon, judging from the geologic profile, showing there is clayey silt or clayey layer, which are vulnerable to consolidation phenomenon.	Negative	Area along the excavated channels. Impact area will be up to some 50 m at most from the channels.	Practically not avoidable. The impact of consolidation last for certain period of time, usually for years after the completion of excavation depending on geologic characteristics.	Down to same level as riverbed of floodway in the vicinity of channels. Magnitude of land subsidence is not clear.	Inconvenience of water use from wells due to draw down of well water level. Land subsidence might cause uneven settlement of houses located close to channels.
	O/M	The above impacts will last in O/M phase.	Ditto	Ditto	Ditto	Ditto	Ditto
3. Water regime	C	None.	-	-	-	-	-
	O/M	Flood control for the floods of up to 20 year recurrence period and mitigation of flood damages for longer recurrence period.	Positive	Area along lower Bolango, Bone, and Tamalate, Lake around Limboto.	Effectiveness will be weekend unless proper watershed management, specifically land use and forest management, is undertaken.	Floods up to 20 year recurrence period are controlled.	Improvement of living environment and economic effect with an EIRR of 16.9%.
	O/M	Stabilization of Lake Limboto water level at rather high.	Positive	In Lake Limboto.	Appropriate gate control at Tapodu gate is requisite.	Higher than water level of 4.0 m.	Improvement of water quality and fishery product.

* C: Construction phase, O/M: Operation and Maintenance phase.

Table 5.8.16 DESCRIPTION OF IMPACTS ON NATURAL ENVIRONMENTAL COMPONENT (2/3)

Environmental components	Phase*	Description of direct impacts.	Negative/ Positive	Spatial extent/ Area to be affected	Conditions of impacts to occur	Quantitative magnitude	Possible secondary impacts
4. Terrestrial flora and fauna	C	Due to the excavation for Tamalate floodway and Tapodu river, some natural vegetation including agricultural one will be cleared. Tree species to be affected in the natural vegetation are Acacia, Banyan, Linggua and Nantu. Excavation works for Tapodu river and Tamalate floodway will disturb habitat of wild birds such as egrets and wild ducks. Other river improvement works will not affect significantly because these sites are already modified to such extent that there is no habitat of wild animals.	Negative	In and around the excavation sites.	Not avoidable.	Negligible or minor judging from the areal ratio of the affected and the whole area of LBB basin.	No significant impact.
	O/M	Impacts mentioned above will last in O/M phase.	Negative	Ditto	Ditto	Ditto	Ditto
	C	Impacts of construction works on fish are the habitat disturbance due to turbidity increase and alkalinity increase caused by dredging and/or concrete works in rivers and Lake Limboto. Disturbance is also caused by means of obstruction of their migration due to temporal channel shift or possibility of improper bypath construction.	Negative	In the vicinity of construction site and downstream.	Practically, not avoidable.	Not clear.	Impacts on fishery or aquaculture. But seemed not to be significant.
5. Aquatic flora and fauna	O/M	Stabilization of water level of Lake Limboto will control the growth of aquatic weeds (macrophytes), specifically submerged plants. This will decrease the decomposition of weeds, which in turn less deteriorate water quality in terms of DO and BOD. Since aquatic weeds function as shelter or supply foods, decrease of weeds may result in affecting fish.	Both	In Lake Limboto.	Proper management of Tapodu gate is requisite.	Submerged and emergent plants cannot grow at depth more than 2 m.	Not clear.
	O/M	Tapodu gate will affect fish's longitudinal migrating habit within Tapodu-Bolango-Bone river system or between the sea and Lake Limboto. The migratory fish which have been identified so far is eel (<i>Anguilla sp.</i>). Coverage of river bank with concrete wall or gabion will modify the fish habitat and may affect fish population.	Negative.	Over the LBB river network.	Practically avoidable.	Not clear.	Impacts on fishing output of eels, and accordingly on the fishermen depending on it.
	O/M	Stabilization of Lake Limboto water level owing to Tapodu gate higher than 4.0 m. This will bring about good condition on fish ecology in terms of water quality improvement and water volume.	Positive	In Lake Limboto.	Proper management of Tapodu gate is requisite.	Not clear.	Increase of fishing output and aquaculture production.

* C: Construction phase, O/M: Operation and Maintenance phase.

Table 5.8.16 DESCRIPTION OF IMPACTS ON NATURAL ENVIRONMENTAL COMPONENT (3/3)

<i>Environmental components</i>	<i>Phase*</i>	<i>Description of direct impacts.</i>	<i>Negative/ Positive</i>	<i>Spatial extent/ Area to be affected</i>	<i>Conditions of impacts to occur</i>	<i>Quantitative magnitude</i>	<i>Possible secondary impacts</i>
6. Air quality including noise	C	Air pollution (by emission gas) and dust will be generated. While air pollution is generated from construction machinery and transportation vehicles at all the construction works, dust is caused by earth work, such as excavation for floodway and river channel widening. Dust is also generated from trucks loaded with earth, i.e. soil and sand. Noise will be also generated during these construction works, caused by construction machinery and transportation vehicles.	Negative	Near construction site. Along the transportation route (not decided yet) of machinery, materials and laborers.	Not avoidable.	Not clear.	Impacts on living environment, especially on school, hospital, clinic which require rather quiet environment.
	O/M	None.	-	-	-	-	-
7. Water quality	C	Turbidity increase will occur during construction phase. The possible source activities are all the construction works on rivers, dredging/widening of rivers and a sediment trap. Alkali water discharge can be caused by concrete work, especially during construction of floodway, dike and bank protection.	Negative	Downstream of each work or in Lake Limboto.	Not avoidable.	Not clear.	Impacts on fishing output and aquaculture. Impacts on water use such as bathing and laundry.
	O/M	High turbid water from Ato-Pohu and Biyonga rivers will be confined within sediment trap and accordingly this alleviates the pollution with high suspended solids and sedimentation in Lake Limboto.	Positive	In Lake Limboto.	Proper management of sediment trap including dredging of sediment deposits is requisite.	Not clear.	Possibility of usage of the sediment load deposited within sediment trap for construction materials.
	O/M	Turbid water flowing into the lake from the Bolongo River will be improved due to the improvement of the Tapodu River.	Negative	In Lake Limboto.	Not avoidable	Not clear	Impacts on fishing output and aquaculture.

* C: Construction phase, O/M: Operation and Maintenance phase.

**Table 5.8.17 RESULT OF IMPACT EVALUATION
ON NATURAL ENVIRONMENTAL COMPONENTS**

<i>Conceivable impacts</i>	<i>Nature of impacts</i>	<i>Evaluation result</i>
(1) Negative impacts		
Groundwater level lowering and land subsidence.	1) Practically not avoidable. 2) Irreversible. 3) Confined along Tamalate floodway, Tapodu river and Tenda Cutoff channel. Impacts are limited to the households located within some 50 m from these channels. 4) Not identical with those who get benefit. *	<u>Compensatory mitigation is applicable.</u>
Vegetation clearance.	1) Not avoidable. 2) Irreversible. 3) Confined in and along Tamalate floodway and Tapodu river. 4) Not necessarily identical. *	Impacts are <u>minimal</u> judging from its spatial extent vs. the whole ecosystem.
Habitat disturbance of terrestrial fauna.	1) Not avoidable. 2) Irreversible. 3) Confined in and around Tamalate floodway and Tapodu river. 4) Not necessarily identical. *	Impacts are <u>minimal</u> judging from its spatial extent.
Habitat disturbance of aquatic fauna, especially fish.	1) Practically not avoidable. 2) Reversible./ Impacts are confined within construction phase. 3) Rivers and in Lake Limboto. 4) Not necessarily identical. *	Impact magnitude is not clear, but <u>seemed not significant.</u>
Disturbance of migration habit of migratory fish, especially eels.	1) Practically not avoidable. 2) Irreversible. 3) In the whole Lake Limboto. 4) Not necessarily identical with those who benefit. *	Impact magnitude is <u>not clear.</u> <u>Compensatory mitigation is applicable</u> for fishermen of eels.
Air pollution (emission gas) and dust.	1) Not avoidable. 2) Reversible. / Impacts are confined within construction phase. 3) Near all the construction sites and transportation routes. 4) Identical with those who benefit. *	<u>Not significant.</u>
Turbid water and alkali water discharge.	Ditto	<u>Not significant.</u>
(2) Positive impacts		
Alleviation of erosion of rivers.	1) Benefit will last for years. 2) Lower reaches of river bank of Bolango, Bone, Tamalate, etc.	<u>Significant.</u>
Reduction of flood risks.	1) Benefit will last for years. 2) Benefit area is low area of LBB basin.	<u>Significant.</u>
Stabilization of water level water quality improvement in Lake Limboto	1) Benefit will last practically forever. 2) As a secondary impact, a stable and high fishing output and aquaculture production will be expected.	<u>Significant.</u>
Confining of turbid water within sediment trap.	1) Benefit lasts for years. 2) As a secondary impact, a high fishing output and aquaculture production will be expected.	<u>Not clear.</u>

*: Whether or not people who get benefit from the project is identical with the people who suffer from it.

Table 5.8.18 DESCRIPTION OF IMPACTS ON SOCIAL ENVIRONMENTAL COMPONENTS (1/3)

<i>Environmental component to be affected</i>	<i>Phase *</i>	<i>Description of direct impact</i>	<i>Negative/ Positive</i>	<i>Spatial extent/ Area to be affected</i>	<i>Conditions of impacts to occur</i>	<i>Quantitative magnitude</i>	<i>Possible secondary impacts**</i>
1. Resettlement	PC	Change of residence and start of new life is necessary for the concerned residents as a result of land acquisition.	Negative	Along Tamalate Floodway site, downstream of Tapodu, Bolango, Biyonga and Alo-Pohu rivers	Not avoidable. The magnitude of impact depends on the magnitude and location of the projects	In total 130 houses and 69 ha of lands	Adjustment oneself to a new location
			Positive				
2. Livelihood	PC	Resettlement measures may force the concerned households to change occupation or lose asset such as rice field.	Negative	Along Tamalate Floodway construction site, downstream of Tapodu, Bolango, Biyonga and Alo-Pohu rivers	Insufficient compensation and no appropriate alternative lands provided	130 houses (estimated more than 500 persons), 69 ha	Impoverishment of the affected households
			Positive				
3. Local Population's Opposition	C	Recruitment of workers for the project implementation provides a job opportunity in the region which can be an alternative source of income for the relocated households	Positive	All the project sites. Area may go beyond boundaries of concerned village, though.	Local residents is recruited favorably to the people from outside.	230-400 worker recruitment (est. more than 900 persons influenced)	Influx of workers outside the local villages
			Negative				
3. Local Population's Opposition	M/O	Stable water level provides favorable environment for fish culture in the lake Limboto.	Positive	Lake Limboto surrounding area (19 fishery villages at kabupaten level)	Tapodu gate properly controlled and managed, with the promotion of fishery in the lake	With 4 m of water level, maximum potential of fish production can be 1,552 ton/year	Labor shift into fishery industry from other sectors
			Negative				
3. Local Population's Opposition	PC	Land acquisition would cause people's frustration or resistance to release of land and project implementation	Negative	Along Tamalate Floodway site, downstream of Tapodu, Bolango, Biyonga and Alo-Pohu rivers	Insufficient socialization of the projects, lack of dialogue between the residents and the government, inappropriate land acquisition measures	14 desa/kelurahan at project sites, and surrounding desa of the lake Limboto	In the most serious case, project commencement is hindered.
			Positive				
3. Local Population's Opposition	C	Construction work would produce noise and waste, and cause traffic jam, esp. around Pilolodaa market	Negative	All the sites of construction work	In the most serious case, project implementation is retarded or rejected.	14 desa/kelurahan at project sites, and Pilolodaa market	In the most serious case, project implementation is retarded or rejected.
			Positive				

Table 5.8.18 DESCRIPTION OF IMPACTS ON SOCIAL ENVIRONMENTAL COMPONENTS (2/3)

<i>Environmental component to be affected</i>	<i>Phase *</i>	<i>Description of direct impact</i>	<i>Negative/ Positive</i>	<i>Spatial extent/ Area to be affected</i>	<i>Conditions of impacts to occur</i>	<i>Quantitative magnitude</i>	<i>Possible secondary impacts**</i>
3. Local Population's Opposition (cont.)	M/O	Construction of facilities may cause community split	Negative	Along Tamalate Floodway and Tapodu river improvement sites	Insufficient socialization of the projects, lack of dialogue between the residents and the government, inappropriate land acquisition measures	Population of desa/kelurahan along Tamalate Floodway and Tapodu river	Not Clear
	PC	None	-	-	-	-	-
4. People's mobility	C	Transportation vehicle could cause crowded traffic and disturbance to activities at Pilolodaa market	Negative	At the Tapodu gate construction site, Kel. Pilolodaa and its neighborhood	Inappropriate schedule of utilization of existing roads	Affected people's number is not clear (Kel. Pilolodaa and its market users)	People's opposition to the project activities
	M/O	The construction of new bridges and access road along the dike together with heightening of some existing bridges could increase mobility of local population	Positive	Around the project sites where concerned bridges and roads are provided	The bridges and roads are properly used and maintained.	Not Clear. (population of Kota Barat/ Selatan/ Utara, Kec. Kabila/ Telaga, mainly)	Not Clear
5. Access to waters	PC	As the lands along concerned rivers are to be acquired, people's access to waters becomes limited. In other words, people's daily life activity (bathing, laundry, waste dumping, privy, etc.) and their visual accessibility to waters are disturbed.	Negative	Along Tamalate Floodway and Tapodu river improvement sites, in addition to some coastal area of lake Limboto	It is difficult to avoid, i.e. to change people's attitude in a short term	130 households relocated + α.	Intensive utilization of alternative water place. Domestic waste may be dumped somewhere else and the place will be polluted.
			Positive		Practice of waste-dumping is controlled.	Not Clear (Residents along the treated rivers and Tamalate Floodway)	
	C	Access to waters is limited by land occupation for construction works and daily life is disturbed.	Negative	All the project sites	Not avoidable.		
M/O	With constructed structures (dikes, gate, etc.), it becomes more difficult to access to river and lake waters.	Negative	Along Tamalate Floodway, Tapodu river improvement sites, in addition to some coastal area of lake Limboto.	Alternative path to waters/place are not provided in the design of structural interventions.			

Table 5.8.18 DESCRIPTION OF IMPACTS ON SOCIAL ENVIRONMENTAL COMPONENTS (3/3)

<i>Environmental component to be affected</i>	<i>Phase *</i>	<i>Description of direct impact</i>	<i>Negative/Positive</i>	<i>Spatial extent/Area to be affected</i>	<i>Conditions of impacts to occur</i>	<i>Quantitative magnitude</i>	<i>Possible secondary impacts**</i>
6. Public Health and sanitation	PC	Health facilities/personnel located in the project sites may need to move as a consequence of land acquisition and people's access to public health becomes difficult.	Negative	Along Tamalate Floodway and Bolango river improvement sites.	Existing health facilities and/or personnel need to be relocated	Not Clear.	Not Clear.
	C	None	-	-	-	-	-
	M/O	When the proposed projects are all properly implemented, Flood risks in the region will be mitigated.	Positive	All the flood prone areas in Kota and Kab. Gorontalo	All the completed facilities are properly used and maintained (no stagnant water within sluices).	Not Clear. (all the population of flood prone area)	Not Clear.
7. Waste	PC	People's habit of waste dumping into rivers may be disturbed.	Negative /Positive	Along all the project sites except for Sediment trap installation.	Access to acquired lands is strictly prohibited.	Not Clear. The volume of waste is not quantified yet.	Domestic waste may be dumped somewhere else and the place will be polluted.
	C	Various construction works will produce construction waste.	Negative	At all the project sites	Construction waste is not properly disposed	Not Clear.	Not Clear.
	M/O	People choose improved rivers as a new waste dumping spot.	Negative	Along all the project sites including Sediment trap installation.	Access to rivers and lake is not prohibited.	Not Clear.	Malfunction of Tapodu Gate and sluice gates.

* PC: Pre-construction phase, C: Construction phase, O/M: Operation and Maintenance phase.

** "Possible secondary impacts" are the impact which may occur as a result of direct impacts mentioned and need to be taken into consideration for project implementation.

**Table 5.8.19 RESULT OF IMPACT EVALUATION
ON SOCIAL ENVIRONMENTAL COMPONENTS**

<i>Conceivable impacts</i>	<i>Nature of impacts</i>	<i>Evaluation result</i>
(1) Negative impacts		
Change of residence	1. Affected population limited compared to past victims/damage 2. Affected area is limited to project sites. 3. Impact lasts forever and irreversible 4. Possible interaction with other components such as livelihood 5. Can be compensated	<u>Not Significant</u> , Proper land acquisition is the key.
Loss of productive lands, change of occupation	1. Number of affected people seems limited 2. Affected area is limited to project sites' neighborhood 3. Intensity/duration seems possibly high 4. Impact is reversible (with compensation)	<u>Not Significant</u> , Proper land acquisition is the key.
Local population's resistance	1. Community perception is positive as a whole 2. Affected area is limited to project sites 3. Impact may last only for a short time of period 4. Possible interrelation with land acquisition procedure 5. Impact is reversible	<u>Not Significant</u> , Proper land acquisition and socialization are the key.
Disturbance of local traffic circulation	1. Affected population is large considering nature of existing local market 2. Affected area is limited (Pilolodaa market only) 3. Impact lasts only during construction stage 4. Other components not affected	<u>Not Significant</u> , need socialization to avoid secondary impact (opposition)
Limited access to river and lake waters	1. Affected population limited compared to past victims/damage 2. Affected area is limited to project sites 3. Impact lasts forever and irreversible 4. Possible interaction with other components like waste 5. Habitat change needs a fundamental change	<u>Not Significant</u>
Disturbance of waste dumping into rivers	1. Number of affected people seems limited 2. Affected area is limited to project sites 3. Impact may last beyond project implementation period 4. Possible interaction with public health 5. Impact is reversible with human intervention	<u>Not Significant</u> ,
(2) Positive impacts		
Job creation and better livelihood (enhanced potential of fish culture)	1. 230-400 jobs estimated, benefiting more than 900 persons 2. Benefiting area can be wide including outside Gorontalo 3. Impact lasts for one phase only, fish culture long-term impact 4. Possible interaction with other components like public health	<u>Significant</u> , both immediate and short-term impact and possibly long-term impact
Better people's mobility	1. Benefiting population is relatively large 2. Benefiting area can go beyond project sites 3. Impact lasts for a long time 4. Possible interaction with other components, livelihood 5. Impact is cumulative (bridges/roads are basic infrastructure)	<u>Significant</u>
Reduction of flood risks	1. Benefiting population is quite large 2. Benefiting area extends to all kecamatan around Lake 3. Impact lasts for a long time with proper O/M 4. Interaction with all the other components	<u>Significant</u>
Improvement of sanitary condition	1. Benefiting population is large, those of flood prone area 2. Affected area can extend to all flood prone areas 3. Impact lasts until the facilities collapse 4. Benefit is evident only when flooding	<u>Significant</u>
Limited access to rives and lake waters (less waste dumping)	1. Number of benefiting people seems limited 2. Benefiting area is limited to project sites 3. Impact may last beyond project implementation period 4. Possible interaction with public health 5. Impact could be assimilated by affected communities	<u>Not Significant</u>

Table 5.8.20 ENVIRONMENTAL MANAGEMENT PLAN ON NATURAL ENVIRONMENTAL COMPONENTS

<i>Environmental component</i>	<i>Management objective</i>	<i>Management goal</i>	<i>Measure/Action for mitigation/enhancement</i>	<i>Evaluation criteria</i>
1. and				
Geology (erosion)	Erosion of river banks.	Keeping river banks being non-eroded condition.	Regular inspection and maintenance of river bank and	Same as Management goal.
2. Groundwater and land subsidence	Well water Land subsidence	Prevention of inconvenience on drinking water supply. Assurance of remedial measure for damage caused by land subsidence	Supply of drinking water for affected households. Detection of occurrence of land subsidence phenomenon.	Ditto Ditto
3. Water regime	Water level of rivers and flood risks Water level in Lake Limboto	Flood control for floods up to 20 year recurrence period. Keeping the planned water level more than 4.0 m.	Appropriate gate control at Tapodu gate. Appropriate gate control at Tapodu gate.	Ditto Ditto
4. Terrestrial flora and fauna	Wild plants and animals Aquatic weeds (Macrophytes)	No impacts on protected species. Prevention of overgrowing.	Transplantation of protected species, if any. Keeping lake water level at constantly high (higher than 4.0	Ditto Ditto
5. Aquatic flora and fauna	Eels and other migratory fish, if any.	Keeping fishing output as current status./Assurance of compensation for damaged fishermen.	Keeping discharge possible enough for eel's migration and water quality in good condition in drainage channels.	Current fishing output of eels.
6. Air Quality	Other fish Air pollution caused by emission gas Dust Noise	Keeping fishing output more than current status. Preventing health damage of nearby residents. Keeping air dust in tolerable condition. Keeping ambient noise level in tolerable condition.	Appropriate gate control at Tapodu gate. Keeping construction machinery and transportation vehicles in good condition by means of regular tune-up. Keeping traffic rules and regulations./Keeping good driving manner. Consideration of transportation routes, e.g. construction of Temporary exclusive road.	Current fishing output./ Current aquaculture production. Ambient air quality standards of NOx, SOx and CO, provided by Government Regulation No. 82, 2001. Allowed dust concentration of 230 µg/m ³ , provided by Government Regulation No.41/1999. Decree of Environmental Ministry No. 48, 1996.
7. Water Quality	Turbidity and alkalinity in rivers and in Lake Limboto Alkalinity in rivers and in Lake Limboto Water quality of Lake Limboto	Keeping turbidity in tolerable condition for daily water use. Keeping pH in tolerable condition for fish habitat. Keeping water quality in suitable for aquaculture.	Enclosure of construction site by sandbags for prevention of turbid water discharge. Installation of on-site treatment pond of high alkali water. Appropriate gate control at Tapodu gate./ Proper inspection and maintenance of sediment trap.	Water quality standards provided by Government Regulation No. 82, 2001. Ditto Ditto

Table 5.8.21 ENVIRONMENTAL MANAGEMENT PLAN ON SOCIAL ENVIRONMENTAL COMPONENTS

Environmental component	Management Element	Management goal	Measure/Action for/Mitigation/Enhancement	Evaluation criteria
1. Resettlement	Land Acquisition	To minimize negative impact by resettlement on the affected residents	Respect the existing regulations regarding land acquisition, in order to determine fair and proper compensation conditions to all the affected residents A combination of informal and formal approaches should be carefully designed and implemented.	(1) Keppress* No.55 /1993 and Peraturan Menteri Negara Agraria/ Kepala BPN No.1 /1994 (2) Keppress No.2 /1993 and Peraturan Menteri Negara Agraria/ Kepala BPN No.3 /1994. - Acceptance of compensation and conditions
	Land Acquisition	To minimize income loss caused by the project, of the affected residents To satisfy the people whose land is acquired by the project	Any loss of agricultural and fishery production should be taken into account to determine the amount and conditions of compensation, in direct consultation with the affected residents Provide alternative lands for continuing present activities	- The amount of compensation fairly determined by using NIQP**
2. Livelihood	Land Acquisition	To control tension among people concerned	Socialization to the affected people so as to avoid unrest	- Incident of people's unrest
	Recruitment of workers	To alleviate negative impact on income of the affected residents	Give priority of recruitment as worker in the project to the affected residents	- Recruitment of local affected residents
3. Local Population's	Fishery promotion	To encourage growth and development of economic activity surrounding Lake Limboto	In collaboration with Dinas Perikanan: Establish Limboto Lake Spatial Plan allotting area for fish culture Training on fish culture Encourage the establishment of fisherman group	- Development of fish culture in Lake Limboto - Contribution of fishery to regional economy
	Dissemination activity (socialization)	To avoid people's unrest and resistance to the project	Socialization of the projects toward the people affected by the Tاملate Floodway, Tapodu Gate and Sediment trap construction, in order to improve the population's perception (level of acceptance) on the mentioned projects	- People's perception on the project (ref: Agree=68%, Not agree=23.1% as of June 2002)
4. People's mobility	Land Acquisition	To ease people's frustration	The amount and conditions of compensation should be fairly determined according to the agreement with land/house owners	- Acceptance of affected people on amount and conditions of compensation concluded
5. Access to waters	Traffic conditions	To alleviate disturbance of people and vehicle's mobility and of usual function of market which is caused by project	Transportation schedule is to be carefully prepared taken into account the existing market at Pilodaa, especially its peak periods and days of the marketstage and surrounding traffic	- Incidence of traffic jam during construction
	Accessibility to river and lake waters	To minimize disturbance of daily activities such as washing and bathing	Design dikes with path or stairs Individual consultation for those who suffer from difficult access to waters	- Constructed dikes - Case of individual consultation
6. Public health and Sanitation	Accessibility to health services	Not to worsen people's access to health services, because of eventual relocation of health facilities/ personnel	Careful choice of project site in order to maintain existing health service If not avoidable, individual consultation for those who suffer from difficult access to health services	- Relocation of health facilities and personnel's residence - Case of individual consultation
	Practice of waste dumping	To keep improved river streams and constructed Floodway clean	Regular investigation and cleaning of the Floodway by either local people or public service	- Situation around constructed structures (Tاملate Floodway, Tapodu gate, dikes, etc.)
7. Waste	Construction waste	To avoid unorganized deposit of construction waste	Determine deposit places for each of construction sites and organize properly disposal of waste	- Situation of construction waste at project sites

* Keppress (Presidential Decree); ** NIQP: (Nilai Jual Objek Pajak: Sold Value of Tax Object)

Table 5.8.22 ENVIRONMENTAL MONITORING PLAN ON SOCIAL ENVIRONMENTAL COMPONENTS

Environmental Component	Management Element	Phase	Monitoring parameter	Monitoring Sites	Monitoring plan Frequency/ Period	methodology *
1. Resettlement	Land acquisition	PC	Compensation (esp. its conditions)	Each project site and BPN	At every meeting of Land acquisition committee	- Progress of land acquisition processes
		PC	Recruited resettled residents	Each project site and contractor's office**	At the conclusion of land acquisition process	- Progress of land acquisition processes - I (Land acquisition committee) - I (affected residents)
2. Livelihood	Land acquisition	PC	Compensation (its amount & conditions)	Each project site and BPN	At the conclusion of land acquisition process	- same as mentioned in "1." above
	Recruitment of workers	C	Recruited resettled residents	Each project site and contractor's office**	At the end of worker recruitment	- I+Q (recruited resettled residents)
3. Local Population's Opposition	Fishery promotion	O/M		Lake Limboto, Dinas Perikanan	Annually	- Statistics Dinas Perikanan
	Dissemination activity	PC	Incident of resistance	Village of incident	When people's unrest is observed and people's frustration expressed	- I+Q (villages at project sites)
4. Traffic facilities	Land acquisition	PC	Compensation (amount and conditions)	Each project site and BPN	At the conclusion of land acquisition process	- same as mentioned in "1." above
	Traffic conditions	C	Crowdedness of traffic	Around Pilolodaa market and contractor's office	Before starting any construction work Once a month during construction stage, including the peak period of construction work	- FO - Number of complaints received
5. Access to waters	Accessibility to rivre and lake waters	PC		Each project site	At the conclusion of land acquisition process	- FO, I
		C	Utilization of river and lake waters by residents	Each project site and contractor's office	When complaints are expressed	- FO, I (residents nearby) - Number of concerned complaints during construction stage - Record of consultation
6. Public health and sanitation	Practice of waste dumping	O/M	Use of health service by affected people	Each project site and nearby health facilities	One month after the completion of construction work	- I+Q (residents along rivers)
	Construction waste	C	Organization of waste deposit	Waste deposit for each project site & contractor's office	At the completion of construction works	- Statistics Dinas Kesehatan - I (health facility) - I+Q (people directly affected) - Record of consultation
7. Waste	Practice of waste dumping	PC	Status of waste dumping by residents	Along Tamalate FW & concerned rivers	At the completion of land acquisition	- FO, I+Q (residents along concerned rivers)
	Construction waste	C	Status of waste dumping by residents	Along Tamalate FW & concerned rivers	At the beginning, peak and end of construction work	- FO, I (Contractor)
	Practice of waste dumping	O/M	Status of waste dumping by residents	Along Tamalate FW & concerned rivers	One month after the completion of construction work	- FO, I+Q (residents along concerned rivers and Tamalate FW)

note: * I: Interview; Q: Questionnaire; I+Q (...): Interview and questionnaire (target groups); FO: Field observation; FW: Floodway; ** contracted company for project

Table 5.8.23 ENVIRONMENTAL MONITORING PLAN ON NATURAL ENVIRONMENTAL COMPONENTS

Environmental Component	Monitoring plan			Methodology		
	Management objective	Phase	Monitoring Parameter		Monitoring Sites	Frequency/Period
1. Geology (erosion & sedimentation)	Erosion of river banks	O/M	Erosion point and magnitude.	Tapodu R., Bolango R., Bone R. and Tamalate R.	After major floods when necessary.	On-site visual observation
	Well water	C & O/M	Well water level	Along Tamalate floodway and Tapodu river, and Siendeng Cutoff channel.	Once a month during and after the construction of Tamalate floodway, excavation of Tapodu river, and Siendeng Cutoff channel. / Period of monitoring is to depend on monitoring result of early stage.	Manual measurement of well water level of local residents.
2. Groundwater and land subsidence	Land subsidence	C & O/M	Ground elevation (Altitude)	Ditto	Ditto	Survey of ground level elevation
3. Water regime	Water level of rivers and flood risks	O/M	Overflow point and Inundation area	LBB basin (Lower basin area)	After major flood when necessary.	On-site visual observation
	Water level in Lake Limboto	O/M	Water level	Lake Limboto and Tapodu gate	Daily for 5 years after completion of Tapodu gate.	Measurement on water gauge
4. Terrestrial flora and fauna	Wild plants and animals	C & O/M	Species designated as protected species.	Tamalate floodway and river widening	Before vegetation clearance.	On-site visual observation
	Aquatic weeds (Macrophytes)	O/M	Submerged and emergent plants.	Benteng Otamaha and other viewpoints.	Several times a year. / Up to 5 years after the construction of Tapodu gate.	Photograph taking and visual observation.
	Eels and other migratory fish, if any	O/M	Fishing output of eels	Market and each fisherman	Every day.	Report from each fisherman
5. Aquatic flora and fauna	Other fish	O/M	Eels' migration	Tapodu river and drainage channels.	Twice a month for 1 year before and after the completion of Tapodu gate.	Setup of eel trap on Tapodu river and drainage channels.
6. Air Quality	Other fish	O/M	fishing output from Limboto	Market and each fisherman	Regularly, e.g., once a week.	Report from each fisherman
	Air pollution caused by emission gas	C	NOx, SOx, CO	Kec. Limboto, Telaga and Kabila. Kota Barat, Selatan and Utara	Once at peak period of each construction work on Alo R., Polu R., Biyonga R., Tapodu R., Bolango R, Bone R., Tamalate floodway, Tamalate weir and Tapodu gate. / 9 points* times in total.	Sampling and laboratory test
	Dust	C	Dust Concentration			On-site survey using noise level meter.
	Noise	C	Noise Level			
7. Water Quality	Turbidity and alkalinity in rivers and in Lake Limboto	C	TSS, Turbidity	Lake Limboto, Alo-Pohu R., Biyonga R., Tapodu R., Bolango R, Bone R., Tamalate R.	Once at peak period of each construction work on Alo R., Polu R., Biyonga R., Tapodu R., Bolango R, Bone R., Tamalate R., Tamalate floodway, Tamalate weir, Tapodu gate and Sediment trap. / 10 times in total.	Sampling and laboratory test
	Alkalinity in rivers and in Lake Limboto	C	pH			On-site survey using pH meter.
	Water quality of Lake Limboto	O/M	pH, DO, BOD5, COD, TSS, Coliform	Lake Limboto	At 3 points and 2 times a year, i.e. in rainy season and dry season, 5 years after completion of Tapodu gate. / 6 points* times x 5 year = 30	On-site survey and Sampling and laboratory test.

* C: Construction phase, O/M: Operation and Maintenance phase

**Table 5.8.24 APPROVAL LETTER
OF ENVIRONMENTAL IMPACT ANALYSIS (1/3)**

**GOVERNMENT OF GORONTALO PROVINCE
EVALUATION COMMITTEE ON ENVIRONMENTAL IMPACT ANALYSIS
(EIA)**

General Sudirman Street No. 57 Gorontalo, Phone 0435-821277 Fax 0435-828281

CHAIR OF EVALUATION COMMITTEE ON ENVIRONMENTAL IMPACT ANALYSIS,
GORONTALO PROVINCE DECREE
NO. 02, 2002

ON
ENVIRONMENTAL SUITABILITY OF FLOOD CONTROL ACTIVITY
IN LIMBOTO-BOLANGO-BONE (LBB) BASIN, GORONTALO PROVINCE
BY JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) AND
DINAS PU/KIMPRASWIL, GORONTALO PROVINCE

THE CHAIR OF EVALUATION COMMITTEE ON
ENVIRONMENTAL IMPACT ANALYSIS (EIA), GORONTALO PROVINCE,

- Considering :
- a. that based on the evaluation made by AMDAL Evaluation Committee, Gorontalo Province, the Environmental Impact Analysis (AMDAL), Environmental Management Plan (RKL), and Environmental Monitoring Plan (RPL) on flood control in LBB Basin conducted by Japan International Cooperation Agency and Dinas PU/KIMPRASWIL, Gorontalo Province, can be approved according to the committee meeting result on 29 August 2002;
 - b. that the results of Environmental Impact Analysis, Environmental Management Plan, and Environmental Monitoring Plan need to be established by a decree from the Chair of AMDAL Evaluation Committee, Gorontalo Province;
 - c. that based on consideration stated in points **a.** and **b.**, decree from the Chair of AMDAL Evaluation Committee, Gorontalo Province on *Environmental Suitability of Flood Control in Limboto-Bolango-Bone Basin*, Gorontalo Province conducted by Japan International Cooperation Agency (JICA) and Dinas PU/KIMPRASWIL, Gorontalo Province need to be established;
- Considering further :
- 1. The Law No. 5 (1990) on Biological natural Resource Conservation and its Ecosystem (State Document No. 49, 1990, addition to State Document No. 3419),
 - 2. The Law No. 24 (1992) on Spatial Planning (State Document No. 115, 1992, addition to State Document No. 3501),
 - 3. The Law No. 23 (1997) on Environmental Management (State Document No. 68, 1997, addition to State Document No. 3699),
 - 4. The Law No. 22 (1999) on Regional Government (State Document No. 60, 1999, addition to State Document No. 3839),
 - 5. Government Regulation No. 27 (1999) on Environmental Impact Analysis (State Document No. 59, 1999, addition to State Document No. 3838),

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**Table 5.8.24 APPROVAL LETTER
OF ENVIRONMENTAL IMPACT ANALYSIS (2/3)**

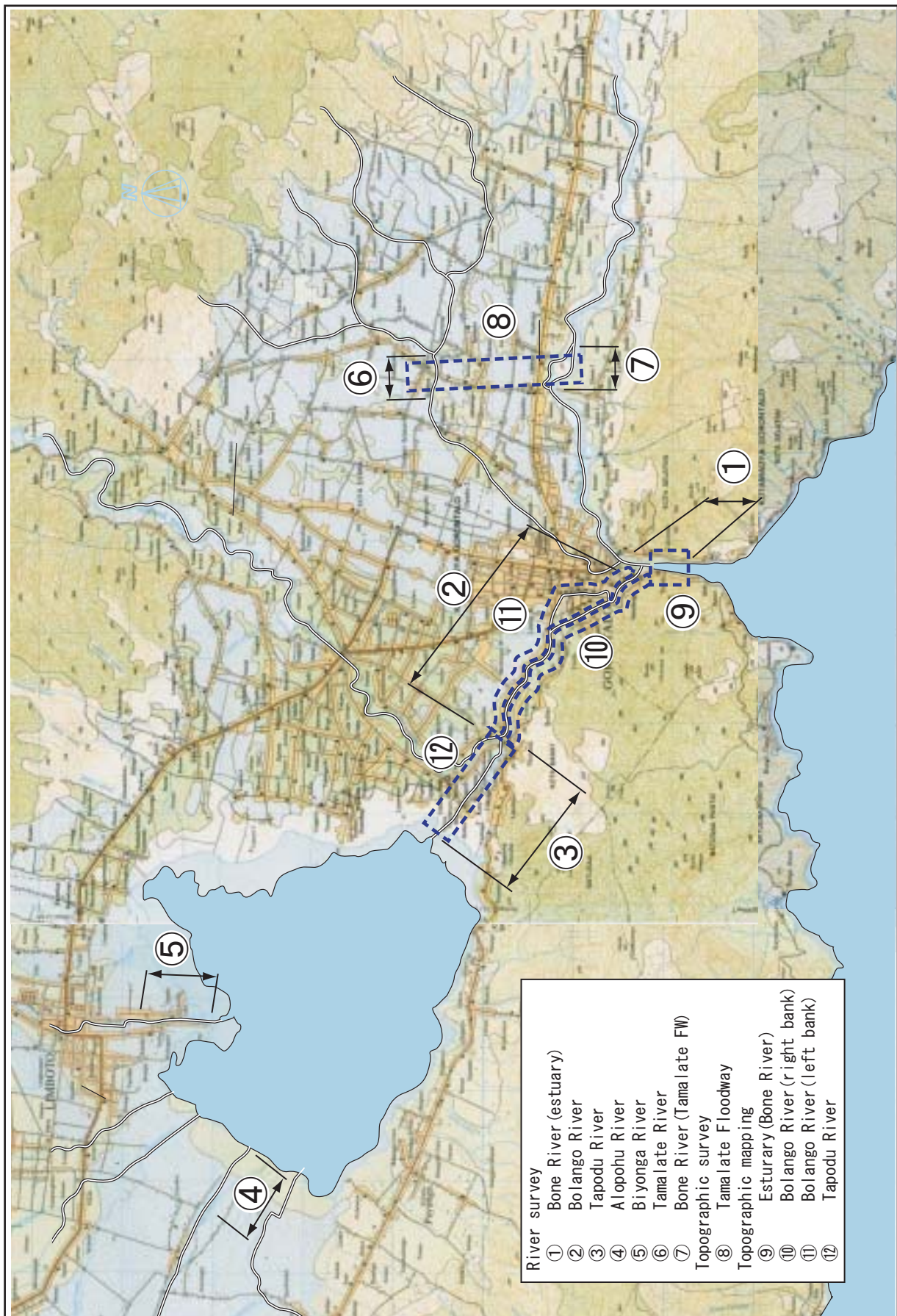
Considering further	<p>6. Government Regulation No. 10 (2000) on Environmental Impact Management Board.</p> <p>a. Decree of Environmental Ministry No. 17/Men-LH/02/2001 on Types of Activities that Required Environmental Impact Analysis,</p> <p>b. Decree of Board of Environmental Impact Control Chair No. 9 (2000) on Community Involvement and Information Transparency during the EIA Process,</p> <p>c. Decree of Board of Environmental Impact Control Chair No. 231 (2002) on Environmental Impact Analysis Arrangement Guideline,</p> <p>d. Decree of Governor No. 231 (2002) on Establishment on Evaluation Committee and EIA Technical Team in Gorontalo Province,</p> <p>e. Minutes of Gorontalo Province EIA Evaluation Committee Meeting, 29 August 2002 on Environmental Impact Analysis, Environmental Management Plan, and Environmental Monitoring Plan of Flood Control Project in Limboto-Bolango-Bone Basin conducted by Japan International Cooperation Agency (JICA) and Dinas PU/KIMPRASWIL, Gorontalo Province,</p> <p>f. Minutes of evaluation on Environmental Impact Analysis of Flood Control Project in Limboto-Bolango-Bone Basin carried out by Gorontalo Province Environmental Impact Analysis Technical Team, 22 September 2002.</p>
TO DECREE	
FIRST	: Environmental suitability of Flood Control Activity in Limboto-Bolango-Bone Basin, Gorontalo Province conducted by Japan International Cooperation Agency (JICA) and Dinas PU/KIMPRASWIL, Gorontalo Province.
SECOND	: Environmental suitability of Flood Control Activity in Limboto-Bolango-Bone Basin, Gorontalo Province conducted by Japan International Cooperation Agency (JICA) and Dinas PU/KIMPRASWIL, Gorontalo Province stated in the FIRST dictum means that the Flood Control Project Activities in Limboto-Bolango-Bone Basin, Gorontalo Province conducted by Japan International Cooperation Agency (JICA) and Dinas PU/KIMPRASWIL, Gorontalo Province is <i>suitable according to environmental viewpoint</i> .
THIRD	: Japan International Cooperation Agency (JICA) and Dinas PU/KIMPRASWIL, Gorontalo Province are required to accomplish and to obey the following procedures during their activities: <i>To perform environmental management and monitoring measures as written in the approved Environmental Management Plan and Environmental Monitoring Plan Documents,</i> <i>To report the results of perform environmental management and monitoring measures to Environmental Impact Management Board (BAPEDAL), Home Affair Minister of Republic Indonesia, Governor of</i>

(Cont'd)

**Table 5.8.24 APPROVAL LETTER
OF ENVIRONMENTAL IMPACT ANALYSIS (3/3)**

	<i>Gorontalo, Walikota Gorontalo, and Bupati Kabupaten Gorontalo every six (6) months from the time this decree is signed.</i>
FOURTH	: The approving authorities are <i>required to include all requirements and obligations</i> , which are not only written in this decree but in Environmental Management and Monitoring Plans, as well as regulations in permitting the flood control activities in LBB basin, Gorontalo Province.
FIFTH	: If in the future case there will be any unpredicted and uncontrolled environmental impacts, which are not described in the approved environmental management and monitoring documents, taking place; the project operator must immediately report the impacts to the institutions mentioned in the THIRD dictum points two (2), to determine any further necessary steps.
SIXTH	: If the flood control project activities require any extension, relocation, or change, whose impacts are not assessed and described in the approved environmental management and monitoring documents, then <i>a new Environmental Impact Analysis (EIA) must be accomplished</i> ,
SEVENTH	: Any failure or violation acted by the Japan International Cooperation Agency (JICA) and Dinas PU/KIMPRASWIL, Gorontalo Province upon this endorsement may be <i>penalized according to the law</i> .
EIGHT	: Any expense for issuing this decree is charged to The Environmental Impact Plan and Control Project, Regional Planning and Developing Board (Bappeda), Gorontalo Province, namely fund from additional budget (ABT).
NINETH	: Any mistakes written in this decree must be in the future corrected accordingly.
<p>Decreed in Gorontalo On September the 23rd 2002 AMDAL EVALUATION COMMITTEE CHAIRMAN</p> <p><i>Already signed and stamped by</i> G U S N A R I S M A I L</p>	
Copy to:	
<ol style="list-style-type: none"> 1. Home Affair Minister in Jakarta 2. State Minister of Environment in Jakarta 3. Public Work/Settlement and Regional Infrastructure Minister in Jakarta 4. Gorontalo Governor in Gorontalo 5. Walikota Gorontalo in Gorontalo 6. Bupati Gorontalo in Limboto 7. The Chair of Environmental Impact Management Board in Jakarta 8. Japan International Cooperation Agency (JICA) Team 9. Achieve 	

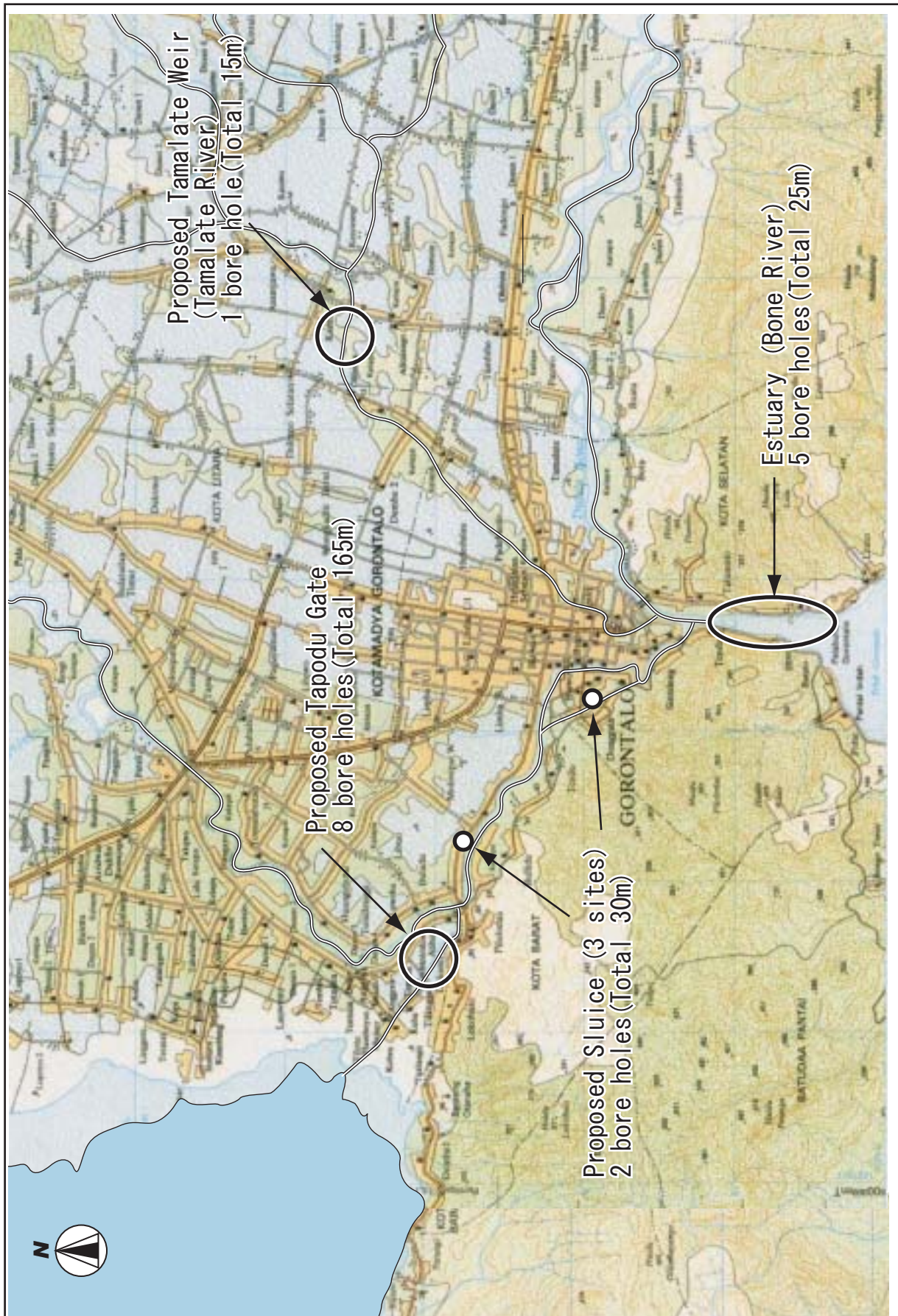
(Remarks) Temporally English translation from original letter written in Indonesian.



*The Study on Flood Control
and Water Management
in Limboto-Bolango-Bone Basin
in the Republic of Indonesia*

Japan International Cooperation Agency

**Figure 5.2.1
LOCATION MAP OF
SUPPLEMENTARY SURVEY AND MAPPING**



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Figure 5.2.2
**LOCATION MAP OF SUPPLEMENTARY
GEOLOGICAL INVESTIGATION**