WQ
WATER QUALITY

THE STUDY

ON

COMPREHENSIVE MANAGEMENT PLAN

FOR

THE WATER RESOURCES OF THE BRANTAS RIVER BASIN

IN

THE REPUBLIC OF INDONESIA

FINAL REPORT

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WQ   Water Quality

Table-1(1) Calculation of Water Quality (BOD) at Bumiayu Bridge (1994)

Item		units	Jun	Jul	Aug	Sep	Oct	Nov	Ave.(Dry)	75%Val
I.Pollution load from upstream										
1)Water quality of Dinoyo Bridge (COs	C0	mg/l								
2)Water flow of Dinoyo Bridge	Q0	m3/s								
3)Pollution load from upstream	L0=C0xQ0	kg/day								
4)Run-off pollution load from upstream	L0	kg/day								
II. Pollution load from sub-basin										
A.Domestic waste water										
A.1 Pollution load (Sub-basin B/09)										
1) Pollution load produced	a1	kg/day	635	635	635	635	635	635		
2) Flow-out ratio	r11-1	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r11-2	-	0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	r1 (r11-1xr11-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	D1= a1 x r1	kg/day	19	19	19	19	19	19		
A.2 Pollution load (Sub-basin B/20)										
1) Pollution load produced	a2	kg/day	1,829	1,829	1,829	1,829	1,829	1,829		
2) Flow-out ratio	r2-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r2-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r2 (r2-1xr2-2)	-	0.2	0.2	0.2	0.2	0.2	0.2		
5) Run-off pollution load	D2= a2 x r2	kg/day	366	366	366	366	366	366		
A.3 Pollution load (Sub-basin B/26)										
1) Pollution load produced	a3	kg/day	4,706	4,706	4,706	4,706	4,706	4,706		
2) Flow-out ratio	r3-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1xr3-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D3= a3 x r3	kg/day	988	988	988	988	988	988		
A.4 Pollution load (Sub-basin B/21)										
1) Pollution load produced	a4	kg/day	6,772	6,772	6,772	6,772	6,772	6,772		
2) Flow-out ratio	r4-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r4-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r4 (r4-1xr4-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D4= a4 x r4	kg/day	1,422	1,422	1,422	1,422	1,422	1,422		
A.5 Pollution load (Sub-basin B/22)										
1) Pollution load produced	a5	kg/day	2,244	2,244	2,244	2,244	2,244	2,244		
2) Flow-out ratio	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r5-3 (r5-1xr5-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D5= a5 x r5	kg/day	1,616	1,616	1,616	1,616	1,616	1,616		
A.6 Total run-off pollution load from domestic waste water	Dd=D1+D2+D3+D4+D5	kg/day	4,411	4,411	4,411	4,411	4,411	4,411		
B.Industrial waste water										
B.1 Pollution load from major producers										
1) Pollution load produced	b1	kg/day	1,561	1,561	1,561	1,561	1,561	1,561		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r11 (r11-1xr11-1)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	I1= b1 x r11	kg/day	703	703	703	703	703	703		
B.2 Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	7,406	7,406	7,406	7,406	7,406	7,406		
2) Flow-out ratio	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12 (r12-1xr12-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I2= b2 x r12	kg/day	2,074	2,074	2,074	2,074	2,074	2,074		
B.3 Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	1,430	1,430	1,430	1,430	1,430	1,430		
2) Flow-out ratio	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13 (r13-1xr13-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I3= b3 x r13	kg/day	400	400	400	400	400	400		
B.4 Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	3,177	3,177	3,177	3,177	3,177	3,177		
C.Agricultural pollution load										
C.1 Pollution load from fields										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1= c1 x r21	kg/day								
C.2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	21,276	21,276	21,276	21,276	21,276	21,276		
2) Flow-out ratio	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r22-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r22 (r22-1xr22-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	A2= c2 x r22	kg/day	638	638	638	638	638	638		
C.3 Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	638	638	638	638	638	638		
D.Other sources										
D.1 Pollution load from others										
1) Pollution load produced	d1	kg/day	36,620	36,620	36,620	36,620	36,620	36,620		
2) Flow-out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r31-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r31 (r31-1xr31-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	Od= d1 x r31	kg/day	1,099	1,099	1,099	1,099	1,099	1,099		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	8.3	9.4	7.8	8.4	7.8	7.5	8.2	8.4
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	9,324	9,324	9,324	9,324	9,324	9,324	9,324	
2)Water flow	Q	m3/s	19.0	15.0	15.0	14.0	12.0	10.0	14.2	
3)Water quality	C=L/Q	mg/l	5.7	7.2	7.2	7.7	9.0	10.8	7.9	9.0

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Table-1(2) Calculation of Water Quality (BOD) at Demangan Bridge (1994)

Item		units	Jun.	Apr.	Aug.	Sep.	Oct.	Nov.	Ave.(Dry)	SS(Wet)
I.Pollution load from upstream										
1)Water quality of Lodoyo Dam (460')	C0	mg/l	2.0	2.7	4.3	6.5	4.3	3.8		
2)Water flow of Lodoyo Dam	Q0	m3/s	72.0	8.0	61.0	57.0	107.0	73.0		
3)Pollution load from upstream	L0=C0xQ0	kg/day	12.442	1.860	22.663	32.504	39.753	23.962		
4)Pollution load from upstream considered self-purification	L0=C0xQ0	kg/day	2.483	285	4.533	6.501	7.951	4.792		
II.Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B-1)	a1	kg/day	1.144	1.144	1.144	1.144	1.144	1.144		
1)Pollution load produced										
2)Flow-out ratio	r1-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3)Flow-down ratio	r1-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	r1(r1-1xr1-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5)Run-off pollution load	D1=a1 x r1	kg/day	183	183	183	183	183	183		
A2.Pollution load (Sub-basin B-2)	a2	kg/day	1.493	1.493	1.493	1.493	1.493	1.493		
1)Pollution load produced										
2)Flow-out ratio	r2-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3)Flow-down ratio	r2-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4)Run-off ratio	r2(r2-1xr2-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5)Run-off pollution load	D2=a2 x r2	kg/day	358	358	358	358	358	358		
A3.Pollution load (Sub-basin B-3)	a3	kg/day	617	617	617	617	617	617		
1)Pollution load produced										
2)Flow-out ratio	r3-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3)Flow-down ratio	r3-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4)Run-off ratio	r3(r3-1xr3-2)	-	0.32	0.32	0.32	0.32	0.32	0.32		
5)Run-off pollution load	D3=a3 x r3	kg/day	197	197	197	197	197	197		
A.4 Total run-off pollution load from domestic waste water	D0=D1+D2+D3	kg/day	739	739	739	739	739	739		
B.Industrial waste water										
B1.Pollution load from major producers	b1	kg/day	230.953	230.953	230.953	230.953	230.953	230.953		
1)Pollution load produced										
2)Flow-out ratio	r11-1	-	0.3	0.3	0.3	0.3	0.3	0.3		
3)Flow-down ratio	r11-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	r11(r11-1xr11-1)	-	0.06	0.06	0.06	0.06	0.06	0.06		
5)Run-off pollution load	I1=b1 x r11	kg/day	13.857	13.857	13.857	13.857	13.857	13.857		
B2.Pollution load from large and medium scale industries	b2	kg/day	1.462	1.462	1.462	1.462	1.462	1.462		
1)Pollution load produced										
2)Flow-out ratio	r12-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3)Flow-down ratio	r12-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4)Run-off ratio	r12(r12-1xr12-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5)Run-off pollution load	I2=b2 x r12	kg/day	351	351	351	351	351	351		
B3.Pollution load from small scale industries	b3	kg/day	257	257	257	257	257	257		
1)Pollution load produced										
2)Flow-out ratio	r13-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3)Flow-down ratio	r13-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4)Run-off ratio	r13(r13-1xr13-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5)Run-off pollution load	I3=b3xr13	kg/day	62	62	62	62	62	62		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	14.270	14.270	14.270	14.270	14.270	14.270		
C.Agricultural pollution load										
C1.Pollution load from fields										
1)Pollution load produced	c1	kg/day								
2)Flow-out ratio	r21-1	-								
3)Flow-down ratio	r21-2	-								
4)Run-off ratio	r21(r21-1xr21-2)	-								
5)Run-off pollution load	A1=c1 r21	kg/day								
C2.Pollution load from livestock	c2	kg/day	11.258	11.258	11.258	11.258	11.258	11.258		
1)Pollution load produced										
2)Flow-out ratio	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3)Flow-down ratio	r22-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4)Run-off ratio	r22(r22-1xr22-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5)Run-off pollution load	A2=c1 x r22	kg/day	338	338	338	338	338	338		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	338	338	338	338	338	338		
D.Other sources										
D1.Pollution load from others	d1	kg/day	10.620	10.620	10.620	10.620	10.620	10.620		
1)Pollution load produced										
2)Flow-out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3)Flow-down ratio	r31-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4)Run-off ratio	r31(r31-1xr31-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5)Run-off pollution load	Od=d1 x r31	kg/day	319	319	319	319	319	319		
III.Water quality at control point										
E.Water quality monitored										
1):1994		mg/l	2.8	3.8	4.3	7.5	2.6	3.5	4.1	4.3
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	18.153	15.945	20.197	23.166	23.615	20.458	20.089	
2)Water flow	Q	m3/s	73.5	17.5	62.1	58.3	98.8	70.9	63.5	
3)Water quality	C=L/Q	mg/l	2.9	10.5	3.8	4.5	2.8	3.3	4.5	4.4

Table 1(3) Calculation of Water Quality (BOD) at Jogbria Bridge (1994)

Item		units	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	SS (B/5)	TS (S/P)
I. Pollution load from upstream										
1) Water quality of Ngariogan Tanchangan (70C)	C0	mg/l	6.3	4.8	10.5	3.9	3.8	4.7		
2) Water flow of Ngariogan Tanchangan	Q0	m3/s	148.6	56.9	55.5	65.0	52.4	41.9		
3) Pollution load from upstream	L0=C0xQ0	kg/day	26.349	23.595	50.440	21.962	17.204	17.015		
4) Pollution load from upstream considered self-purification	L0'=C0xQ0	kg/day	15.350	4.720	10.086	4.383	3.41	3.403		
II. Pollution load from sub-basin										
A. Domestic waste water										
A1. Pollution load (Sub-basin B310)										
1) Pollution load produced	a1	kg/day	2.347	2.347	2.347	2.347	2.347	2.347		
2) Flow-out ratio	d1-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	d1-2	-	0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	r1 (r1-1xr1-2)	-	0.08	0.08	0.08	0.08	0.08	0.08		
5) Run-off pollution load	D1= a1 x r1	kg/day	188	188	188	188	188	188		
A2. Pollution load (Sub-basin B311)										
1) Pollution load produced	a2	kg/day	2.544	2.544	2.544	2.544	2.544	2.544		
2) Flow-out ratio	r2-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r2-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r2 (r2-1xr2-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	D2= a2 x r2	kg/day	407	407	407	407	407	407		
A3. Pollution load (Sub-basin B312)										
1) Pollution load produced	a3	kg/day	245	245	245	245	245	245		
2) Flow-out ratio	r3-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1xr3-2)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D3= a3 x r3	kg/day	66	66	66	66	66	66		
A4. Pollution load (Sub-basin B313)										
1) Pollution load produced	a4	kg/day	352	352	352	352	352	352		
2) Flow-out ratio	r4-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r4-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r4 (r4-1xr4-2)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D4= a4 x r4	kg/day	95	95	95	95	95	95		
A5. Pollution load (Sub-basin B314)										
1) Pollution load produced	a5	kg/day	254	254	254	254	254	254		
2) Flow-out ratio	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r5-3 (r5-1xr5-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	D5= a5 x r5	kg/day	114	114	114	114	114	114		
A6. Pollution load (Sub-basin B315)										
1) Pollution load produced	a6	kg/day	1.521	1.521	1.521	1.521	1.521	1.521		
2) Flow-out ratio	r6-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r6-2	-	0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	r6-3 (r6-1xr6-2)	-	0.48	0.48	0.48	0.48	0.48	0.48		
5) Run-off pollution load	D6= a6 x r6	kg/day	730	730	730	730	730	730		
A7. Pollution load (Sub-basin B316)										
1) Pollution load produced	a7	kg/day	171	171	171	171	171	171		
2) Flow-out ratio	r7-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r7-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r7-3 (r7-1xr7-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D7= a7 x r7	kg/day	123	123	123	123	123	123		
A8. Pollution load (Sub-basin B317)										
1) Pollution load produced	a8	kg/day	2.287	2.287	2.287	2.287	2.287	2.287		
2) Flow-out ratio	r8-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r8-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r8-3 (r8-1xr8-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D8= a8 x r8	kg/day	480	480	480	480	480	480		
A9. Total run-off pollution load from domestic waste water	Dd=D1+...+D8	kg/day	2.204	2.204	2.204	2.204	2.204	2.204		
B. Industrial waste water										
B1. Pollution load from major producers										
1) Pollution load produced	b1	kg/day	788.432	788.432	788.432	788.432	788.432	788.432		
2) Flow-out ratio	r11-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r11-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r11 (r11-1xr11-3)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	I1= b1 x r11	kg/day	19.711	19.711	19.711	19.711	19.711	19.711		
B2. Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	4.748	4.748	4.748	4.748	4.748	4.748		
2) Flow-out ratio	r12-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r12-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r12 (r12-1xr12-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	I2= b2 x r12	kg/day	475	475	475	475	475	475		
B3. Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	791	791	791	791	791	791		
2) Flow-out ratio	r13-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r13-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r13 (r13-1xr13-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	I3= b3 x r13	kg/day	79	79	79	79	79	79		
B4. Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	20.265	20.265	20.265	20.265	20.265	20.265		
C. Agricultural pollution load										
C1. Pollution load from fields										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1= c1 x r21	kg/day								
C2. Pollution load from livestock										
1) Pollution load produced	c2	kg/day	24.835	24.838	24.838	24.838	24.838	24.838		
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r22 (r22-1xr22-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	A2= c1 x r22	kg/day	621	621	621	621	621	621		
C3. Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	621	621	621	621	621	621		
D. Other sources										
D1. Pollution load from others										
1) Pollution load produced	d1	kg/day	12.280	12.280	12.280	12.280	12.280	12.280		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	d31 (r31-1xr31-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	Od= d1 x r31	kg/day	307	307	307	307	307	307		
III. Water quality at control point										
E. Water quality monitored										
1) 1994		mg/l	3.5	3.8	11.9	3.4	7.7	4.5	5.8	7.7
2) Average (1992-1996)										
3) Median (1992-1996)										
F. Result of calculation										
1) Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	38.746	28.116	33.484	27.777	26.837	26.799	30.293	
2) Water flow	Q	m3/s	121.0	47.0	52.0	65.0	47.0	32.0	60.7	
3) Water quality	C=L/Q	mg/l	3.7	6.9	7.5	4.9	6.6	9.7	6.6	2.5

Table-1(4) Calculation of Water Quality (BOD) at Padangan Bridge (1994)

Items		units	Jan	Jul	Aug	Sep	Oct	Nov	Ave./Dry	1994
I. Pollution load from up-stream										
1) Water quality of Bero Tributary at (1993)	CU	mg/l	2.5	1.9	4.8	6.6	4.9	2.3	3.9	
2) Water flow of Bero Tributary at	QU	m3/s	79.5	77.6	73.9	16.2	11.9	12.6	45.3	
3) Pollution load from up-stream	LU=CU×QU	kg/day	17,172	12,739	30,565	9,216	5,036	2,935	12,948	
4) Pollution load from up-stream considered with purification	LU=CU×QU	kg/day	6,599	5,006	12,226	3,695	2,015	1,176	5,175	
II. Pollution load from sub-basin										
A. Domestic waste water										
A1 Pollution load (Sub-basin BS-3)										
1) Pollution load produced	a1	kg/day	420	420	420	420	420	420		
2) Flow-out ratio	r1-1		0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2		0.9	0.9	0.9	0.9	0.9	0.9		
4) Run-off ratio	r1 (r1-1×r1-2)		0.81	0.81	0.81	0.81	0.81	0.81		
5) Run-off pollution load	D1= a1 × r1	kg/day	340	340	340	340	340	340		
A2 Pollution load (Sub-basin BS-4)										
1) Pollution load produced	a2	kg/day	1,114	1,114	1,114	1,114	1,114	1,114		
2) Flow-out ratio	r2-1		0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r2-2		0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	r2 (r2-1×r2-2)		0.05	0.05	0.05	0.05	0.05	0.05		
5) Run-off pollution load	D2= a2 × r2	kg/day	56	56	56	56	56	56		
A3 Pollution load (Sub-basin BS-5)										
1) Pollution load produced	a3	kg/day	429	429	429	429	429	429		
2) Flow-out ratio	r3-1		0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r3-2		0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1×r3-2)		0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D3= a3 × r3	kg/day	90	90	90	90	90	90		
A4 Pollution load (Sub-basin BS-6)										
1) Pollution load produced	a4	kg/day	292	292	292	292	292	292		
2) Flow-out ratio	r4-1		0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r4-2		0.7	0.7	0.7	0.7	0.7	0.7		
4) Run-off ratio	r4 (r4-1×r4-2)		0.56	0.56	0.56	0.56	0.56	0.56		
5) Run-off pollution load	D4= a4 × r4	kg/day	164	164	164	164	164	164		
A5 Pollution load (Sub-basin BS-7)										
1) Pollution load produced	a5	kg/day	48	48	48	48	48	48		
2) Flow-out ratio	r5-1		0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2		0.9	0.9	0.9	0.9	0.9	0.9		
4) Run-off ratio	r5 (r5-1×r5-2)		0.81	0.81	0.81	0.81	0.81	0.81		
5) Run-off pollution load	D5= a5 × r5	kg/day	39	39	39	39	39	39		
A6 Pollution load (Sub-basin BS-10)										
1) Pollution load produced	a6	kg/day	847	847	847	847	847	847		
2) Flow-out ratio	r6-1		0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r6-2		0.05	0.05	0.05	0.05	0.05	0.05		
4) Run-off ratio	r6 (r6-1×r6-2)		0.015	0.015	0.015	0.015	0.015	0.015		
5) Run-off pollution load	D6= a6 × r6	kg/day	13	13	13	13	13	13		
A7 Pollution load (Sub-basin BS-1)										
1) Pollution load produced	a7	kg/day	2,126	2,126	2,126	2,126	2,126	2,126		
2) Flow-out ratio	r7-1		0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r7-2		0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r7 (r7-1×r7-2)		0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D7= a7 × r7	kg/day	213	213	213	213	213	213		
A8 Pollution load (Sub-basin BS-12)										
1) Pollution load produced	a8	kg/day	3,661	3,661	3,661	3,661	3,661	3,661		
2) Flow-out ratio	r8-1		0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r8-2		0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r8 (r8-1×r8-2)		0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D8= a8 × r8	kg/day	366	366	366	366	366	366		
A9 Pollution load (Sub-basin BS-13)										
1) Pollution load produced	a9	kg/day	236	236	236	236	236	236		
2) Flow-out ratio	r9-1		0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r9-2		0.7	0.7	0.7	0.7	0.7	0.7		
4) Run-off ratio	r9 (r9-1×r9-2)		0.56	0.56	0.56	0.56	0.56	0.56		
5) Run-off pollution load	D9= a9 × r9	kg/day	132	132	132	132	132	132		
A10 Pollution load (Sub-basin BS-14)										
1) Pollution load produced	a10	kg/day	3,369	3,369	3,369	3,369	3,369	3,369		
2) Flow-out ratio	r10-1		0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r10-2		0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r10 (r10-1×r10-2)		0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D10= a10 × r10	kg/day	337	337	337	337	337	337		
A11 Pollution load (Sub-basin BS-15)										
1) Pollution load produced	a11	kg/day	750	750	750	750	750	750		
2) Flow-out ratio	r11-1		0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r11-2		0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	r11 (r11-1×r11-2)		0.42	0.42	0.42	0.42	0.42	0.42		
5) Run-off pollution load	D11 = a11 × r11	kg/day	315	315	315	315	315	315		
A12 Total run-off pollution load (from domestic waste water)	Dd=D1+···+D11	kg/day	2,064	2,064	2,064	2,064	2,064	2,064		
B. Industria waste water										
B1 Pollution load from major producers										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r11-1									
3) Flow-down ratio	r11-2									
4) Run-off ratio	r11 (r11-1×r11-1)		0	0	0	0	0	0		
5) Run-off pollution load	I1= b1 × r11	kg/day	0	0	0	0	0	0		
B2 Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	1,794	1,794	1,794	1,794	1,794	1,794		
2) Flow-out ratio	r12-1		0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r12-2		0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r12 (r12-1×r12-2)		0.4	0.4	0.4	0.4	0.4	0.4		
5) Run-off pollution load	I2= b2 × r12	kg/day	718	718	718	718	718	718		
B3 Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	381	381	381	381	381	381		
2) Flow-out ratio	r13-1		0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r13-2		0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r13 (r13-1×r13-2)		0.4	0.4	0.4	0.4	0.4	0.4		
5) Run-off pollution load	I3= b3 × r13	kg/day	152	152	152	152	152	152		
B4 Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	870	870	870	870	870	870		
C. Agricultural pollution load										
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	49,114	49,114	49,114	49,114	49,114	49,114		
2) Flow-out ratio	r22-1		0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r22-2		0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r22 (r22-1×r22-2)		0.05	0.05	0.05	0.05	0.05	0.05		
5) Run-off pollution load	A2= c1 × r22	kg/day	2,456	2,456	2,456	2,456	2,456	2,456		
C3 Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	2,456	2,456	2,456	2,456	2,456	2,456		
D. Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	36,440	36,440	36,440	36,440	36,440	36,440		
2) Flow-out ratio	r31-1		0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r31-2		0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r31 (r31-1×r31-2)		0.05	0.05	0.05	0.05	0.05	0.05		
5) Run-off pollution load	Od= d1 × r31	kg/day	1,822	1,822	1,822	1,822	1,822	1,822		
III. Water quality at control point										
E. Water quality monitored										
L:1994		mg/l	6.6	4.5	4.3	10.6	2.9	7.6	6.0	7.6
F. Result of calculation										
1 Total run-off pollution load	L=LU+Dd+Id+Ad+Od	kg/day	14,350	12,307	19,638	10,967	9,227	8,367	12,391	
2 Water flow	Q	m3/s	62.4	60.0	40.0	42.4	39.5	34.8	46.5	
3 Water quality	C=L/Q	mg/l	2.6	2.4	5.6	3.0	2.7	2.8	3.2	3.0

WQ-4

Table-1.5) Calculation of Water Quality (BOD) at Canggu Tambangan (1954)

Items	symbol	unit	Jan	Feb	Aug	Sep	Oct	Nov	Ave(Dev)	75%Val
I.Pollution load from upstream										
1)Water quality of Padangan (1994)	C0	mg/l	6.6	4.9	4.3	10.5	2.3	7.6		
2)Water flow of Padangan	Q0	m3/s	62.4	60.9	47.0	42.4	34.5	34.8		
3)Pollution load from upstream	L0'=C0×Q0	kg/day	35.5×()	20.736	14.85	36.832	9.593	22.653		
4)Pollution load from upstream considered self-purification	L0=C0×Q0	kg/day	5.337	3.110	2.229	5.825	1.439	3.425		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B5-19)										
1) Pollution load produced	a1	kg/day	144	144	144	144	144	144		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r1 (r11-1×r11-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1= a1 × r1	kg/day	52	52	52	52	52	52		
A2.Pollution load (Sub-basin B6-20)										
1) Pollution load produced	a2	kg/day	133	133	133	133	133	133		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r2 (r12-1×r12-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D2= a2 × r2	kg/day	48	48	48	48	48	48		
A3.Total run-off pollution load from domestic waste water	Dd=D1+D2	kg/day	100	100	100	100	100	100		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	20.279	20.279	20.279	20.279	20.279	20.279		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	d1 (r11-1×r11-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I1= b1 × d1	kg/day	7.301	7.301	7.301	7.301	7.301	7.301		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	37	37	37	37	37	37		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I2= b2× d12	kg/day	13	13	13	13	13	13		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	8	8	8	8	8	8		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I3= b3×r13	kg/day	3	3	3	3	3	3		
B4.Total run-off pollution load from the industries	Ii=I1+I2+I3	kg/day	7.339	7.339	7.339	7.339	7.339	7.339		
C.Agricultural pollution load										
C1.Pollution load from fields										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1× r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	1.022	1.022	1.022	1.022	1.022	1.022		
2) Flow-out ratio	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r22-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	A2= c2 × r22	kg/day	41	41	41	41	41	41		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	41	41	41	41	41	41		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	4.325	4.325	4.325	4.325	4.325	4.325		
2) Flow-out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r31-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	Od= d1 × r31	kg/day	173	173	173	173	173	173		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	3.4	4.0	3.3	10.6	5.2	4.9	5.2	5.2
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Ii+Ad+Od	kg/day	12.990	10.763	9.882	13.477	9.137	11.080	11.221	
2)Water flow	Q	m3/s	24.6	29.5	21.5	22.3	25.0	21.2	24.0	
3)Water quality	C=L/Q	mg/l	6.1	4.2	5.3	7.0	4.2	6.0	5.5	6.1

Table-1(5) Calculation of Water Quality (BOD) at Karangpilang (1994)

Items		units	Jun	Jul	Aug	Sep	Oct	Nov	Ave/Ord	???
I.Pollution load from upstream										
1)Water quality of Canggu Tambangan (BOD)	C0	mg/l	3.4	2.9	3.3	10.6	3.2	4.9		
2)Water flow of Canggu Tambangan	Q0	m3/s	24.6	29.5	19.5	22.2	25.0	21.2		
3)Pollution load from upstream	LP=C0xQ0	kg/day	7,226	7,342	6,130	20,332	11,232	8,975		
4)Pollution load from upstream considered self-purification	L0=C0n/Q0	kg/day	1,084	1,109	920	3,050	1,685	1,316		
II.Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B621)										
1)Pollution load produced	a1	kg/day	289	289	289	289	289	289		
2)Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3)Flow-down ratio	r1-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	r1 (r1-1xr1-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5)Run-off pollution load	D1= a1 x r1	kg/day	52	52	52	52	52	52		
A2.Pollution load (Sub-basin B622)										
1)Pollution load produced	a2	kg/day	929	929	929	929	929	929		
2)Flow-out ratio	r2-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3)Flow-down ratio	r2-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4)Run-off ratio	r2 (r2-1xr2-2)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5)Run-off pollution load	D2= a2 x r2	kg/day	251	251	251	251	251	251		
A3.Pollution load (Sub-basin B623)										
1)Pollution load produced	a3	kg/day	374	374	374	374	374	374		
2)Flow-out ratio	r3-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3)Flow-down ratio	r3-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4)Run-off ratio	r3 (r3-1xr3-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5)Run-off pollution load	D3= a3 x r3	kg/day	168	168	168	168	168	168		
A4.Pollution load (Sub-basin B624)										
1)Pollution load produced	a4	kg/day	149	149	149	149	149	149		
2)Flow-out ratio	r4-1	-	0.6	0.6	0.6	0.6	0.6	0.6		
3)Flow-down ratio	r4-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	r4 (r4-1xr4-2)	-	0.12	0.12	0.12	0.12	0.12	0.12		
5)Run-off pollution load	D4= a4 x r4	kg/day	18	18	18	18	18	18		
A5.Pollution load (Sub-basin B630)										
1)Pollution load produced	a5	kg/day	958	958	958	958	958	958		
2)Flow-out ratio	r5-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3)Flow-down ratio	r5-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	r5 (r5-1xr5-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5)Run-off pollution load	D5= a5 x r5	kg/day	96	96	96	96	96	96		
A6.Pollution load (Sub-basin B631)										
1)Pollution load produced	a6	kg/day	148	148	148	148	148	148		
2)Flow-out ratio	r6-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3)Flow-down ratio	r6-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4)Run-off ratio	r6 (r6-1xr6-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5)Run-off pollution load	D6= a6 x r6	kg/day	31	31	31	31	31	31		
A7.Pollution load (Sub-basin B632)										
1)Pollution load produced	a7	kg/day	485	485	485	485	485	485		
2)Flow-out ratio	r7-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3)Flow-down ratio	r7-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4)Run-off ratio	r7 (r7-1xr7-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5)Run-off pollution load	D7= a7 x r7	kg/day	116	116	116	116	116	116		
A.8.Total run-off pollution load from domestic waste water	Dd=D1+...+D7	kg/day	732	732	732	732	732	732		
B.Industrial waste water										
B1.Pollution load from major producers										
1)Pollution load produced	b1	kg/day	98,054	98,054	98,054	98,054	98,054	98,054		
2)Flow-out ratio	r11-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3)Flow-down ratio	r11-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4)Run-off ratio	r11 (r11-1xr11-1)	-	0.2	0.2	0.2	0.2	0.2	0.2		
5)Run-off pollution load	I1= b1 x r12	kg/day	19,611	19,611	19,611	19,611	19,611	19,611		
B2.Pollution load from large and medium scale industries										
1)Pollution load produced	b2	kg/day	9,440	9,440	9,440	9,440	9,440	9,440		
2)Flow-out ratio	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3)Flow-down ratio	r12-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4)Run-off ratio	r12(r12-1xr12-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5)Run-off pollution load	I2= b2x r12	kg/day	1,652	1,652	1,652	1,652	1,652	1,652		
B3.Pollution load from small scale industries										
1)Pollution load produced	b3	kg/day	1,104	1,104	1,104	1,104	1,104	1,104		
2)Flow-out ratio	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3)Flow-down ratio	r13-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4)Run-off ratio	r13 (r13-1xr13-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5)Run-off pollution load	I3=b3xr13	kg/day	193	193	193	193	193	193		
B.4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	21,456	21,456	21,456	21,456	21,456	21,456		
C.Agricultural pollution load										
C1.Pollution load from fields										
1)Pollution load produced	c1	kg/day								
2)Flow-out ratio	r21-1	-								
3)Flow-down ratio	r21-2	-								
4)Run-off ratio	r21 (r21-1xr21-2)	-								
5)Run-off pollution load	A1= c1 x r21	kg/day								
C2.Pollution load from livestock										
1)Pollution load produced	c2	kg/day	6,934	6,934	6,934	6,934	6,934	6,934		
2)Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3)Flow-down ratio	r22-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	r22(r22-1xr22-2)	-	0.01	0.01	0.01	0.01	0.01	0.01		
5)Run-off pollution load	A2= c1 x r22	kg/day	69	69	69	69	69	69		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	69	69	69	69	69	69		
D.Other sources										
D1.Pollution load from others										
1)Pollution load produced	d1	kg/day	10,358	10,358	10,358	10,358	10,358	10,358		
2)Flow-out ratio	r32-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3)Flow-down ratio	r32-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	r31 (r31-1xr31-2)	-	0.01	0.01	0.01	0.01	0.01	0.01		
5)Run-off pollution load	Od= d1 x r31	kg/day	104	104	104	104	104	104		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	15.7	11.1	11.2	14.0	7.9	7.9	11.3	14.0
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	23,445	23,470	23,281	25,411	24,046	23,707	23,393	
2)Water flow	Q	m3/s	18.3	24.0	21.2	19.8	18.6	28.3	21.7	
3)Water quality	C=L/Q	mg/l	14.8	11.3	12.7	14.9	15.0	9.7	13.1	14.0

Table 1.6) Calculation of Water Quality (BOD) at Ngagel (1994)

Items		units	Jun	Jul	Aug	Sep	Oct	Nov	Ave/Dry	75%
I. Pollution load from upstream										
1) Water quality of Kanangpiring (1045)	C0	mg/l	15.7	13.1	14.2	14.0	7.9	7.9		
2) Water flow of Kanangpiring	Q0	m3/s	18.3	24.0	24.2	19.8	18.6	29.3		
3) Pollution load from upstream	$10^3 \cdot C0 \times Q0$	kg/day	24,824	23,017	30,515	23,990	12,696	19,315		
4) Pollution load from upstream considered self-purification	$L0 = C0 \times Q0$	kg/day	3,224	3,453	3,077	3,595	1,904	2,897		
II. Pollution load from sub-basin										
A. Domestic waste water										
A1. Pollution load (Sub-basin B540)										
1) Pollution load produced	a1	kg/day	835	835	835	835	835	835		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r11 (r11-1×r11-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1 = a1 × r11	kg/day	301	301	301	301	301	301		
A2. Pollution load (Sub-basin B541)										
1) Pollution load produced	a2	kg/day	292	292	292	292	292	292		
2) Flow-out ratio	r21	-	0.6	0.6	0.6	0.6	0.6	0.6		
3) Flow-down ratio	r22	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r2 (r21×r22)	-	0.12	0.12	0.12	0.12	0.12	0.12		
5) Run-off pollution load	D2 = a2 × r2	kg/day	35	35	35	35	35	35		
A3. Pollution load (Sub-basin B542)										
1) Pollution load produced	a3	kg/day	1,029	1,029	1,029	1,029	1,029	1,029		
2) Flow-out ratio	r31	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r32	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r31×r32)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D3 = a3 × r3	kg/day	216	216	216	216	216	216		
A4. Pollution load (Sub-basin B543)										
1) Pollution load produced	a4	kg/day	4,808	4,808	4,808	4,808	4,808	4,808		
2) Flow-out ratio	r41	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r42	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r4 (r41×r42)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D4 = a4 × r4	kg/day	1,731	1,731	1,731	1,731	1,731	1,731		
A5. Pollution load (Sub-basin B544)										
1) Pollution load produced	a5	kg/day	2,320	2,320	2,320	2,320	2,320	2,320		
2) Flow-out ratio	r51	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r52	-	0.7	0.7	0.7	0.7	0.7	0.7		
4) Run-off ratio	r5 (r51×r52)	-	0.63	0.63	0.63	0.63	0.63	0.63		
5) Run-off pollution load	D5 = a5 × r5	kg/day	1,462	1,462	1,462	1,462	1,462	1,462		
A6. Total run-off pollution load from domestic waste water	D6 = D1+D2+D3+D4+D5	kg/day	3,744	3,744	3,744	3,744	3,744	3,744		
B. Industrial waste water										
B1. Pollution load from major producers										
1) Pollution load produced	b1	kg/day	4,948	4,948	4,948	4,948	4,948	4,948		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r11 (r11-1×r11-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I1 = b1 × r11	kg/day	1,781	1,781	1,781	1,781	1,781	1,781		
B2. Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	5,849	5,849	5,849	5,849	5,849	5,849		
2) Flow-out ratio	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I2 = b2 × r12	kg/day	1,638	1,638	1,638	1,635	1,638	1,638		
B3. Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	1,032	1,032	1,032	1,032	1,032	1,032		
2) Flow-out ratio	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I3 = b3 × r13	kg/day	289	289	289	289	289	289		
B4. Total run-off pollution load from the industries	I4 = I1+I2+I3	kg/day	3,708	3,708	3,708	3,708	3,708	3,708		
C. Agricultural pollution load										
C1. Pollution load from fields										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1 = c1 × r21	kg/day								
C2. Pollution load from livestock										
1) Pollution load produced	c2	kg/day	2,203	2,203	2,203	2,203	2,203	2,203		
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.02	0.02	0.02	0.02	0.02	0.02		
5) Run-off pollution load	A2 = c1 × r22	kg/day	44	44	44	44	44	44		
C3. Total run-off pollution load from agriculture	A3 = A1+A2	kg/day	44	44	44	44	44	44		
D. Other sources										
D1. Pollution load from others										
1) Pollution load produced	d1	kg/day	5,435	5,435	5,435	5,435	5,435	5,435		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.02	0.02	0.02	0.02	0.02	0.02		
5) Run-off pollution load	O6 = d1 × r31	kg/day	109	109	109	109	109	109		
III. Water quality at control point										
E. Water quality monitored										
1) 1994		mg/l	6.1	6.0	8.0	9.8	7.3	6.3	7.5	8.0
2) Average (1992-1996)										
3) Median (1992-1996)										
F. Result of calculation										
1) Total run-off pollution load	L = L0+D6+I4+A3+O6	kg/day	11,329	11,058	10,682	11,198	9,509	10,502	10,713	
2) Water flow	Q	m3/s	15.4	20.9	17.8	15.4	13.2	23.1	17.6	
3) Water quality	C = L/Q	mg/l	8.5	6.1	6.9	8.4	8.3	5.3	7.3	8.0

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Table 1.7) Calculation of Water Quality (BOD) at Kayoon (1994)

Item		values	Sep.	Jul.	Aug.	Sep.	Oct.	Nov.	Ave/Day	75%V?
I.Pollution load from up stream										
1)Water quality of Jrua Bridge (BOD)	C0	mg/l	6.1	6.0	8.5	9.5	7.3	6.3		
2)Water flow of Jrua Bridge	Q0	m3/s	2.5	2.5	2.5	2.5	2.5	2.5		
3)Pollution load from upstream	L0=C0×Q0	kg/day	1,318	1,296	1,728	2,117	1,577	1,361		
4)Pollution load from upstream considered self purification	L0=C0×Q0	kg/day	264	259	346	423	315	272		
II.Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub basin B545)		kg/day	652	652	652	652	652	652		
1) Pollution load produced	a1		652	652	652	652	652	652		
2) Flow-out ratio	r1-1		0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2		0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r1 (r1-1×r1-2)		0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1= a1 × r1	kg/day	235	235	235	235	235	235		
A2.Pollution load (Sub-basin B646)		kg/day	973	973	973	973	973	973		
1) Pollution load produced	a2		973	973	973	973	973	973		
2) Flow-out ratio	r2-1		0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r2-2		0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	r2 (r2-1×r2-2)		0.54	0.54	0.54	0.54	0.54	0.54		
5) Run-off pollution load	D2= a2 × r2	kg/day	525	525	525	525	525	525		
A3.Total run-off pollution load from domestic waste water	D0=D1+D2	kg/day	760	760	760	760	760	760		
B.Industrial waste water										
B1.Pollution load from major producers		kg/day	0	0	0	0	0	0		
1) Pollution load produced	b1		0	0	0	0	0	0		
2) Flow-out ratio	r11-1									
3) Flow-down ratio	r11-2									
4) Run-off ratio	r11 (r11-1×r11-1)		0	0	0	0	0	0		
5) Run-off pollution load	I1= b1 × r11	kg/day	0	0	0	0	0	0		
B2.Pollution load from large and medium scale industries		kg/day	654	654	654	654	654	654		
1) Pollution load produced	b2		654	654	654	654	654	654		
2) Flow-out ratio	r12-1		0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2		0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r12 (r12-1×r12-2)		0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	I2= b2 × r12	kg/day	294	294	294	294	294	294		
B3.Pollution load from small scale industries		kg/day	123	123	123	123	123	123		
1) Pollution load produced	b3		123	123	123	123	123	123		
2) Flow-out ratio	r13-1		0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2		0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r13 (r13-1×r13-2)		0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	I3= b3 × r13	kg/day	55	55	55	55	55	55		
B4.Total run-off pollution load from the industries	I=I1+I2+I3	kg/day	350	350	350	350	350	350		
C.Agricultural pollution load										
C1.Pollution load from fields										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1									
3) Flow-down ratio	r21-2									
4) Run-off ratio	r21 (r21-1×r21-2)									
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	91	91	91	91	91	91		
2) Flow-out ratio	r22-1		0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2		0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r22 (r22-1×r22-2)		0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	A2= c2 × r22	kg/day	2	2	2	2	2	2		
C3.Total run-off pollution load from agriculture	A3=A1+A2	kg/day	2	2	2	2	2	2		
D.Other sources										
D1.Pollution load (non others)										
1) Pollution load produced	d1	kg/day	580	580	580	580	580	580		
2) Flow-out ratio	r31-1		0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2		0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r31 (r31-1×r31-2)		0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	O4= d1 × r31	kg/day	15	15	15	15	15	15		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l			6.2					6.2
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+D0+I2+A3+O4	kg/day	1,040	1,286	1,472	1,550	1,442	1,399	1,440	
2)Water flow	Q	m3/s			2.8				2.8	
3)Water quality	C=L/Q	mg/l			6.1				6.1	

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Table-1.8) Calculation of Water Quality (BOD) at Purong (1994)

Items		units	Jun	Jul	Aug	Sep	Oct	Nov	Avg/Obs	75%Val
I.Pollution load from upstream										
1)Water quality of intake of source and	C0	mg/l			25.0					
2)Water flow of intake of source and	Q0	m3/s			6.0					
3)Pollution load from upstream	L0=C0×Q0	kg/day			12.960					
4)Pollution load from upstream considered self-purification	L0=C0×Q0	kg/day			259					
II. Pollution load from sub-basin										
A.Domestic waste water										
A1 Pollution load										
1) Pollution load produced	a1	kg/day	59	59	59	59	59	59		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r11 (r11-1×r11-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	D1= a1 × r11	kg/day	11	11	11	11	11	11		
A2 Total run-off pollution load from domestic waste water	Dd=D1	kg/day	11	11	11	11	11	11		
B.Industrial waste water										
B1 Pollution load from major producers										
1) Pollution load produced	b1	kg/day	185.367	185.367	185.367	185.367	185.367	185.367		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.02	0.02	0.02	0.02	0.02	0.02		
4) Run-off ratio	r11 (r11-1×r11-1)	-	0.018	0.018	0.018	0.018	0.018	0.018		
5) Run-off pollution load	I1= b1 × r11	kg/day	3.337	3.337	3.337	3.337	3.337	3.337		
B2 Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	103	103	103	103	103	103		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I2= b2 × r12	kg/day	19	19	19	19	19	19		
B3 Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	16	16	16	16	16	16		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I3=b3×r13	kg/day	3	3	3	3	3	3		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	3.358	3.358	3.358	3.358	3.358	3.358		
C.Agricultural pollution load										
C1 Pollution load from fields										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	56	56	56	56	56	56		
2) Flow-out ratio	r22-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r22-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	A2= c2 × r22	kg/day	2	2	2	2	2	2		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	2	2	2	2	2	2		
D.Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	113	113	113	113	113	113		
2) Flow-out ratio	r31-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r31-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	Od= d1 × r31	kg/day	5	5	5	5	5	5		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l			12.9					12.9
2)Average(1962-1966)										
3)Median(1962-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	3.375	3.375	3.625	3.375	3.375	3.375	3.410	
2)Water flow	Q	m3/s			3.2					3.2
3)Water quality	C=L/Q	mg/l			13.1					13.1

Table-1(9) Calcuculation of Water Quality (BOD) at Bandayu Bridge (1994)

Items		units	Jun	Jul	Aug	Sep	Oct	Nov	Ave (Oct)	75%Val
I.Pollution load from upstream										
1) Water quality of intake of water canal	C0	mg/l								
2) Water flow of intake of water canal	Q0	m3/s								
3) Pollution load from upstream	L0=C0×Q0	kg/day								
4) Pollution load from upstream considered self purification	L0=C0×r0	kg/day								
II. Pollution load from watersheds										
A.Domestic waste water										
A1.Pollution load										
1) Pollution load produced	a1	kg/day	20	20	20	20	20	20		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D1=a1×r1	kg/day	14	14	14	14	14	14		
A2.Total run-off pollution load from domestic waste water	Dd=D1	kg/day	14	14	14	14	14	14		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r11-1	-								
3) Flow-down ratio	r11-2	-								
4) Run-off ratio	r11 (r11-1×r11-1)	-	0	0	0	0	0	0		
5) Run-off pollution load	I1=b1×r11	kg/day	0	0	0	0	0	0		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	34	34	34	34	34	34		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	I2=b2×r12	kg/day	24	24	24	24	24	24		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	5	5	5	5	5	5		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	I3=b3×r13	kg/day	4	4	4	4	4	4		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	28	28	28	28	28	28		
C.Agricultural pollution load										
C1.Pollution load from fields										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1=c1×r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	19	19	19	19	19	19		
2) Flow-out ratio	r22-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r22-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	A2=c2×r22	kg/day	3.04	3.04	3.04	3.04	3.04	3.04		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	3.04	3.04	3.04	3.04	3.04	3.04		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	38	38	38	38	38	38		
2) Flow-out ratio	r31-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r31-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	Od=d1×r31	kg/day	6.00	6.00	6.00	6.00	6.00	6.00		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l			9.3					9.3
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	52	52	52	52	52	52		52
2)Water flow	Q	m3/s			0.06					0.06
3)Water quality	C=L/Q	mg/l			9.9					9.9

Table-2(1) Calculation of Water Quality (BOD) at Bumiayu Bridge (2020 : Without project)

Items	units	Jan	Jul	Avg	Sep	Oct	Nov	Min(Oct)	Max(May)
I.Pollution load from upstream									
1)Water quality	C0	mg/l								
2)Water flow	Q0	m³/s								
3)Pollution load from upstream	L0=C0×Q0	kg/day								
4) Run-off pollution load from upstream	L0	kg/day								
II. Pollution load from sub-basin									
A.Domestic waste water									
A1 Pollution load (Sub-basin B000)									
1) Pollution load produced	a1	kg/day	897	897	897	897	897	897		
2) Flow-out ratio	r1-1	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r1-2	-	0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	D1= a1 × r1	kg/day	27	27	27	27	27	27		
A2 Pollution load (Sub-basin B001)									
1) Pollution load produced	a2	kg/day	3,745	3,745	3,745	3,745	3,745	3,745		
2) Flow-out ratio	r2-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r2-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r2 (r2-1×r2-2)	-	0.2	0.2	0.2	0.2	0.2	0.2		
5) Run-off pollution load	D2= a2 × r2	kg/day	749	749	749	749	749	749		
A3 Pollution load (Sub-basin B020)									
1) Pollution load produced	a3	kg/day	8,562	8,562	8,562	8,562	8,562	8,562		
2) Flow-out ratio	r3-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1×r3-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D3= a3 × r3	kg/day	1,798	1,798	1,798	1,798	1,798	1,798		
A4 Pollution load (Sub-basin B021)									
1) Pollution load produced	a4	kg/day	14,365	14,365	14,365	14,365	14,365	14,365		
2) Flow-out ratio	r4-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r4-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r4 (r4-1×r4-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D4= a4 × r4	kg/day	3,017	3,017	3,017	3,017	3,017	3,017		
A5 Pollution load (Sub-basin B022)									
1) Pollution load produced	a5	kg/day	5,185	5,185	5,185	5,185	5,185	5,185		
2) Flow-out ratio	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r5-3 (r5-1×r5-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D5= a5 × r5	kg/day	3,733	3,733	3,733	3,733	3,733	3,733		
A6 Total run-off pollution load from domestic waste water	D6=D1+D2+D3+D4+D5	kg/day	9,324	9,324	9,324	9,324	9,324	9,324		
B Industrial waste water									
B1 Pollution load from major producers									
1) Pollution load produced	b1	kg/day	1,561	1,561	1,561	1,561	1,561	1,561		
2) Flow-out ratio	d11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	d11-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r11 (r11-1×r11-1)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	I1= b1 × r11	kg/day	702	702	702	702	702	702		
B2 Pollution load from large and medium scale industries									
1) Pollution load produced	b2	kg/day	17,775	17,775	17,775	17,775	17,775	17,775		
2) Flow-out ratio	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I2= b2 × r12	kg/day	4,977	4,977	4,977	4,977	4,977	4,977		
B3 Pollution load from small scale industries									
1) Pollution load produced	b3	kg/day	3,432	3,432	3,432	3,432	3,432	3,432		
2) Flow-out ratio	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I3= b3 × r13	kg/day	961	961	961	961	961	961		
B4 Total run-off pollution load from the industries	I4=I1+I2+I3	kg/day	6,640	6,640	6,640	6,640	6,640	6,640		
C.Agricultural pollution load									
C1 Pollution load from fields*									
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2 Pollution load from livestock									
1) Pollution load produced	c2	kg/day	21,276	21,276	21,276	21,276	21,276	21,276		
2) Flow-out ratio	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r22-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r22(r22-1×r22-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	A2= c2 × r22	kg/day	638	638	638	638	638	638		
C3 Total run-off pollution load from agriculture	A3=A1+A2	kg/day	638	638	638	638	638	638		
D.Other sources									
D1 Pollution load from others									
1) Pollution load produced	d1	kg/day	36,620	36,620	36,620	36,620	36,620	36,620		
2) Flow-out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r31-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	Od= d1 × r31	kg/day	1,099	1,099	1,099	1,099	1,099	1,099		
III.Water quality at control point									
E.Water quality monitored									
1)1994		mg/l	8.3	9.4	7.8	8.4	7.8	7.5	6.2	8.4
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation									
1)Total run-off pollution load	L=L0+D6+I4+A3+Od	kg/day	17,701	17,701	17,701	17,701	17,701	17,701	17,701	
2)Water flow	Q	m³/s	10.0	10.0	10.0	10.0	10.0	10.0	10.0	
3)Water quality	C=L/Q	mg/l	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5

Note : *Pollution load from fields is included in other sources.

Table-2(2) Calculation of Water Quality (BOD) at Demangan Bridge (2020 : without project)

Items		units	May	Jul	Aug	Sep	Oct	Nov	Ave(Dry)	75%Val
I.Pollution load from upstream										
1) Water quality of Leoloyo Dam (465)	C0	mg/l	2.0	2.7	4.3	6.6	4.3	3.8		
2) Water flow of Leoloyo Dam	Q0	m3/s	72.0	6.0	61.0	57.0	107.0	73.0		
3) Pollution load from upstream	L0=C0xQ0	kg/day	12.442	1.470	22.663	32.504	39.753	23.967		
4) Run-off pollution load from upstream	L0=C0x(Q0	kg/day	2.488	290	4.533	6.501	7.951	4.793		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B(42)										
1) Pollution load produced	a1	kg/day	1.529	1.529	1.529	1.529	1.529	1.529		
2) Flow-out ratio	r11-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r11-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r11(r11-1xr11-1)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	D1=a1 x r11	kg/day	245	245	245	245	245	245		
A2.Pollution load (Sub-basin B (50)										
1) Pollution load produced	a2	kg/day	1.901	1.901	1.901	1.901	1.901	1.901		
2) Flow-out ratio	r21-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r22-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r2 (r22-1xr22-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	D2= a2 x r2	kg/day	456	456	456	456	456	456		
A3.Pollution load (Sub-basin B (53)										
1) Pollution load produced	a3	kg/day	732	732	732	732	732	732		
2) Flow-out ratio	r31-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r31-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r3 (r31-1xr31-2)	-	0.32	0.32	0.32	0.32	0.32	0.32		
5) Run-off pollution load	D3= a3 x r3	kg/day	234	234	234	234	234	234		
A4.Total run-off pollution load from domestic waste water	Dd=D1+D2+D3	kg/day	932	932	932	932	932	932		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	230.953	230.953	230.953	230.953	230.953	230.953		
2) Flow-out ratio	r11-1	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r11-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r11 (r11-1xr11-1)	-	0.06	0.06	0.06	0.06	0.06	0.06		
5) Run-off pollution load	I1= b1 x r11	kg/day	13.857	13.857	13.857	13.857	13.857	13.857		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	3.510	3.510	3.510	3.510	3.510	3.510		
2) Flow-out ratio	r12-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r12-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r12 (r12-1xr12-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	I2= b2x r12	kg/day	842	842	842	842	842	842		
B3 Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	617	617	617	617	617	617		
2) Flow-out ratio	r13-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r13-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r13 (r13-1xr13-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	I3=b3x i3	kg/day	148	148	148	148	148	148		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	14.848	14.848	14.848	14.848	14.848	14.848		
C.Agricultural pollution load										
C1 Pollution load from fields *										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1= c1x r21	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	11.258	11.258	11.258	11.258	11.258	11.258		
2) Flow-out ratio	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r22-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r22(r22-1xr22-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	A2= c1 x r22	kg/day	338	338	338	338	338	338		
C3 Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	338	338	338	338	338	338		
D.Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	10.620	10.620	10.620	10.620	10.620	10.620		
2) Flow-out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r31-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r31 (r31-1xr31-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	Od= d1 x r31	kg/day	319	319	319	319	319	319		
III.Water quality at control point										
E.Water quality monitored										
1) 1964		mg/l	2.3	3.8	4.3	7.5	2.6	3.5	4.1	4.3
2) Average (1992-1996)										
3) Median (1992-1996)										
F.Result of calculation										
1) Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	18.924	16.716	20.968	22.937	24.386	21.229	20.860	
2) Water flow	Q	m3/s	62.6	62.6	62.6	62.6	62.6	62.6	62.6	
3) Water quality	C=L/Q	mg/l	3.5	3.1	3.9	4.2	4.5	3.9	3.9	4.2

Note : * Pollution load from fields is included in other sources

Table-2(3) Caluculation of Water Quality (BOD) at Jogbriu Bridge (2020 : without project)

Item		unit	Jan	Feb	Aug	Sep	Oct	Nov	Ave.Dry	75%Val
I.Pollution load from upstream										
1)Water quality of Ngrenggo Tambangan (X0)	C0	mg/l	6.5	4.8	10.5	3.9	3.8	4.7		
2)Water flow of Ngrenggo Tambangan	Q0	m3/s	141.0	56.9	35.6	65.9	52.4	41.9		
3)Pollution load from upstream	L0 =C0×Q0	kg/day	76,749	23,575	30,440	24,902	19,264	17,045		
4) Run-off pollution load from upstream	L0=C0×Q0	kg/day	15,350	4,715	10,668	4,360	3,44	3,403		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B310)										
1) Pollution load produced	a1	kg/day	2,897	2,897	2,897	2,897	2,897	2,897		
2) Flow-out ratio	r1-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r1-2	-	0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.08	0.08	0.08	0.08	0.08	0.08		
5) Run-off pollution load	D1= a1 × r1	kg/day	232	232	232	232	232	232		
A2.Pollution load (Sub-basin B311)										
1) Pollution load produced	a2	kg/day	3,009	3,009	3,009	3,009	3,009	3,009		
2) Flow-out ratio	r2-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r2-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r2 (r2-1×r2-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	D2= a2 × r2	kg/day	481	481	481	481	481	481		
A3.Pollution load (Sub-basin B312)										
1) Pollution load produced	a3	kg/day	277	277	277	277	277	277		
2) Flow-out ratio	r3-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1×r3-2)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D3= a3 × r3	kg/day	75	75	75	75	75	75		
A4.Pollution load (Sub-basin B313)										
1) Pollution load produced	a4	kg/day	396	396	396	396	396	396		
2) Flow-out ratio	r4-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r4-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r4 (r4-1×r4-2)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D4= a4 × r4	kg/day	107	107	107	107	107	107		
A5.Pollution load (Sub-basin B314)										
1) Pollution load produced	a5	kg/day	288	288	288	288	288	288		
2) Flow-out ratio	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r5-3 (r5-1×r5-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	D5= a5 × r5	kg/day	130	130	130	130	130	130		
A6.Pollution load (Sub-basin B315)										
1) Pollution load produced	a6	kg/day	1,796	1,796	1,796	1,796	1,796	1,796		
2) Flow-out ratio	r6-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r6-2	-	0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	r6-3 (r6-1×r6-2)	-	0.48	0.48	0.48	0.48	0.48	0.48		
5) Run-off pollution load	D6= a6 × r6	kg/day	862	862	862	862	862	862		
A7.Pollution load (Sub-basin B316)										
1) Pollution load produced	a7	kg/day	203	203	203	203	203	203		
2) Flow-out ratio	r7-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r7-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r7-3 (r7-1×r7-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D7= a7 × r7	kg/day	146	146	146	146	146	146		
A8.Pollution load (Sub-basin B317)										
1) Pollution load produced	a8	kg/day	2,943	2,943	2,943	2,943	2,943	2,943		
2) Flow-out ratio	r8-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r8-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r8-3 (r8-1×r8-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D8= a8 × r8	kg/day	618	618	618	618	618	618		
A9.Total run-off pollution load from domestic waste water	Dd=D1+···D8	kg/day	2,651	2,651	2,651	2,651	2,651	2,651		
B.Industria waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	788,432	788,432	788,432	788,432	788,432	788,432		
2) Flow-out ratio	r11-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r11-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r11 (r11-1×r11-1)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	I1= b1 × r11	kg/day	19,711	19,711	19,711	19,711	19,711	19,711		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	4,748	4,748	4,748	4,748	4,748	4,748		
2) Flow-out ratio	r12-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r12-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	I2= b2 × r12	kg/day	475	475	475	475	475	475		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	791	791	791	791	791	791		
2) Flow-out ratio	r13-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r13-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	I3= b3×r13	kg/day	79	79	79	79	79	79		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	20,265	20,265	20,265	20,265	20,265	20,265		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	24,838	24,838	24,838	24,838	24,838	24,838		
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r22(r22-1×r22-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	A2= c1 × r22	kg/day	621	621	621	621	621	621		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	621	621	621	621	621	621		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	12,280	12,280	12,280	12,280	12,280	12,280		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	Od= d1 × r31	kg/day	307	307	307	307	307	307		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	3.5	3.8	11.9	3.4	7.7	4.5	5.5	7.7
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	39,193	28,543	33,930	28,224	27,284	27,246	30,740	
2)Water flow	Q	m3/s	58.2	58.2	58.2	58.2	58.2	58.2	58.2	
3)Water quality	C=L/Q	mg/l	7.8	5.7	6.7	5.6	5.4	5.4	6.1	6.7

Note : *Pollution load from fields is included in other sources.

Table-2(4) Calculation of Water Quality (BOD) at Padangan Bridge (2020 : without project)

Items		Unit	Jun	Jul	Aug	Sep	Oct	Nov	Ave.(Dry)	75% Val.
I.Pollution load from upstream										
1)Water quality of Bojo Tambangan (C0)	C0	mg/l	2.5	1.9	4.5	6.5	4.9	2.7		
2)Water flow of Bojo Tambangan	Q0	m3/s	79.5	77.6	75.7	16.2	11.9	12.6		
3)Pollution load from upstream	L0'=C0×Q0	kg/day	17,172	12,739	30,565	9,238	5,038	2,939		
4) Run-off pollution load from upstream	L0=C0×Q0	kg/day	6,869	5,096	12,226	3,695	2,015	1,176		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B503)										
1) Pollution load produced	a1	kg/day	642	642	642	642	642	642		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.9	0.9	0.9	0.9	0.9	0.9		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.81	0.81	0.81	0.81	0.81	0.81		
5) Run-off pollution load	D1= a1 × r1	kg/day	520	520	520	520	520	520		
A2.Pollution load (Sub-basin B504)										
1) Pollution load produced	a2	kg/day	1,700	1,700	1,700	1,700	1,700	1,700		
2) Flow-out ratio	r2-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r2-2	-	0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	r2 (r2-1×r2-2)	-	0.05	0.05	0.05	0.05	0.05	0.05		
5) Run-off pollution load	D2= a2 × r2	kg/day	85	85	85	85	85	85		
A3.Pollution load (Sub-basin B505)										
1) Pollution load produced	a3	kg/day	655	655	655	655	655	655		
2) Flow-out ratio	r3-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1×r3-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D3= a3 × r3	kg/day	138	138	138	138	138	138		
A4.Pollution load (Sub-basin B506)										
1) Pollution load produced	a4	kg/day	446	446	446	446	446	446		
2) Flow-out ratio	r4-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r4-2	-	0.7	0.7	0.7	0.7	0.7	0.7		
4) Run-off ratio	r4 (r4-1×r4-2)	-	0.56	0.56	0.56	0.56	0.56	0.56		
5) Run-off pollution load	D4= a4× r4	kg/day	250	250	250	250	250	250		
A5.Pollution load (Sub-basin B507)										
1) Pollution load produced	a5	kg/day	73	73	73	73	73	73		
2) Flow-out ratio	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	-	0.9	0.9	0.9	0.9	0.9	0.9		
4) Run-off ratio	r5-3 (r5-1×r5-2)	-	0.81	0.81	0.81	0.81	0.81	0.81		
5) Run-off pollution load	D5= a5× r5	kg/day	59	59	59	59	59	59		
A6.Pollution load (Sub-basin B510)										
1) Pollution load produced	a6	kg/day	1,293	1,293	1,293	1,293	1,293	1,293		
2) Flow-out ratio	r6-1	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r6-2	-	0.05	0.05	0.05	0.05	0.05	0.05		
4) Run-off ratio	r6-3 (r6-1×r6-2)	-	0.015	0.015	0.015	0.015	0.015	0.015		
5) Run-off pollution load	D6= a6× r6	kg/day	19	19	19	19	19	19		
A7.Pollution load (Sub-basin B511)										
1) Pollution load produced	a7	kg/day	3,246	3,246	3,246	3,246	3,246	3,246		
2) Flow-out ratio	r7-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r7-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r7-3 (r7-1×r7-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D7= a7× r7	kg/day	325	325	325	325	325	325		
A8.Pollution load (Sub-basin B512)										
1) Pollution load produced	a8	kg/day	5,588	5,588	5,588	5,588	5,588	5,588		
2) Flow-out ratio	r8-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r8-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r8-3 (r8-1×r8-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D8= a8× r8	kg/day	559	559	559	559	559	559		
A9.Pollution load (Sub-basin B513)										
1) Pollution load produced	a9	kg/day	361	361	361	361	361	361		
2) Flow-out ratio	r9-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r9-2	-	0.7	0.7	0.7	0.7	0.7	0.7		
4) Run-off ratio	r9-3 (r9-1×r9-2)	-	0.56	0.56	0.56	0.56	0.56	0.56		
5) Run-off pollution load	D9= a9× r9	kg/day	202	202	202	202	202	202		
A10.Pollution load (Sub-basin B514)										
1) Pollution load produced	a10	kg/day	5,144	5,144	5,144	5,144	5,144	5,144		
2) Flow-out ratio	r10-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r10-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r10-3 (r10-1×r10-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D10= a10× r10	kg/day	514	514	514	514	514	514		
A11.Pollution load (Sub-basin B515)										
1) Pollution load produced	a11	kg/day	1,153	1,153	1,153	1,153	1,153	1,153		
2) Flow-out ratio	r11-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r11-2	-	0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	r11-3 (r11-1×r11-2)	-	0.42	0.42	0.42	0.42	0.42	0.42		
5) Run-off pollution load	D11= a11× r11	kg/day	484	484	484	484	484	484		
A12 Total run-off pollution load from domestic waste water	Dd=D1+...+D11	kg/day	3,155	3,155	3,155	3,155	3,155	3,155		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	ri1-1	-								
3) Flow-down ratio	ri1-2	-								
4) Run-off ratio	ri1 (ri1-1×ri1-2)	-	0	0	0	0	0	0		
5) Run-off pollution load	I1= b1 × ri1	kg/day	0	0	0	0	0	0		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	4,842	4,842	4,842	4,842	4,842	4,842		
2) Flow-out ratio	ri2-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	ri2-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	ri2 (ri2-1×ri2-2)	-	0.4	0.4	0.4	0.4	0.4	0.4		
5) Run-off pollution load	I2= b2× ri2	kg/day	1,937	1,937	1,937	1,937	1,937	1,937		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	1,028	1,028	1,028	1,028	1,028	1,028		
2) Flow-out ratio	ri3-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	ri3-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	ri3 (ri3-1×ri3-2)	-	0.4	0.4	0.4	0.4	0.4	0.4		
5) Run-off pollution load	I3=b3×ri3	kg/day	411	411	411	411	411	411		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	2,348	2,348	2,348	2,348	2,348	2,348		
C.Agricultural pollution load										
C1 Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	rC1-1	-								
3) Flow-down ratio	rC1-2	-								
4) Run-off ratio	rC1 (rC1-1×rC1-2)	-								
5) Run-off pollution load	A1= c1× rC1	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	49,114	49,114	49,114	49,114	49,114	49,114		
2) Flow-out ratio	rC2-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	rC2-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	rC2(rC2-1×rC2-2)	-	0.05	0.05	0.05	0.05	0.05	0.05		
5) Run-off pollution load	A2= c2 × rC2	kg/day	2,456	2,456	2,456	2,456	2,456	2,456		
C3 Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	2,456	2,456	2,456	2,456	2,456	2,456		
D.Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	36,440	36,440	36,440	36,440	36,440	36,440		
2) Flow-out ratio	rd1-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	rd1-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	rd1 (rd1-1×rd1-2)	-	0.05	0.05	0.05	0.05	0.05	0.05		
5) Run-off pollution load	Od= d1 × rd1	kg/day	1,822	1,822	1,822	1,822	1,822	1,822		
III.Water quality at control point										
E.Water quality monitored										
1) 1994		mg/l	6.6	4.0	4.3	10.6	2.9	7.8	6.0	7.6
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	16,650	14,877	22,007	13,476	11,796	10,957	14,961	
2)Water flow	Q	m3/s	35.8	35.8	35.8	35.8	35.8	35.8	35.8	
3)Water quality	C=L/Q	mg/l	5.4	4.8	7.1	4.4	3.8	3.5	4.8	5.4

Note : *Pollution load from fields is included in other sources

Table-2(5) Calculation of Water Quality (BOD) at Canggu Tambangan (2020 : without project)

Items	notes	unit							Ave/dry	Ave/wet
I. Pollution load from up stream										
1) Water quality of Padungan (1994)	C9	mg/l								
2) Water flow of Padungan	Q9	m3/s								
3) Pollution load from upstream	L9=C9×Q9	kg/day	16,650	14,827	22,463	13,476	11,796	10,957		
4) Run-off pollution load from upstream	L9=C9×Q9	kg/day	2,897	2,232	3,361	2,021	1,707	1,644		
II. Pollution load from sub-basin										
A. Domestic waste water										
A1 Pollution load (Sub-basin 0619)										
1) Pollution load produced	a1	kg/day	219	219	219	219	219	219		
2) Flow out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1= a1 × r1	kg/day	79	79	79	79	79	79		
A2 Pollution load (Sub-basin 0620)		kg/day								
1) Pollution load produced	a2		202	202	202	202	202	202		
2) Flow-out ratio	r2-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r2-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run off ratio	r2 (r2-1×r2-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D2= a2 × r2	kg/day	73	73	73	73	73	73		
A3 Total run-off pollution load from domestic waste water	Dd=D1+D2	kg/day	152	152	152	152	152	152		
B. Industrial waste water										
B1 Pollution load from major producers										
1) Pollution load produced	b1	kg/day	20,279	20,279	20,279	20,279	20,279	20,279		
2) Flow out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r11 (r11-1×r11-1)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I1= b1 × r11	kg/day	7,300	7,300	7,300	7,300	7,300	7,300		
B2 Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	100	100	100	100	100	100		
2) Flow out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I2= b2 × r12	kg/day	36	36	36	36	36	36		
B3 Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	21	21	21	21	21	21		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I3= b3 × r13	kg/day	8	8	8	8	8	8		
B4 Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	7,576	7,575	7,573	7,573	7,573	7,573		
C. Agricultural pollution load										
C1 Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	1,022	1,022	1,022	1,022	1,022	1,022		
2) Flow-out ratio	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r22-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	A2= c2 × r22	kg/day	41	41	41	41	41	41		
C3 Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	41	41	41	41	41	41		
D. Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	760	760	760	760	760	760		
2) Flow-out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r31-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	Od= d1 × r31	kg/day	30	30	30	30	30	30		
III. Water quality at control point										
E. Water quality monitored										
1) 1994		mg/l	3.4	4.0	3.3	10.6	5.2	4.9	5.2	5.2
2) Average (1992-1996)										
3) Median (1992-1996)										
F. Result of calculation										
1) Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	10,293	10,027	11,097	9,813	9,565	9,439	10,040	
2) Water flow	Q	m3/s	12.8	12.8	12.8	12.8	12.8	12.8	12.8	
3) Water quality	C=L/Q	mg/l	9.3	9.1	10.0	8.9	8.5	8.5	9.1	9.3

Note : *Pollution load from fields is included in other sources.

Item		units	Jan	Jul	Aug	Sep	Oct	Nov	Ave.(Dec)	75%Va
I.Pollution load from upstream										
1)Water quality of Cenggu Tambangan (1990)	C0	mg/l								
2)Water flow of Cenggu Tambangan	Q0	m3/s								
3)Pollution load from upstream	L0=C0xQ0	kg/day	10.293	10.022	11.097	9.817	9.563	9.439		
4) Run-off pollution load from upstream	LR=C0xQ0	kg/day	1.545	1.504	1.664	1.473	1.435	1.416		
II.Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B621)										
1) Pollution load produced	a1	kg/day	485	485	485	485	485	485		
2) Flow out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow down ratio	r1-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r1 (r1-1xr1-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	D1= a1 x r1	kg/day	87	87	87	87	87	87		
A2.Pollution load (Sub-basin B622)										
1) Pollution load produced	a2	kg/day	1.557	1.557	1.557	1.557	1.557	1.557		
2) Flow-out ratio	r2-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow down ratio	r2-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r2 (r2-1xr2-2)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D2= a2 x r2	kg/day	420	420	420	420	420	420		
A3.Pollution load (Sub-basin B623)										
1) Pollution load produced	a3	kg/day	626	626	626	626	626	626		
2) Flow-out ratio	r3-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow down ratio	r3-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r3 (r3-1xr3-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	D3= a3 x r3	kg/day	282	282	282	282	282	282		
A4.Pollution load (Sub-basin B624)										
1) Pollution load produced	a4	kg/day	248	248	248	248	248	248		
2) Flow out ratio	r4-1	-	0.6	0.6	0.6	0.6	0.6	0.6		
3) Flow-down ratio	r4-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r4 (r4-1xr4-2)	-	0.12	0.12	0.12	0.12	0.12	0.12		
5) Run-off pollution load	D4= a4 x r4	kg/day	30	30	30	30	30	30		
A5.Pollution load (Sub-basin B630)										
1) Pollution load produced	a5	kg/day	1.605	1.605	1.605	1.605	1.605	1.605		
2) Flow out ratio	r5-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow down ratio	r5-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r5-3 (r5-1xr5-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D5= a5 x r5	kg/day	161	161	161	161	161	161		
A6.Pollution load (Sub-basin B631)										
1) Pollution load produced	a6	kg/day	248	248	248	248	248	248		
2) Flow-out ratio	r6-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r6-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r6-3 (r6-1xr6-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D6= a6 x r6	kg/day	52	52	52	52	52	52		
A7.Pollution load (Sub-basin B632)										
1) Pollution load produced	a7	kg/day	812	812	812	812	812	812		
2) Flow-out ratio	r7-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r7-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r7-3 (r7-1xr7-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	D7= a7 x r7	kg/day	195	195	195	195	195	195		
A8.Total run-off pollution load from domestic waste water	Dd=D1+---D7	kg/day	1.227	1.227	1.227	1.227	1.227	1.227		
B.Industria waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	98.054	98.054	98.054	98.054	98.054	98.054		
2) Flow-out ratio	r11-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow down ratio	r11-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4) Run-off ratio	r11 (r11-1xr11-1)	-	0.2	0.2	0.2	0.2	0.2	0.2		
5) Run-off pollution load	I1= b1 x r11	kg/day	19.611	19.611	19.611	19.611	19.611	19.611		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	41.535	41.535	41.535	41.535	41.535	41.535		
2) Flow-out ratio	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow down ratio	r12-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4) Run-off ratio	r12 (r12-1xr12-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I2= b2 x r12	kg/day	7.269	7.269	7.269	7.269	7.269	7.269		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	6.586	6.586	6.586	6.586	6.586	6.586		
2) Flow-out ratio	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r13-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4) Run-off ratio	r13 (r13-1xr13-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I3=b3xr13	kg/day	1.153	1.153	1.153	1.153	1.153	1.153		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	28.032	28.032	28.032	28.032	28.032	28.032		
C.Agricultural pollution load										
C1 Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1= c1 x r21	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	6.934	6.934	6.934	6.934	6.934	6.934		
2) Flow out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow down ratio	r22-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r22 (r22-1xr22-2)	-	0.01	0.01	0.01	0.01	0.01	0.01		
5) Run-off pollution load	A2= c1 x r22	kg/day	69	69	69	69	69	69		
C3.Total run-off pollution load from agriculture	Ad= A1+A2	kg/day	69	69	69	69	69	69		
D.Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	10.358	10.358	10.358	10.358	10.358	10.358		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow down ratio	r31-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r31 (r31-1xr31-2)	-	0.01	0.01	0.01	0.01	0.01	0.01		
5) Run-off pollution load	Od= d1 x r31	kg/day	104	104	104	104	104	104		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	15.7	11.1	11.2	14.0	7.9	7.9	11.2	14.0
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	30.975	30.936	31.096	30.904	30.866	30.847	30.937	
2)Water flow	Q	m3/s	12.8	12.8	12.8	12.8	12.8	12.8		
3)Water quality	C=L/Q	mg/l	28.6	28.0	28.1	27.9	27.9	27.9	28.0	25.0

Note : *Pollution load from fields is included in other sources.

WQ-16

Items		units	Jun	Jul	Aug	Sep	Oct	Nov	Average	95%Va
I.Pollution load from upstream										
1)Water quality of Karangpilang (IC-05)	C0	mg/l								
2)Water flow of Karangpilang	Q0	m3/s								
3)Pollution load from upstream	(C0-C0)xQ0	kg/day	30.975	30.936	31.096	30.904	30.566	30.847		
4)Run-off pollution load from upstream	(C0-C0)xQ0	kg/day	4.646	4.540	4.664	4.636	4.530	4.627		
II.Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin BS-K)	a1	kg/day	1.511	1.511	1.511	1.511	1.511	1.511		
1)Pollution load produced										
2)Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3)Flow-down ratio	r1-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4)Run-off ratio	r1 (r1-1xr1-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5)Run-off pollution load	D1= a1 x r1	kg/day	544	544	544	544	544	544		
A2.Pollution load (Sub-basin B641)	a2	kg/day	427	427	427	427	427	427		
1)Pollution load produced										
2)Flow-out ratio	r2-1	-	0.6	0.6	0.6	0.6	0.6	0.6		
3)Flow-down ratio	r2-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	r2 (r2-1xr2-2)	-	0.12	0.12	0.12	0.12	0.12	0.12		
5)Run-off pollution load	D2= a2 x r2	kg/day	51	51	51	51	51	51		
A3.Pollution load (Sub-basin B542)	a3	kg/day	1.867	1.867	1.867	1.867	1.867	1.867		
1)Pollution load produced										
2)Flow-out ratio	r3-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3)Flow-down ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4)Run-off ratio	r3 (r3-1xr3-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5)Run-off pollution load	D3= a3 x r3	kg/day	392	392	392	392	392	392		
A4.Pollution load (Sub-basin B643)	a4	kg/day	8.921	8.921	8.921	8.921	8.921	8.921		
1)Pollution load produced										
2)Flow-out ratio	r4-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3)Flow-down ratio	r4-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4)Run-off ratio	r4 (r4-1xr4-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5)Run-off pollution load	D4= a4 x r4	kg/day	3.212	3.212	3.212	3.212	3.212	3.212		
A5.Pollution load (Sub-basin B644)	a5	kg/day	4.313	4.313	4.313	4.313	4.313	4.313		
1)Pollution load produced										
2)Flow-out ratio	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3)Flow-down ratio	r5-2	-	0.7	0.7	0.7	0.7	0.7	0.7		
4)Run-off ratio	r5-3 (r5-1xr5-2)	-	0.63	0.63	0.63	0.63	0.63	0.63		
5)Run-off pollution load	D5= a5 x r5	kg/day	2.717	2.717	2.717	2.717	2.717	2.717		
A6.Total run-off pollution load from domestic waste water	D0=D1+D2+D3+D4+D5	kg/day	6.916	6.916	6.916	6.916	6.916	6.916		
B.Industria waste water										
B1.Pollution load from major producers	b1	kg/day	4.948	4.948	4.948	4.948	4.948	4.948		
1)Pollution load produced										
2)Flow-out ratio	rt1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3)Flow-down ratio	rt1-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4)Run-off ratio	rt1 (rt1-1xrt1-1)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5)Run-off pollution load	I1= b1 x rt1	kg/day	1.781	1.781	1.781	1.781	1.761	1.781		
B2.Pollution load from large and medium scale industries	b2	kg/day	27.476	27.476	27.476	27.476	27.476	27.476		
1)Pollution load produced										
2)Flow-out ratio	rt2-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3)Flow-down ratio	rt2-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4)Run-off ratio	rt2 (rt2-1xrt2-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5)Run-off pollution load	I2= b2 x rt2	kg/day	7.693	7.693	7.693	7.693	7.693	7.693		
B3.Pollution load from small scale industries	b3	kg/day	4.851	4.851	4.851	4.851	4.851	4.851		
1)Pollution load produced										
2)Flow-out ratio	rt3-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3)Flow-down ratio	rt3-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4)Run-off ratio	rt3 (rt3-1xrt3-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5)Run-off pollution load	I3= b3 x rt3	kg/day	1.358	1.358	1.358	1.358	1.358	1.358		
B4.Total run-off pollution load from the industries	I0=I1+I2+I3	kg/day	10.833	10.833	10.833	10.833	10.833	10.833		
C.Agricultural pollution load										
C1.Pollution load from fields *	c1	kg/day								
1)Pollution load produced										
2)Flow-out ratio	r21-1	-								
3)Flow-down ratio	r21-2	-								
4)Run-off ratio	c21 (r21-1xr21-2)	-								
5)Run-off pollution load	A1= c1x r21	kg/day								
C2.Pollution load from livestock	c2	kg/day	2.203	2.203	2.203	2.203	2.203	2.203		
1)Pollution load produced										
2)Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3)Flow-down ratio	r22-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4)Run-off ratio	r22(r22-1xr22-2)	-	0.02	0.02	0.02	0.02	0.02	0.02		
5)Run-off pollution load	A2= c1 x r22	kg/day	44	44	44	44	44	44		
C3.Total run-off pollution load from agriculture	A0=A1+A2	kg/day	44	44	44	44	44	44		
D.Other sources										
D1.Pollution load from others	d1	kg/day	5.435	5.435	5.435	5.435	5.435	5.435		
1)Pollution load produced										
2)Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3)Flow-down ratio	r31-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4)Run-off ratio	r31 (r31-1xr31-2)	-	0.02	0.02	0.02	0.02	0.02	0.02		
5)Run-off pollution load	O0= d1 x r31	kg/day	109	109	109	109	109	109		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	6.1	6.0	8.0	9.8	7.3	6.3	7.3	8.0
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+D0+I0+A0+O0	kg/day	22.548	22.542	22.566	22.537	22.532	22.529	22.542	
2)Water flow	Q	m3/s	12.8	12.8	12.8	12.8	12.8	12.8	12.8	
3)Water quality	C=L/Q	mg/l	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4

Note : *Pollution load from fields is included in other sources.

Table-2(8) Calculation of Water Quality (BOD) at Kayoon (2020 : without project)

Items		units	Jan	Feb	Aug	Sep	Oct	Nov	Ave (D)	75%Y,1
I.Pollution load from upstream										
1) Water quality of Jetis Bridge (H,O)	C0	mg/l								
2) Water flow of Jetis Bridge	Q0	m3/s								
3) Pollution load from upstream	L0=C0×Q0	kg/day	22.548	22.542	22.566	22.537	22.532	22.529		
4) Run-off pollution load from upstream	L0=C0×Q0	kg/day	4.510	4.508	4.513	4.507	4.506	4.506		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub basin B645)		kg/day	1.213	1.213	1.213	1.213	1.213	1.213		
1) Pollution load produced	a1									
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1= a1 × r1	kg/day	437	437	437	437	437	437		
A2.Pollution load (Sub basin B645)		kg/day	1.809	1.809	1.809	1.809	1.809	1.809		
1) Pollution load produced	a2									
2) Flow-out ratio	r2-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r2-2	-	0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	r2 (r2-1×r2-2)	-	0.54	0.54	0.54	0.54	0.54	0.54		
5) Run-off pollution load	D2= a2 × r2	kg/day	977	977	977	977	977	977		
A3.Total run-off pollution load from domestic waste water	Dd=D1+D2	kg/day	1.414	1.414	1.414	1.414	1.414	1.414		
B.Industrial waste water										
B1.Pollution load from major producers		kg/day	0	0	0	0	0	0		
1) Pollution load produced	b1									
2) Flow-out ratio	r11-1	-								
3) Flow-down ratio	r11-2	-								
4) Run-off ratio	r11 (r11-1×r11-2)	-								
5) Run-off pollution load	I1= b1 × r11	kg/day	0	0	0	0	0	0		
B2.Pollution load from large and medium scale industries		kg/day	3.705	3.705	3.705	3.705	3.705	3.705		
1) Pollution load produced	b2									
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	I2= b2 × r12	kg/day	1.667	1.667	1.667	1.667	1.667	1.667		
B3.Pollution load from small scale industries		kg/day	580	580	580	580	580	580		
1) Pollution load produced	b3									
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	I3= b3×r13	kg/day	261	261	261	261	261	261		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	1.928	1.928	1.928	1.928	1.928	1.928		
C.Agricultural pollution load										
C1.Pollution load from fields*		kg/day								
1) Pollution load produced	c1									
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1× r21	kg/day								
C2.Pollution load from livestock		kg/day	91	91	91	91	91	91		
1) Pollution load produced	c2									
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	A2= c2 × r22	kg/day	2	2	2	2	2	2		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	2	2	2	2	2	2		
D.Other sources										
D1.Pollution load from others		kg/day	580	580	580	580	580	580		
1) Pollution load produced	d1									
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	Od= d1 × r31	kg/day	15	15	15	15	15	15		
III.Water quality at control point										
E.Water quality monitored										
1) 1994		mg/l			6.2					6.2
2) Average (1992-1996)										
3) Median (1992-1996)										
F.Result of calculation										
1) Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	7.868	7.867	7.872	7.866	7.865	7.864	7.867	
2) Water flow	Q	m3/s							8.1	8.1
3) Water quality	C=L/Q	mg/l			11.2				11.2	11.2

Note : *Pollution load from fields is included in other sources

Table-3(9) Caluculation of Water Quality (BOD) at Pelajaran (2020 : without project)

Items		units	Jan.	Feb.	Avg.	Sep.	Oct.	Nov.	Ave.(Dry)	95%V.C
I.Pollution load from upstream										
1)Water quality of inside of water shed	C0	mg/l			25.9					
2)Water flow of inside of water shed	Q0	m3/s			6.0					
3)Pollution load from upstream	L0=C0xQ0	kg/day			12.960					
4) Run-off pollution load from upstream	L0=C0xQ0	kg/day			254					
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load										
1)Pollution load produced	a1	kg/day	114	114	114	114	114	114		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r1 (r11-1xr11-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	D1= a1 x r1	kg/day	21	21	21	21	21	21		
A2.Total run-off pollution load from domestic waste water	Dd=D1	kg/day	21	21	21	21	21	21		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	430,500	430,500	430,500	430,500	430,500	430,500		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.02	0.02	0.02	0.02	0.02	0.02		
4) Run-off ratio	r11 (r11-1xr11-1)	-	0.018	0.018	0.018	0.018	0.018	0.018		
5) Run-off pollution load	I1= b1 x r11	kg/day	7,749	7,749	7,749	7,749	7,749	7,749		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	205	205	205	205	205	205		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r12 (r12-1xr12-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I2= b2 x r12	kg/day	37	37	37	37	37	37		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	33	33	33	33	33	33		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r13 (r13-1xr13-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I3=b3 x r13	kg/day	6	6	6	6	6	6		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	7,792	7,792	7,792	7,792	7,792	7,792		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1= c1 x r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	56	56	56	56	56	56		
2) Flow-out ratio	r22-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r22-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r22(r22-1xr22-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	A2= c2 x r22	kg/day	2	2	2	2	2	2		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	2	2	2	2	2	2		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	113	113	113	113	113	113		
2) Flow-out ratio	r31-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r31-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r31 (r31-1xr31-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	Od= d1 x r31	kg/day	5	5	5	5	5	5		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l			12.9					12.9
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	7,819	7,819	8,076	7,819	7,819	7,819	7,562	
2)Water flow	Q	m3/s			3.2				3.2	
3)Water quality	C=L/Q	mg/l			29.2				29.2	

Note : *Pollution load from fields is included in other sources

Table-2(10) Caluculation of Water Quality (BOD) at Porong (2020 : without project)

Items		units	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Ave.(Dry)	75% Val
I.Pollution load from upstream										
1) Water quality of intake of river canal	C0	mg/l								
2) Water flow of intake of river canal	Q0	m3/s								
3) Pollution load from upstream	L0=C0xQ0	kg/day								
4) Run-off pollution load from upstream	l0=C0 x r0	kg/day								
II. Pollution load from whole basin										
A.Domestic waste water										
A1 Pollution load										
1) Pollution load produced	a1	kg/day	38	38	38	38	38	38		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r1 (r1-1xr1-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D1=a1 x r1	kg/day	27	27	27	27	27	27		
A2.Total run-off pollution load from domestic waste water	Dd=D1	kg/day	27	27	27	27	27	27		
B.Industrial waste water										
B1.Pollution load from major polluters										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r11-1	-								
3) Flow-down ratio	r11-2	-								
4) Run-off ratio	r11 (r11-1xr11-1)	-	0	0	0	0	0	0		
5) Run-off pollution load	l1=b1 x r11	kg/day	0	0	0	0	0	0		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	68	68	68	68	68	68		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r12 (r12-1xr12-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	l2=b2x r12	kg/day	49	49	49	49	49	49		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	11	11	11	11	11	11		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r13 (r13-1xr13-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	l3=b3xr13	kg/day	8	8	8	8	8	8		
B4.Total run-off pollution load from the industries	Id=l1+l2+l3	kg/day	57	57	57	57	57	57		
C.Agricultural pollution load										
C1 Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1=c1 x r21	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	19	19	19	19	19	19		
2) Flow-out ratio	r22-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r22-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r22 (r22-1xr22-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	A2=c2 x r22	kg/day	3.04	3.04	3.04	3.04	3.04	3.04		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	3.04	3.04	3.04	3.04	3.04	3.04		
D.Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	38	38	38	38	38	38		
2) Flow-out ratio	r31-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r31-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r31 (r31-1xr31-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	Od= d1 x r31	kg/day	6.00	6.00	6.00	6.00	6.00	6.00		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l				9.3				9.3
2)Average(1990-1996)										
3)Median (1990-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	93	93	93	93	93	93		93
2)Water flow	Q	m3/s				0.06				0.06
3)Water quality	C=L/Q	mg/l				18.0				18.0

Note : *Pollution load from fields is included in other sources

Table-X(1) Caluculation of Water Quality (BOD) at Bemiayu Bridge (2020 : Case-I)

Item		unit								
1.Pollution load from upstream										
1)Water quality	C0	mg/l								
2)Water flow	Q0	m3/s								
3)Pollution load from upstream	L0=C0×Q0	kg/day								
4)Run-off pollution load from upstream	L0	kg/day								
II. Pollution load from sub-basin										
A.Domestic waste water										
A1 Pollution load (Sub-basin B000)	a1	kg/day	897	897	897	897	897	897		
1) Pollution load produced	r1-1	-	0.3	0.3	0.3	0.3	0.3	0.3		
2) Flow-out ratio	r1-2	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r1 (r1-1×r1-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
4) Run-off ratio	D1=a1×r1	kg/day	27	27	27	27	27	27		
5) Run-off pollution load										
A2 Pollution load (Sub-basin B001)	a2	kg/day	757	757	757	757	757	757		
1) Pollution load produced	r2-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
2) Flow-out ratio	r2-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
3) Flow-down ratio	r2 (r2-1×r2-2)	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	D2=a2×r2	kg/day	151	151	151	151	151	151		
5) Run-off pollution load										
A3 Pollution load (Sub-basin B020)	a3	kg/day	6,509	6,509	6,509	6,509	6,509	6,509		
1) Pollution load produced	r3-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
2) Flow-out ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r3 (r3-1×r3-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
4) Run-off ratio	D3=a3×r3	kg/day	1,367	1,367	1,367	1,367	1,367	1,367		
5) Run-off pollution load										
A4 Pollution load (Sub-basin B021)	a4	kg/day	9,215	9,215	9,215	9,215	9,215	9,215		
1) Pollution load produced	r4-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
2) Flow-out ratio	r4-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r4 (r4-1×r4-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
4) Run-off ratio	D4=a4×r4	kg/day	1,935	1,935	1,935	1,935	1,935	1,935		
5) Run-off pollution load										
A5 Pollution load (Sub-basin B022)	a5	kg/day	3,021	3,021	3,021	3,021	3,021	3,021		
1) Pollution load produced	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
2) Flow-out ratio	r5-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r5-3 (r5-1×r5-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
4) Run-off ratio	D5=a5×r5	kg/day	2,177	2,177	2,177	2,177	2,177	2,177		
5) Run-off pollution load										
A6 Total run-off pollution load from domestic waste water	D6=D1+D2+D3+D4+D5	kg/day	5,657	5,657	5,657	5,657	5,657	5,657		
B.Industrial waste water										
B1 Pollution load from major producers	b1	kg/day	206	206	206	206	206	206		
1) Pollution load produced	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
2) Flow-out ratio	r11-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r11 (r11-1×r11-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
4) Run-off ratio	I1=b1×r11	kg/day	93	93	93	93	93	93		
5) Run-off pollution load										
B2 Pollution load from large and medium scale industries	b2	kg/day	14,220	14,220	14,220	14,220	14,220	14,220		
1) Pollution load produced	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
2) Flow-out ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
3) Flow-down ratio	r12 (r12-1×r12-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
4) Run-off ratio	I2=b2×r12	kg/day	3,982	3,982	3,982	3,982	3,982	3,982		
5) Run-off pollution load										
B3 Pollution load from small scale industries	b3	kg/day	3,432	3,432	3,432	3,432	3,432	3,432		
1) Pollution load produced	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
2) Flow-out ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
3) Flow-down ratio	r13 (r13-1×r13-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
4) Run-off ratio	I3=b3×r13	kg/day	961	961	961	961	961	961		
5) Run-off pollution load										
B4 Total run-off pollution load from the industries	I4=I1+I2+I3	kg/day	5,035	5,035	5,035	5,035	5,035	5,035		
C.Agricultural pollution load										
C1 Pollution load from fields*	c1	kg/day								
1) Pollution load produced	r21-1	-								
2) Flow-out ratio	r21-2	-								
3) Flow-down ratio	r21 (r21-1×r21-2)	-								
4) Run-off ratio	A1=c1×r21	kg/day								
5) Run-off pollution load										
C2 Pollution load from livestock	c2	kg/day	21,276	21,276	21,276	21,276	21,276	21,276		
1) Pollution load produced	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
2) Flow-out ratio	r22-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r22 (r22-1×r22-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
4) Run-off ratio	A2=c1×r22	kg/day	638	638	638	638	638	638		
5) Run-off pollution load										
C3 Total run-off pollution load from agriculture	A4=A1+A2	kg/day	638	638	638	638	638	638		
D.Other sources										
D1 Pollution load from others	d1	kg/day	36,620	36,620	36,620	36,620	36,620	36,620		
1) Pollution load produced	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
2) Flow-out ratio	r31-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r31 (r31-1×r31-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
4) Run-off ratio	Od=d1×r31	kg/day	1,099	1,099	1,099	1,099	1,099	1,099		
5) Run-off pollution load										
III.Water quality at control point										
E.Water quality monitored		mg/l	8.3	9.1	7.8	8.6	7.5	7.5	8.2	8.4
1)1994										
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Od+I4+A4+Od	kg/day	12,429	12,429	12,429	12,429	12,429	12,429		
2)Water flow	Q	m3/s	10.0	10.0	10.0	10.0	10.0	10.0		
3)Water quality	C=L/Q	mg/l	14.4	14.4	14.4	14.4	14.4	14.4		14.4

Note : *Pollution load from fields is included in other sources.

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Table-3(2) Caluculation of Water Quality (BOD) at Demangan Bridge (2020 : Case-1)

Item		unit	T-P	T-N	COD	BOD	SS	Arg(Org)	T/S Vol
I.Pollution load from up stream									
1)Water quality of Ledoyo Dam (SO)	C0	mg/l	2.0	2.3	4.3	6.6	4.3	3.8	
2)Water flow of Ledoyo Dam	Q0	m3/s	720	660	610	570	1070	730	
3)Pollution load from up stream	L0=C0xQ0	kg/day	12442	1480	22663	32504	39753	23567	
4)Run-off pollution load from up stream	L0=K0xQ0	kg/day	2483	240	4533	6501	7953	4753	
II.Pollution load from sub basin									
A.Domestic waste water									
A1.Pollution load (Sub-basin B142)									
1)Pollution load produced	a1	kg/day	1312	1312	1312	1312	1312	1312	
2)Flow-out ratio	r1-1	-	0.8	0.8	0.8	0.8	0.8	0.8	
3)Flow-down ratio	r1-2	-	0.2	0.2	0.2	0.2	0.2	0.2	
4)Run-off ratio	r1 (r1-1xr1-2)	-	0.16	0.16	0.16	0.16	0.16	0.16	
5)Run-off pollution load	D1= a1 x r1	kg/day	210	210	210	210	210	210	
A2.Pollution load (Sub-basin B130)									
1)Pollution load produced	a2	kg/day	1731	1731	1731	1731	1731	1731	
2)Flow-out ratio	r2-1	-	0.8	0.8	0.8	0.8	0.8	0.8	
3)Flow-down ratio	r2-2	-	0.3	0.3	0.3	0.3	0.3	0.3	
4)Run-off ratio	r2 (r2-1xr2-2)	-	0.24	0.24	0.24	0.24	0.24	0.24	
5)Run-off pollution load	D2= a2 x r2	kg/day	415	415	415	415	415	415	
A3.Pollution load (Sub-basin B153)									
1)Pollution load produced	a3	kg/day	732	732	732	732	732	732	
2)Flow-out ratio	r3-1	-	0.8	0.8	0.8	0.8	0.8	0.8	
3)Flow-down ratio	r3-2	-	0.4	0.4	0.4	0.4	0.4	0.4	
4)Run-off ratio	r3 (r3-1xr3-2)	-	0.32	0.32	0.32	0.32	0.32	0.32	
5)Run-off pollution load	D3= a3 x r3	kg/day	234	234	234	234	234	234	
A4.Total run-off pollution load from domestic waste water	Od=D1+D2+D3	kg/day	860	860	860	860	860	860	
B.Industria waste water									
B1.Pollution load from major producers									
1)Pollution load produced	b1	kg/day	6221	6221	6221	6221	6221	6221	
2)Flow-out ratio	r11-1	-	0.3	0.3	0.3	0.3	0.3	0.3	
3)Flow-down ratio	r11-2	-	0.2	0.2	0.2	0.2	0.2	0.2	
4)Run-off ratio	r11 (r11-2xr11-1)	-	0.06	0.06	0.06	0.06	0.06	0.06	
5)Run-off pollution load	I1= b1 x r11	kg/day	373	373	373	373	373	373	
B2.Pollution load from large and medium scale industries									
1)Pollution load produced	b2	kg/day	2808	2808	2808	2808	2808	2808	
2)Flow-out ratio	r12-1	-	0.8	0.8	0.8	0.8	0.8	0.8	
3)Flow-down ratio	r12-2	-	0.3	0.3	0.3	0.3	0.3	0.3	
4)Run-off ratio	r12 (r12-2xr12-1)	-	0.24	0.24	0.24	0.24	0.24	0.24	
5)Run-off pollution load	I2= b2 x r12	kg/day	674	674	674	674	674	674	
B3.Pollution load from small scale industries									
1)Pollution load produced	b3	kg/day	617	617	617	617	617	617	
2)Flow-out ratio	r13-1	-	0.8	0.8	0.8	0.8	0.8	0.8	
3)Flow-down ratio	r13-2	-	0.3	0.3	0.3	0.3	0.3	0.3	
4)Run-off ratio	r13 (r13-1xr13-2)	-	0.24	0.24	0.24	0.24	0.24	0.24	
5)Run-off pollution load	I3=b3xr13	kg/day	148	148	148	148	148	148	
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	1195	1195	1195	1195	1195	1195	
C.Agricultural pollution load									
C1.Pollution load from fields*									
1)Pollution load produced	c1	kg/day							
2)Flow-out ratio	r21-1	-							
3)Flow-down ratio	r21-2	-							
4)Run-off ratio	r21 (r21-1xr21-2)	-							
5)Run-off pollution load	A1= c1 x r21	kg/day							
C2.Pollution load from livestock									
1)Pollution load produced	c2	kg/day	11258	11258	11258	11258	11258	11258	
2)Flow-out ratio	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1	
3)Flow-down ratio	r22-2	-	0.3	0.3	0.3	0.3	0.3	0.3	
4)Run-off ratio	r22(r22-1xr22-2)	-	0.03	0.03	0.03	0.03	0.03	0.03	
5)Run-off pollution load	A2= c1 x r22	kg/day	338	338	338	338	338	338	
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	338	338	338	338	338	338	
D.Other sources									
D1.Pollution load from others									
1)Pollution load produced	d1	kg/day	10650	10650	10650	10650	10650	10650	
2)Flow-out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1	
3)Flow-down ratio	r31-2	-	0.3	0.3	0.3	0.3	0.3	0.3	
4)Run-off ratio	r31 (r31-1xr31-2)	-	0.03	0.03	0.03	0.03	0.03	0.03	
5)Run-off pollution load	Oe= d1 x r31	kg/day	319	319	319	319	319	319	
III.Water quality at control point									
E.Water quality monitored									
1)1994		mg/l	2.6	3.6	4.3	7.5	2.6	3.5	4.1	4.3
2)Average (1992-1996)									
3)Median (1992-1996)									
F.Result of calculation									
1)Total run-off pollution load	L=L0+Od+Id+Ad+Od	kg/day	5200	2993	7244	9242	10662	7505	3135	
2)Water flow	Q	m3/s	626	626	626	626	626	626	626	
3)Water quality	C=L/Q	mg/l	1.0	0.6	1.3	1.7	2.0	1.4	1.3	1.7

Note : *Pollution load from fields is included in other sources

Table-3(3) Caluculation of Water Quality (BOD) at Jogbriu Bridge (2020 : Case-I)

Items		units	water	Tan	Id	Avg	Imo	AK	Nn	A+iDe	?iWd
I.Pollution load from upstream											
1)Water quality of Ngonggo Tambangan (2000)	C0	mg/l	6.3	4.8	10.5	3.9	3.8	4.7		
2)Water flow of Ngonggo Tambangan	Q0	m3/s	141.0	56.9	55.5	65.9	52.4	41.9		
3)Pollution load from upstream	L0=C0xQ0	kg/day	76.349	23.548	50.405	21.962	17.205	17.015		
C Run-off pollution load from upstream	Lo=C0xQ0	kg/day	15.350	4.726	10.088	4.390	3.441	3.403		
II. Pollution load from sub-basin											
A Domestic waste water											
A1 Pollution load (Sub-basin B3-0)											
1) Pollution load produced	a1	kg/day	2.662	2.662	2.662	2.662	2.662	2.662		
2) Flow-out ratio	r1-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r1-2	-	0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	r1 (r1-1xr1-2)	-	0.08	0.08	0.08	0.08	0.08	0.08		
5) Run-off pollution load	D1= a1 x r1	kg/day	213	213	213	213	213	213		
A2 Pollution load (Sub-basin B3-1)											
1) Pollution load produced	a2	kg/day	2.530	2.530	2.530	2.530	2.530	2.530		
2) Flow-out ratio	r2-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r2-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r2 (r2-1xr2-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	D2= a2 x r2	kg/day	405	405	405	405	405	405		
A3.Pollution load (Sub-basin B3-2)											
1) Pollution load produced	a3	kg/day	211	211	211	211	211	211		
2) Flow-out ratio	r3-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1xr3-2)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D3= a3 x r3	kg/day	57	57	57	57	57	57		
A4.Pollution load (Sub-basin B3-3)											
1) Pollution load produced	a4	kg/day	297	297	297	297	297	297		
2) Flow-out ratio	r4-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r4-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r4 (r4-1xr4-2)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D4= a4 x r4	kg/day	80	80	80	80	80	80		
A5.Pollution load (Sub-basin B3-4)											
1) Pollution load produced	a5	kg/day	11	11	11	11	11	11		
2) Flow-out ratio	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r5-3 (r5-1xr5-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	D5= a5 x r5	kg/day	5	5	5	5	5	5		
A6.Pollution load (Sub-basin B3-5)											
1) Pollution load produced	a6	kg/day	1.504	1.504	1.504	1.504	1.504	1.504		
2) Flow-out ratio	r6-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r6-2	-	0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	r6-3 (r6-1xr6-2)	-	0.48	0.48	0.48	0.48	0.48	0.48		
5) Run-off pollution load	D6= a6 x r6	kg/day	722	722	722	722	722	722		
A7.Pollution load (Sub-basin B3-6)											
1) Pollution load produced	a7	kg/day	170	170	170	170	170	170		
2) Flow-out ratio	r7-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r7-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r7-3 (r7-1xr7-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D7= a7 x r7	kg/day	122	122	122	122	122	122		
A8.Pollution load (Sub-basin B3-7)											
1) Pollution load produced	a8	kg/day	2.916	2.916	2.916	2.916	2.916	2.916		
2) Flow-out ratio	r8-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r8-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r8-3 (r8-1xr8-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D8= a8 x r8	kg/day	612	612	612	612	612	612		
A9 Total run-off pollution load from domestic waste water	Dd=D1+...+D8	kg/day	2.217	2.217	2.217	2.217	2.217	2.217		
B.Industria waste water											
B1.Pollution load from major producers											
1) Pollution load produced	b1	kg/day	55.815	55.815	55.815	55.815	55.815	55.815		
2) Flow-out ratio	r11-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r11-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r11 (r11-1xr11-1)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	I1= b1 x r11	kg/day	1.395	1.395	1.395	1.395	1.395	1.395		
B2.Pollution load from large and medium scale industries											
1) Pollution load produced	b2	kg/day	3.799	3.799	3.799	3.799	3.799	3.799		
2) Flow-out ratio	r12-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r12-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r12 (r12-1xr12-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	I2= b2 x r12	kg/day	380	380	380	380	380	380		
B3 Pollution load from small scale industries											
1) Pollution load produced	b3	kg/day	791	791	791	791	791	791		
2) Flow-out ratio	r13-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r13-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r13 (r13-1xr13-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	I3=b3xr13	kg/day	79	79	79	79	79	79		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	1.854	1.854	1.854	1.854	1.854	1.854		
C.Agricultural pollution load											
C1 Pollution load from fields *											
C1 Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1= c1 x r21	kg/day								
C2 Pollution load from livestock											
1) Pollution load produced	c2	kg/day	24.838	24.838	24.838	24.838	24.838	24.838		
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r22 (r22-1xr22-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	A2= c2 x r22	kg/day	621	621	621	621	621	621		
C3 Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	621	621	621	621	621	621		
D.Other sewers											
D1 Pollution load from others											
1) Pollution load produced	d1	kg/day	12.280	12.280	12.280	12.280	12.280	12.280		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r31 (r31-1xr31-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	Od= d1 x r31	kg/day	307	307	307	307	307	307		
III. Water quality at control point											
E.Water quality monitored											
1)1996		mg/l	3.5	3.8	11.9	3.4	7.7	4.5	5.8	7.7
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation											
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	20.349	9.718	15.087	9.379	8.440	8.402	11.996	
2)Water flow	Q	m3/s	58.2	58.2	58.2	58.2	58.2	58.2	58.2	
3)Water quality	C=L/Q	mg/l	4.0	1.9	3.0	1.9	1.7	1.7	2.4	3.0

Note : *Pollution load from fields is included in other sewers

WQ-23

Items		units			Aug	Sep	Oct	Nov	Ave.Flow	75% Val
I. Pollution load from upstream										
1) Water quality of Bero Tambangan (BOD)	C0	mg/l	2.5	1.9	4.9	6.5	4.9	2.5		
2) Water flow of Bero Tambangan	Q0	m3/s	79.5	77.6	33.9	16.2	50.0	12.6		
3) Pollution load from upstream	L0=C0×Q0	kg/day	17,173	12,739	30,565	9,215	50.0	2,969		
4) Run-off pollution load from upstream	L0=C0×Q0	kg/day	6,823	5,236	12,226	3,695	2015	1,176		
II. Pollution load from sub-basin										
A. Domestic waste water										
A1 Pollution load (Sub-basin BS01)										
1) Pollution load produced	a1	kg/day	642	642	642	642	642	642		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.9	0.9	0.9	0.9	0.9	0.9		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.81	0.81	0.81	0.81	0.81	0.81		
5) Run-off pollution load	D1= a1 × r1	kg/day	520	520	520	520	520	520		
A2 Pollution load (Sub-basin BS04)										
1) Pollution load produced	a2	kg/day	1,700	1,700	1,700	1,700	1,700	1,700		
2) Flow-out ratio	r2-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r2-2	-	0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	r2 (r2-1×r2-2)	-	0.05	0.05	0.05	0.05	0.05	0.05		
5) Run-off pollution load	D2= a2 × r2	kg/day	85	85	85	85	85	85		
A3 Pollution load (Sub-basin BS05)										
1) Pollution load produced	a3	kg/day	655	655	655	655	655	655		
2) Flow-out ratio	r3-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1×r3-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D3= a3 × r3	kg/day	138	138	138	138	138	138		
A4 Pollution load (Sub-basin BS06)										
1) Pollution load produced	a4	kg/day	446	446	446	446	446	446		
2) Flow-out ratio	r4-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r4-2	-	0.7	0.7	0.7	0.7	0.7	0.7		
4) Run-off ratio	r4 (r4-1×r4-2)	-	0.56	0.56	0.56	0.56	0.56	0.56		
5) Run-off pollution load	D4= a4 × r4	kg/day	250	250	250	250	250	250		
A5 Pollution load (Sub-basin BS07)										
1) Pollution load produced	a5	kg/day	73	73	73	73	73	73		
2) Flow-out ratio	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	-	0.9	0.9	0.9	0.9	0.9	0.9		
4) Run-off ratio	r5 (r5-1×r5-2)	-	0.81	0.81	0.81	0.81	0.81	0.81		
5) Run-off pollution load	D5= a5 × r5	kg/day	59	59	59	59	59	59		
A6 Pollution load (Sub-basin BS10)										
1) Pollution load produced	a6	kg/day	1,295	1,295	1,295	1,295	1,295	1,295		
2) Flow-out ratio	r6-1	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r6-2	-	0.05	0.05	0.05	0.05	0.05	0.05		
4) Run-off ratio	r6 (r6-1×r6-2)	-	0.015	0.015	0.015	0.015	0.015	0.015		
5) Run-off pollution load	D6= a6 × r6	kg/day	19	19	19	19	19	19		
A7 Pollution load (Sub-basin BS11)										
1) Pollution load produced	a7	kg/day	3,246	3,246	3,246	3,246	3,246	3,246		
2) Flow-out ratio	r7-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r7-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r7 (r7-1×r7-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D7= a7 × r7	kg/day	325	325	325	325	325	325		
A8 Pollution load (Sub-basin BS12)										
1) Pollution load produced	a8	kg/day	5,593	5,593	5,593	5,593	5,593	5,593		
2) Flow-out ratio	r8-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r8-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r8 (r8-1×r8-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D8= a8 × r8	kg/day	559	559	559	559	559	559		
A9 Pollution load (Sub-basin BS13)										
1) Pollution load produced	a9	kg/day	361	361	361	361	361	361		
2) Flow-out ratio	r9-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r9-2	-	0.7	0.7	0.7	0.7	0.7	0.7		
4) Run-off ratio	r9 (r9-1×r9-2)	-	0.56	0.56	0.56	0.56	0.56	0.56		
5) Run-off pollution load	D9= a9 × r9	kg/day	202	202	202	202	202	202		
A10 Pollution load (Sub-basin BS14)										
1) Pollution load produced	a10	kg/day	5,144	5,144	5,144	5,144	5,144	5,144		
2) Flow-out ratio	r10-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r10-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r10 (r10-1×r10-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D10= a10 × r10	kg/day	514	514	514	514	514	514		
A11 Pollution load (Sub-basin BS15)										
1) Pollution load produced	a11	kg/day	1,115	1,115	1,115	1,115	1,115	1,115		
2) Flow-out ratio	r11-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r11-2	-	0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	r11 (r11-1×r11-2)	-	0.42	0.42	0.42	0.42	0.42	0.42		
5) Run-off pollution load	D11= a11 × r11	kg/day	468	468	468	468	468	468		
A12 Total run-off pollution load from domestic waste water	Dd=D1+···+D11	kg/day	3,559	3,559	3,559	3,559	3,559	3,559		
B. Industrial waste water										
B1 Pollution load from major producers										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	f1-1	-								
3) Flow-down ratio	f1-2	-								
4) Run-off ratio	f1 (f1-1×f1-2)	-	0	0	0	0	0	0		
5) Run-off pollution load	I1=b1 × f1	kg/day	0	0	0	0	0	0		
B2 Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	3,875	3,875	3,875	3,875	3,875	3,875		
2) Flow-out ratio	f2-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	f2-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	f2 (f2-1×f2-2)	-	0.4	0.4	0.4	0.4	0.4	0.4		
5) Run-off pollution load	I2=b2 × f2	kg/day	1,550	1,550	1,550	1,550	1,550	1,550		
B3 Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	1,028	1,028	1,028	1,028	1,028	1,028		
2) Flow-out ratio	f3-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	f3-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	f3 (f3-1×f3-2)	-	0.4	0.4	0.4	0.4	0.4	0.4		
5) Run-off pollution load	I3=b3 × f3	kg/day	411	411	411	411	411	411		
B4 Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	1,961	1,961	1,961	1,961	1,961	1,961		
C. Agricultural pollution load										
C1 Pollution load from fields *										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	G1-1	-								
3) Flow-down ratio	G1-2	-								
4) Run-off ratio	G1 (G1-1×G1-2)	-								
5) Run-off pollution load	A1=c1 × G1	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	49,114	49,114	49,114	49,114	49,114	49,114		
2) Flow-out ratio	G2-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	G2-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	G2 (G2-1×G2-2)	-	0.05	0.05	0.05	0.05	0.05	0.05		
5) Run-off pollution load	A2=c2 × G2	kg/day	2,456	2,456	2,456	2,456	2,456	2,456		
C3 Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	2,456	2,456	2,456	2,456	2,456	2,456		
D. Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	36,440	36,440	36,440	36,440	36,440	36,440		
2) Flow-out ratio	O1-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	O1-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	O1 (O1-1×O1-2)	-	0.05	0.05	0.05	0.05	0.05	0.05		
5) Run-off pollution load	Od= d1 × O1	kg/day	1,822	1,822	1,822	1,822	1,822	1,822		
III. Water quality at control point										
E. Water quality monitored										
1) 1994		mg/l	6.6	4.0	4.5	10.6	2.9	7.6	6.0	7.6
F. Result of calculation										
1) Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	14,267	14,474	21,604	13,073	11,393	10,554	14,557	
2) Water flow	Q	m3/s	35.8	35.8	35.8	35.8	35.8	35.8		
3) Water quality	C=L/Q	mg/l	4.5	4.7	7.0	4.2	3.7	3.4	4.7	5.3

Note : *Pollution load from fields is included in other sources.

Table-3.5) Caluculation of Water Quality (BOD) at Canggu Tambangan (2020 : Case-I)

Item		units								
I.Pollution load from up stream										
1) Water quality of Patang sio (1994)	C0	mg/l								
2) Water flow of Patang sio	Q0	m3/s								
3)Pollution load from up stream	L0=C0xQ0	kg/day	16.242	14.474	21.685	12.073	11.353	10.554		
4) Run-off pollutive load from up stream	L0=C0xQ0	kg/day	2.437	2.171	3.24	1.961	1.908	1.583		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1 Pollution load (Sub-basin B629)										
1) Pollution load produced	a1	kg/day	219	219	219	219	219	219		
2) Flow out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow down ratio	r1-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r1 (r1-1xr1-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1= a1 x r1	kg/day	79	79	79	79	79	79		
A2 Pollution load (Sub-basin B620)										
1) Pollution load produced	a2	kg/day	202	202	202	202	202	202		
2) Flow out ratio	r2-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow down ratio	r2-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r2 (r2-1xr2-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D2= a2 x r2	kg/day	73	73	73	73	73	73		
A3 Total run-off pollution load from domestic waste water	Dd=D1+D2	kg/day	152	152	152	152	152	152		
B.Industrial waste water										
B.1 Pollution load from major producers										
1) Pollution load produced	b1	kg/day	8.129	8.129	8.129	8.129	8.129	8.129		
2) Flow out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow down ratio	r11-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r11 (r11-1xr11-1)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I1= b1 x r11	kg/day	2.926	2.926	2.926	2.926	2.926	2.926		
B.2 Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	80	80	80	80	80	80		
2) Flow out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12(r12-1xr12-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I2= b2x r12	kg/day	29	29	29	29	29	29		
B.3 Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	21	21	21	21	21	21		
2) Flow out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow down ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13 (r13-1xr13-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I3=b3x r13	kg/day	8	8	8	8	8	8		
B.4 Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	3.144	3.144	3.144	3.144	3.144	3.144		
C.Agricultural pollution load										
C.1 Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow out ratio	r21-1	-								
3) Flow down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1= c1 x r21	kg/day								
C.2 Pollution load from livestok										
1) Pollution load produced	c2	kg/day	1.022	1.022	1.022	1.022	1.022	1.022		
2) Flow out ratio	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow down ratio	r22-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r22(r22-1xr22-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	A2= c2 x r22	kg/day	41	41	41	41	41	41		
C.3 Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	41	41	41	41	41	41		
D.Other sources										
D.1 Pollution load from others										
1) Pollution load produced	d1	kg/day	760	760	760	760	760	760		
2) Flow out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow down ratio	r31-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r31 (r31-1xr31-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	Od= d1 x r31	kg/day	30	30	30	30	30	30		
III. Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	3.4	4.6	3.3	10.6	5.2	4.9	5.2	5.2
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	5.804	5.538	6.608	5.328	5.076	4.950	5.551	
2)Water flow	Q	m3/s	12.8	12.8	12.8	12.8	12.8	12.8	12.8	
3)Water quality	C=L/Q	mg/l	5.2	5.0	6.0	4.8	4.6	4.5	5.0	5.2

Note : *Pollution load from fields is included in other sources

Items		Codes	Jan	Feb	Mar	Apr	May	Jun	Ave.(Dry)	75%V.I
I.Pollution load from upstream										
1)Water quality of Cangge Tambangin (BOD)	C0	mg/l								
2)Water flow of Cangge Tambangin	Q0	m3/s								
3)Pollution load from upstream	L0=C0×Q0	kg/day	5,804	5,539	6,568	5,328	5,076	4,950		
4)Run-off pollution load from upstream	L0=C0×Q0	kg/day	871	831	985	799	761	743		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B621)										
1) Pollution load produced	a1	kg/day	342	342	342	342	342	342		
2) Flow-out ratio	r1-1		0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	D1= a1 × r1	kg/day	62	62	62	62	62	62		
A2.Pollution load (Sub-basin B622)										
1) Pollution load produced	a2	kg/day	1,097	1,097	1,097	1,097	1,097	1,097		
2) Flow-out ratio	r2-1		0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r2-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r2 (r2-1×r2-2)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D2= a2 × r2	kg/day	296	296	296	296	296	296		
A3.Pollution load (Sub-basin B623)										
1) Pollution load produced	a3	kg/day	442	442	442	442	442	442		
2) Flow-out ratio	r3-1		0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r3-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r3 (r3-1×r3-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	D3= a3 × r3	kg/day	199	199	199	199	199	199		
A4.Pollution load (Sub-basin B624)										
1) Pollution load produced	a4	kg/day	175	175	175	175	175	175		
2) Flow-out ratio	r4-1		0.6	0.6	0.6	0.6	0.6	0.6		
3) Flow-down ratio	r4-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r4 (r4-1×r4-2)	-	0.12	0.12	0.12	0.12	0.12	0.12		
5) Run-off pollution load	D4= a4 × r4	kg/day	21	21	21	21	21	21		
A5.Pollution load (Sub-basin B630)										
1) Pollution load produced	a5	kg/day	1,132	1,132	1,132	1,132	1,132	1,132		
2) Flow-out ratio	r5-1		0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r5-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r5 (r5-1×r5-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D5= a5 × r5	kg/day	113	113	113	113	113	113		
A6.Pollution load (Sub-basin B631)										
1) Pollution load produced	a6	kg/day	175	175	175	175	175	175		
2) Flow-out ratio	r6-1		0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r6-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r6 (r6-1×r6-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D6= a6 × r6	kg/day	37	37	37	37	37	37		
A7.Pollution load (Sub-basin B632)										
1) Pollution load produced	a7	kg/day	573	573	573	573	573	573		
2) Flow-out ratio	r7-1		0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r7-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r7 (r7-1×r7-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	D7= a7 × r7	kg/day	138	138	138	138	138	138		
A8.Total run-off pollution load from domestic waste water	Dd=D1+···+D7	kg/day	865	865	865	865	865	865		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	49,803	49,803	49,803	49,803	49,803	49,803		
2) Flow-out ratio	r11-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r11-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4) Run-off ratio	r11 (r11-1×r11-2)	-	0.2	0.2	0.2	0.2	0.2	0.2		
5) Run-off pollution load	I1= b1 × r11	kg/day	9,961	9,961	9,961	9,961	9,961	9,961		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	33,228	33,228	33,228	33,228	33,228	33,228		
2) Flow-out ratio	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r12-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I2= b2 × r12	kg/day	5,815	5,815	5,815	5,815	5,815	5,815		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	6,586	6,586	6,586	6,586	6,586	6,586		
2) Flow-out ratio	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r13-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I3= b3 × r13	kg/day	1,153	1,153	1,153	1,153	1,153	1,153		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	16,928	16,928	16,928	16,928	16,928	16,928		
C.Agricultural pollution load										
C1 Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	6,934	6,934	6,934	6,934	6,934	6,934		
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.01	0.01	0.01	0.01	0.01	0.01		
5) Run-off pollution load	A2= c2 × r22	kg/day	69	69	69	69	69	69		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	69	69	69	69	69	69		
D.Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	10,358	10,358	10,358	10,358	10,358	10,358		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.01	0.01	0.01	0.01	0.01	0.01		
5) Run-off pollution load	Od= d1 × r31	kg/day	104	104	104	104	104	104		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	15.7	11.4	11.2	14.6	7.9	7.9	11.3	14.6
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	18,837	18,797	18,957	18,765	18,527	18,709	18,799	
2)Water flow	Q	m3/s	12.8	12.8	12.8	12.8	12.8	12.8	12.8	
3)Water quality	C=L/Q	mg/l	17.0	17.0	17.1	17.0	16.9	16.9	17.0	17.0

Note : *Pollution load from fields is included in other sources.

Table-3(7) Caluculation of Water Quality (BOD) at Ngagel (2020 : Case-I)

Items		units	Jul			Sep	Oct	Nov	Ave Dry	75%V.4
I.Pollution load from upstream										
1)Water quality of Karangpilang (1045)	CU	mg/l								
2)Water flow of Karangpilang	CO	m3/s								
3)Pollution load from upstream	LO=CU×QO	kg/day	18,832	18,767	18,557	18,765	18,727	18,769		
4)Run-off pollution load from upstream	LO=CU×QO	kg/day	2,826	2,83	2,543	2,815	2,88	2,86		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B540)										
1) Pollution load produced	a1	kg/day	924	924	924	924	924	924		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1= a1 × r1	kg/day	333	333	333	333	333	333		
A2.Pollution load (Sub-basin B541)										
1) Pollution load produced	a2	kg/day	271	271	271	271	271	271		
2) Flow-out ratio	r2-1	-	0.6	0.6	0.6	0.6	0.6	0.6		
3) Flow-down ratio	r2-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r2 (r2-1×r2-2)	-	0.12	0.12	0.12	0.12	0.12	0.12		
5) Run-off pollution load	D2= a2 × r2	kg/day	33	33	33	33	33	33		
A3.Pollution load (Sub-basin B542)										
1) Pollution load produced	a3	kg/day	1,143	1,143	1,143	1,143	1,143	1,143		
2) Flow-out ratio	r3-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1×r3-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D3= a3 × r3	kg/day	240	240	240	240	240	240		
A4.Pollution load (Sub-basin B543)										
1) Pollution load produced	a4	kg/day	5,430	5,430	5,430	5,430	5,430	5,430		
2) Flow-out ratio	r4-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r4-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r4 (r4-1×r4-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D3= a4 × r4	kg/day	1,955	1,955	1,955	1,955	1,955	1,955		
A5.Pollution load (Sub-basin B544)										
1) Pollution load produced	a5	kg/day	2,625	2,625	2,625	2,625	2,625	2,625		
2) Flow-out ratio	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	-	0.7	0.7	0.7	0.7	0.7	0.7		
4) Run-off ratio	r5-3 (r5-1×r5-2)	-	0.63	0.63	0.63	0.63	0.63	0.63		
5) Run-off pollution load	D5= a5× r5	kg/day	1,654	1,654	1,654	1,654	1,654	1,654		
A6.Total run-off pollution load from domestic waste water	D6=D1+D2+D3+D4+D5	kg/day	4,213	4,213	4,213	4,213	4,213	4,213		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b2	kg/day	684	684	684	684	684	684		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r11 (r11-1×r11-1)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I1= b1 × r11	kg/day	246	246	246	246	246	246		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	21,984	21,951	21,984	21,981	21,982	21,982		
2) Flow-out ratio	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I2= b2× r12	kg/day	6,155	6,155	6,155	6,155	6,155	6,155		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	4,851	4,851	4,851	4,851	4,851	4,851		
2) Flow-out ratio	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I3= b3× r13	kg/day	1,358	1,358	1,358	1,358	1,358	1,358		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	7,759	7,759	7,759	7,759	7,759	7,759		
C.Agricultural pollution load										
C1.Pollution load from fields *										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1× r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	2,203	2,203	2,203	2,203	2,203	2,203		
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r22(r22-1×r22-2)	-	0.02	0.02	0.02	0.02	0.02	0.02		
5) Run-off pollution load	A2= c2 × r22	kg/day	44	44	44	44	44	44		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	44	44	44	44	44	44		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	5,435	5,435	5,435	5,435	5,435	5,435		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.02	0.02	0.02	0.02	0.02	0.02		
5) Run-off pollution load	Od= d1 × r31	kg/day	109	109	109	109	109	109		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	6.1	6.0	8.0	9.5	7.3	6.3	7.3	8.0
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=LO+Od+Id+Ad+Od	kg/day	14,951	14,945	14,957	14,940	14,934	14,932	14,945	
2)Water flow	Q	m3/s	12.8	12.8	12.8	12.8	12.8	12.8	12.8	
3)Water quality	C=L/Q	mg/l	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5

Note : *Pollution load from fields is included in other sources.

Table-3(8) Calculation of Water Quality (BOD) at Kayoon (2020 : Case-I)

Items		units	Jan	Feb	Aug	Sep	Oct	Nov	Ave.(Dry)	Dry/Yr
I.Pollution load from upstream										
1)Water quality of Jetis Bridge (1100)	C0	mg/l								
2)Water flow of Jetis Bridge	Q0	m3/s								
3)Pollution load from upstream	L0=C0xQ0	kg/day	14.951	14.935	14.969	14.936	14.934	14.932		
4) Run-off pollution load from upstream	L0=C0xQ0	kg/day	2.990	2.939	2.994	2.938	2.937	2.994		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin BS45)		kg/day	0	0	0	0	0	0		
1) Pollution load produced	a1		0.9	0.9	0.9	0.9	0.9	0.9		
2) Flow out ratio	r1-1	-	0.4	0.4	0.4	0.4	0.4	0.4		
3) Flow down ratio	r1-2	-	0.36	0.36	0.36	0.36	0.36	0.36		
4) Run-off ratio	r1 (r1-1xr1-2)	-	0	0	0	0	0	0		
5) Run-off pollution load	D1=a1 x r1	kg/day	0	0	0	0	0	0		
A2.Pollution load (Sub-basin BS46)		kg/day	0	0	0	0	0	0		
1) Pollution load produced	a2		0.9	0.9	0.9	0.9	0.9	0.9		
2) Flow out ratio	r2-1	-	0.6	0.6	0.6	0.6	0.6	0.6		
3) Flow down ratio	r2-2	-	0.54	0.54	0.54	0.54	0.54	0.54		
4) Run-off ratio	r2(r2-1xr2-2)	-	0	0	0	0	0	0		
5) Run-off pollution load	D2=a2 x r2	kg/day	0	0	0	0	0	0		
A3.Total run-off pollution load from domestic waste water	Dd=D1+D2	kg/day	0	0	0	0	0	0		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow out ratio	r11-1	-								
3) Flow down ratio	r11-2	-								
4) Run-off ratio	r11 (r11-1xr11-1)	-	0	0	0	0	0	0		
5) Run-off pollution load	I1=b1 x r11	kg/day	0	0	0	0	0	0		
B2.Pollution load from large and medium scale industries		kg/day	2.460	2.460	2.460	2.460	2.460	2.460		
1) Pollution load produced	b2		0.9	0.9	0.9	0.9	0.9	0.9		
2) Flow out ratio	r12-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow down ratio	r12-2	-	0.45	0.45	0.45	0.45	0.45	0.45		
4) Run-off ratio	r12 (r12-1xr12-2)	-	1.107	1.107	1.107	1.107	1.107	1.107		
5) Run-off pollution load	I2=b2x r12	kg/day	580	580	580	580	580	580		
B3.Pollution load from small scale industries		kg/day	0.9	0.9	0.9	0.9	0.9	0.9		
1) Pollution load produced	b3		0.5	0.5	0.5	0.5	0.5	0.5		
2) Flow out ratio	r13-1	-	0.45	0.45	0.45	0.45	0.45	0.45		
3) Flow down ratio	r13-2	-	261	261	261	261	261	261		
4) Run-off ratio	r13 (r13-1xr13-2)	-								
5) Run-off pollution load	I3=b3xr13	kg/day								
B4.Total run-off pollution load from the industries	Ii=I1+I2+I3	kg/day	1.368	1.368	1.368	1.368	1.368	1.368		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow out ratio	r21-1	-								
3) Flow down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1= c1x r21	kg/day								
C2.Pollution load from livestock		kg/day	91	91	91	91	91	91		
1) Pollution load produced	c2		0.05	0.05	0.05	0.05	0.05	0.05		
2) Flow out ratio	r22-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow down ratio	r22-2	-	0.025	0.025	0.025	0.025	0.025	0.025		
4) Run-off ratio	r22(r22-1xr22-2)	-	2	2	2	2	2	2		
5) Run-off pollution load	A2= c2 x r22	kg/day								
C3.Total run-off pollution load from agriculture	Aa=A1+A2	kg/day	2	2	2	2	2	2		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	580	580	580	580	580	580		
2) Flow out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow down ratio	r31-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r31 (r31-1xr31-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	Oc= d1 x r31	kg/day	15	15	15	15	15	15		
III.Water quality at control point										
E.Water quality monitored										
1) 1994		mg/l			6.2					6.2
2) Average (1992-1996)										
3) Mid.(1992-1996)										
F.Result of calculation										
1) Total run-off pollution load	L=L0+Dd+Ii+Ad+Od	kg/day	4.375	4.374	4.375	4.375	4.372	4.37	4.374	
2) Water flow	Q	m3/s			8.1					8.1
3) Water quality	C=L/Q	mg/l			6.3					6.3

Note : *Pollution load from fields is included in other sources.

Items		units	BOD_5	BOD_u	NH_3	NO_2	NO_3	N_{org}	Avg/Dry	DRY/WET
I. Pollution load from upstream										
1) Water quality of intake of water canal	C0	mg/l			25.0					
2) Water flow of intake of water canal	Q0	m3/s			6.5					
3) Pollution load from upstream	L0=C0×Q0	kg/day			12.960					
4) Run-off pollution load from upstream	L0=C0×Q0	kg/day			259					
II. Pollution load from sub-basin										
A. Domestic waste water										
A1. Pollution load										
1) Pollution load produced	a1	kg/day	68	68	68	68	68	68		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	D1= a1 × r1	kg/day	12	12	12	12	12	12		
A2.Total run-off pollution load from domestic waste water	Dd=D1	kg/day	12	12	12	12	12	12		
B. Industrial waste water										
B1. Pollution load from major producers										
1) Pollution load produced	b1	kg/day	84,000	84,000	84,000	84,000	84,000	84,000		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.02	0.02	0.02	0.02	0.02	0.02		
4) Run-off ratio	r11 (r11-1×r11-2)	-	0.018	0.018	0.018	0.018	0.018	0.018		
5) Run-off pollution load	I1= b1 × r11	kg/day	1.512	1.512	1.512	1.512	1.512	1.512		
B2. Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	164	164	164	164	164	164		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I2= b2 × r12	kg/day	30	30	30	30	30	30		
B3. Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	33	33	33	33	33	33		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I3= b3 × r13	kg/day	6	6	6	6	6	6		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	1.547	1.547	1.547	1.547	1.547	1.547		
C. Agricultural pollution load										
C1. Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2. Pollution load from livestock										
1) Pollution load produced	c2	kg/day	56	56	56	56	56	56		
2) Flow-out ratio	r22-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r22-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	A2= c2 × r22	kg/day	2	2	2	2	2	2		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	2	2	2	2	2	2		
D. Other sources										
D1. Pollution load from others										
1) Pollution load produced	d1	kg/day	113	113	113	113	113	113		
2) Flow-out ratio	r31-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r31-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	Od= d1 × r31	kg/day	5	5	5	5	5	5		
III. Water quality at control point										
E. Water quality monitored										
1) 1994		mg/l			12.9					12.9
2) Average(1992-1996)										
3) Median(1992-1996)										
F. Result of calculation										
1) Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	1.565	1.566	1.826	1.566	1.566	1.566	1.610	
2) Water flow	Q	m3/s			3.3				3.2	
3) Water quality	C=L/Q	mg/l			6.6				6.6	

Note : *Pollution load from fields is included in other sources.

Table-3(10) Caluculation of Water Quality (BOD) at Porong (2020 : Case-I)

Items		units	Jan.	Jul.	Avg.	Sep.	Oct.	Nov.	Avg.(Dry)	75%VR
I.Pollution load from upstream										
1) Water quality at intake of river canal	C0	mg/l								
2) Water flow at intake of river canal	Q0	m3/s								
3) Pollution load from upstream	L0=C0×Q0	kg/day								
4) Run-off pollution load from upstream	L0=C0×r0	kg/day								
II. Pollution load from sub-basin										
A.Domestic waste water										
A) Pollution load										
1) Pollution load produced	a1	kg/day	23	23	23	23	23	23		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D1= a1 × r1	kg/day	17	17	17	17	17	17		
A2.Total run-off pollution load from domestic waste water	Ad=D1	kg/day	17	17	17	17	17	17		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r11-1	-								
3) Flow-down ratio	r11-2	-								
4) Run-off ratio	r11 (r11-1×r11-2)	-	0	0	0	0	0	0		
5) Run-off pollution load	I1= b1 × r11	kg/day	0	0	0	0	0	0		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	55	55	55	55	55	55		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	I2= b2 × r12	kg/day	40	40	40	40	40	40		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	11	11	11	11	11	11		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	I3= b3 × r13	kg/day	8	8	8	8	8	8		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	48	48	48	48	48	48		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	19	19	19	19	19	19		
2) Flow-out ratio	r22-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r22-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	A2= c1 × r22	kg/day	3.04	3.04	3.04	3.04	3.04	3.04		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	3.04	3.04	3.04	3.04	3.04	3.04		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	38	38	38	38	38	38		
2) Flow-out ratio	r31-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r31-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	Od= d1 × r31	kg/day	6.00	6.00	6.00	6.00	6.00	6.00		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l			9.3					9.3
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	73	73	73	73	73	73	73	
2)Water flow	Q	m3/s			0.06				0.06	
3)Water quality	C=L/Q	mg/l			14.1				14.1	

Note : *Pollution load from fields is included in other sources

Item		units								
I.Pollution load from upstream										
1) Water quality	C0	mg/l								
2) Water flow	Q0	m3/s								
3) Pollution load from upstream	LP=C0xQ0	kg/day								
4) Run-off pollution load from upstream	L0	kg/day								
II. Pollution load from sub-basin										
A.Domestic waste water										
A1 Pollution load (Sub-basin B*O*)										
1) Pollution load produced	a1	kg/day	897	897	897	897	897	897		
2) Flow-out ratio	c1-1	.	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	c1-2	.	0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	r1(c1-1xc1-2)	.	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	D1=a1xr1	kg/day	27	27	27	27	27	27		
A2 Pollution load (Sub-basin BOC)										
1) Pollution load produced	a2	kg/day	757	757	757	757	757	757		
2) Flow-out ratio	c2-1	.	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	c2-2	.	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r2(c2-1xc2-2)	.	0.2	0.2	0.2	0.2	0.2	0.2		
5) Run-off pollution load	D2=a2xr2	kg/day	151	151	151	151	151	151		
A3 Pollution load (Sub-basin B*O*)										
1) Pollution load produced	a3	kg/day	6509	6509	6509	6509	6509	6509		
2) Flow-out ratio	c3-1	.	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	c3-2	.	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3(c3-1xc3-2)	.	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D3=a3xr3	kg/day	1367	1367	1367	1367	1367	1367		
A4 Pollution load (Sub-basin BO21)										
1) Pollution load produced	a4	kg/day	9215	9215	9215	9215	9215	9215		
2) Flow-out ratio	r4-1	.	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	c4-2	.	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r4(c4-1xc4-2)	.	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D5=a4xr4	kg/day	1935	1935	1935	1935	1935	1935		
A5 Pollution load (Sub-basin BO22)										
1) Pollution load produced	a5	kg/day	3023	3023	3023	3023	3023	3023		
2) Flow-out ratio	r5-1	.	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	.	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r5-5(r5-1xr5-2)	.	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D5=a5xr5	kg/day	2177	2177	2177	2177	2177	2177		
A6 Total run-off pollution load from domestic waste water	Dd=D1+D2+D3+D4+D5	kg/day	5657	5657	5657	5657	5657	5657		
B.Industrial waste water										
B1 Pollution load from major productions										
1) Pollution load produced	b1	kg/day	206	206	206	206	206	206		
2) Flow-out ratio	r11-1	.	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	.	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r11(r11-1xr11-1)	.	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	I1=b1xr11	kg/day	93	93	93	93	93	93		
B2 Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	14,220	14,220	14,220	14,220	14,220	14,220		
2) Flow-out ratio	r12-1	.	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r12-2	.	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12(r12-1xr12-2)	.	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I2=b2xr12	kg/day	3,982	3,982	3,982	3,982	3,982	3,982		
B3 Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	3,432	3,432	3,432	3,432	3,432	3,432		
2) Flow-out ratio	r13-1	.	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r13-2	.	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13(r13-1xr13-2)	.	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I3=b3xr13	kg/day	961	961	961	961	961	961		
B4 Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	5,035	5,035	5,035	5,035	5,035	5,035		
C.Agricultural pollution load										
C1 Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	.								
3) Flow-down ratio	r21-2	.								
4) Run-off ratio	r21(r21-1xr21-2)	.								
5) Run-off pollution load	A1=c1xr21	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	21,276	21,276	21,276	21,276	21,276	21,276		
2) Flow-out ratio	r22-1	.	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r22-2	.	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r22(r22-1xr22-2)	.	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	A2=c2xr22	kg/day	638	638	638	638	638	638		
C3 Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	638	638	638	638	638	638		
D.Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	36,620	36,620	36,620	36,620	36,620	36,620		
2) Flow-out ratio	r31-1	.	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r31-2	.	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r31(r31-1xr31-2)	.	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	Od=d1xr31	kg/day	1,099	1,099	1,099	1,099	1,099	1,099		
III.Water quality at control point										
E.Water quality monitored										
1) 1994		mg/l	8.3	9.4	7.8	8.4	7.8	7.5	8.2	8.4
2) Average(1992-1996)										
3) Median(1992-1996)										
F.Result of calculation										
1) Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	12,429	12,429	12,429	12,429	12,429	12,429	12,429	
2) Water flow	Q	m3/s	10.0	10.0	10.0	10.0	10.0	10.0	10.0	
3) Water quality	C=L/Q	mg/l	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4

Note : *Pollution load from fields is included in other sources.

Items	units	Dec	Jan	Jul	Sep	Nov	Ave	Ave/Des	75%Val
I.Pollution load from upstream									
1)Water quality of Lodoyo Dam (360)	C0	mg/l	2.0	2.7	4.3	6.6	4.3	3.8		
2)Water flow of Lodoyo Dam	Q0	m3/s	72.0	8.0	61.0	57.0	107.0	23.0		
3)Pollution load from upstream	L0=C0xQ0	kg/day	12.442	1.400	22.663	32.504	39.753	23.967		
4) Run-off pollution load from upstream	L0=C0xQ0	kg/day	2.488	240	4.533	6.501	7.951	4.793		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B142)	a1	kg/day	1.312	1.312	1.332	1.312	1.312	1.312		
1) Pollution load produced	a1	kg/day	1.312	1.312	1.332	1.312	1.312	1.312		
2) Flow-out ratio	r1-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r1-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r1 (r1-1xr1-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	D1= a1 x r1	kg/day	210	210	210	210	210	210		
A2.Pollution load (Sub-basin B150)	a2	kg/day	1.731	1.731	1.731	1.731	1.731	1.731		
1) Pollution load produced	a2	kg/day	1.731	1.731	1.731	1.731	1.731	1.731		
2) Flow-out ratio	r2-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r2-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r2 (r2-1xr2-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	D2= a2 x r2	kg/day	415	415	415	415	415	415		
A3.Pollution load (Sub-basin B453)	a3	kg/day	732	732	732	732	732	732		
1) Pollution load produced	a3	kg/day	732	732	732	732	732	732		
2) Flow-out ratio	r3-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r3-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r3 (r3-1xr3-2)	-	0.32	0.32	0.32	0.32	0.32	0.32		
5) Run-off pollution load	D3= a3 x r3	kg/day	234	234	234	234	234	234		
A.4.Total run-off pollution load from domestic waste water	D4=D1+D2+D3	kg/day	860	860	860	860	860	860		
B.Industrial waste water										
B1.Pollution load from major producer	b1	kg/day	6.221	6.221	6.221	6.221	6.221	6.221		
1) Pollution load produced	b1	kg/day	6.221	6.221	6.221	6.221	6.221	6.221		
2) Flow-out ratio	r11-1	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r11-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r11 (r11-1xr11-2)	-	0.06	0.06	0.06	0.06	0.06	0.06		
5) Run-off pollution load	I1= b1 x r11	kg/day	373	373	373	373	373	373		
B2.Pollution load from large and medium scale industries	b2	kg/day	2.808	2.808	2.808	2.808	2.808	2.808		
1) Pollution load produced	b2	kg/day	2.808	2.808	2.808	2.808	2.808	2.808		
2) Flow-out ratio	r12-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r12-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r12 (r12-1xr12-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	I2= b2 x r12	kg/day	674	674	674	674	674	674		
B3.Pollution load from small scale industries	b3	kg/day	617	617	617	617	617	617		
1) Pollution load produced	b3	kg/day	617	617	617	617	617	617		
2) Flow-out ratio	r13-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r13-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r13 (r13-1xr13-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	I3= b3 x r13	kg/day	148	148	148	148	148	148		
B.4.Total run-off pollution load from the industries	I4=I1+I2+I3	kg/day	1.195	1.195	1.195	1.195	1.195	1.195		
C.Agricultural pollution load										
C1.Pollution load from fields*	c1	kg/day								
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1= c1 x r21	kg/day								
C2.Pollution load from livestock	c2	kg/day	11.258	11.258	11.258	11.258	11.258	11.258		
1) Pollution load produced	c2	kg/day	11.258	11.258	11.258	11.258	11.258	11.258		
2) Flow-out ratio	r22-1	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r22-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r22(r22-1xr22-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	A2= c1 x r22	kg/day	338	338	338	338	338	338		
C3.Total run-off pollution load from agriculture	A3=A1+A2	kg/day	338	338	338	338	338	338		
D.Other source										
D1.Pollution load from others	d1	kg/day	10.620	10.620	10.620	10.620	10.620	10.620		
1) Pollution load produced	d1	kg/day	10.620	10.620	10.620	10.620	10.620	10.620		
2) Flow-out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r31-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r31 (r31-1xr31-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	Od= d1 x r31	kg/day	319	319	319	319	319	319		
III. Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	2.8	3.8	4.3	7.5	2.6	3.5	4.1	4.3
2)Average(1992-1996)										
3)Max.(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+D4+I4+A3+Od	kg/day	5.200	2.991	7.244	9.212	10.662	7.505	7.135	
2)Water flow	Q	m3/s	62.6	62.6	62.6	62.6	62.6	62.6	62.6	
3)Water quality	C=L/Q	mg/l	1.0	0.6	1.3	1.7	2.0	1.4	1.3	1.3

Note : *Pollution load from fields is included in other sources.

Table-4(3) Calculation of Water Quality (BOD) at Jogbria Bridge (2020 : Case-II)

Items		units	Jan	Jul	Aug	Sep	Oct	Nov	Average	75%Vl
I.Pollution load from upstream										
1)Water quality of Ngotegyo Tamhung in (2001)	C0	mg/l	6.3	4.8	10.5	3.9	3.8	4.7		
2)Water flow of Ngotegyo Tamhung in	Q0	m3/s	140.0	56.9	55.6	65.9	52.4	41.9		
3)Pollution load from upstream	L0=C0×Q0	kg/day	76.769	23.593	50.440	24.902	17.204	17.043		
4)Run-off pollution load from upstream	L0=C0×Q0	kg/day	15.350	4.730	10.088	4.980	3.441	3.409		
II. Pollution load from sub-basin										
A. Domestic waste water										
A1.Pollution load (Sub-No. 6 B310)										
1) Pollution load produced	a1	kg/day	2.662	2.662	2.662	2.662	2.662	2.662		
2) Flow-out ratio	r11	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r12	-	0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	r1 (r11×r12)	-	0.08	0.08	0.08	0.08	0.08	0.08		
5) Run-off pollution load	D1= a1 × r1	kg/day	213	213	213	213	213	213		
A2.Pollution load (Sub-basin B311)										
1) Pollution load produced	a2	kg/day	2.530	2.530	2.530	2.530	2.530	2.530		
2) Flow-out ratio	r21	-	0.8	0.8	0.8	0.8	0.9	0.8		
3) Flow-down ratio	r22	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r2 (r21×r22)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	D2= a2 × r2	kg/day	405	405	405	405	405	405		
A3.Pollution load (Sub-basin B312)										
1) Pollution load produced	a3	kg/day	211	211	211	211	211	211		
2) Flow-out ratio	r31	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r32	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r31×r32)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D3= a3 × r3	kg/day	57	57	57	57	57	57		
A4.Pollution load (Sub-basin B313)										
1) Pollution load produced	a4	kg/day	297	297	297	297	297	297		
2) Flow-out ratio	r41	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r42	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r4 (r41×r42)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D4= a4 × r4	kg/day	80	80	80	80	80	80		
A5.Pollution load (Sub-basin B314)										
1) Pollution load produced	a5	kg/day	11	11	11	11	11	11		
2) Flow-out ratio	r51	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r52	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r5 (r51×r52)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	D5= a5 × r5	kg/day	5	5	5	5	5	5		
A6.Pollution load (Sub-basin B315)										
1) Pollution load produced	a6	kg/day	1.504	1.504	1.504	1.504	1.504	1.504		
2) Flow-out ratio	r61	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r62	-	0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	r6 (r61×r62)	-	0.48	0.48	0.48	0.48	0.48	0.48		
5) Run-off pollution load	D6= a6 × r6	kg/day	722	722	722	722	722	722		
A7.Pollution load (Sub-basin B316)										
1) Pollution load produced	a7	kg/day	170	170	170	170	170	170		
2) Flow-out ratio	r71	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r72	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r7 (r71×r72)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D7= a7 × r7	kg/day	122	122	122	122	122	122		
A8.Pollution load (Sub-basin B317)										
1) Pollution load produced	a8	kg/day	2.916	2.916	2.916	2.916	2.916	2.916		
2) Flow-out ratio	r81	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r82	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r8 (r81×r82)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D8= a8 × r8	kg/day	612	612	612	612	612	612		
A9.Total run-off pollution load from domestic waste water	Dd=D1···+D8	kg/day	2.217	2.217	2.217	2.217	2.217	2.217		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	55.815	55.815	55.815	55.815	55.815	55.815		
2) Flow-out ratio	r111	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r112	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r11 (r111×r112)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	I1= b1 × r11	kg/day	1.395	1.395	1.395	1.395	1.395	1.395		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	3.799	3.799	3.799	3.799	3.799	3.799		
2) Flow-out ratio	r121	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r122	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r12 (r121×r122)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	I2= b2 × r12	kg/day	380	380	380	380	380	380		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	791	791	791	791	791	791		
2) Flow-out ratio	r131	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r132	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r13 (r131×r132)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	I3= b3 × r13	kg/day	79	79	79	79	79	79		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	1.854	1.854	1.854	1.854	1.854	1.854		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r211	-								
3) Flow-down ratio	r212	-								
4) Run-off ratio	r21 (r211×r21-2)	-								
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	24.838	24.838	24.838	24.838	24.838	24.838		
2) Flow-out ratio	r221	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r222	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r22 (r221×r22-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	A2= c2 × r22	kg/day	621	621	621	621	621	621		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	621	621	621	621	621	621		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	12.280	12.280	12.280	12.280	12.280	12.280		
2) Flow-out ratio	r311	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r312	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r31 (r311×r312)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	Od= d1 × r31	kg/day	307	307	307	307	307	307		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	3.5	3.8	11.9	3.4	2.7	4.5	5.3	7.7
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calibration										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	20.349	9.713	15.067	9.379	8.440	8.402	11.896	
2)Water flow	Q	m3/s	58.2	58.2	58.2	58.2	58.2	58.2	58.2	
3)Water quality	C=L/Q	mg/l	4.0	1.9	3.0	1.9	1.7	1.7	2.4	2.0

Note : *Pollution load from fields is included in other sources.

Table-4(1) Caluculation of Water Quality (BOD) at Padangan Bridge (2020 : Case-II)

Items		Unit		May	Jul	Aug	Sep	Oct	Nov	Avg/Dry	Std Val
I. Pollution load at upstream											
1) Water quality of Bero Tambergan (BOD)	c0	mg/l		2.5	1.3	4.5	6.6	4.2	2.2		
2) Water flow of Bero Tambergan	Q0	m3/s		7.65	77.6	34.7	14.5	11.9	12.6		
3) Pollution load from upstream	L0=c0×Q0	kg/day		17,472	12,759	30,567	9,246	5,073	2,959		
4) Run-off pollution load from upstream	L0=c0×Q0	kg/day		6,349	5,096	12,226	3,695	2,045	1,176		
II. Pollution load from sub basin											
A. Domestic waste water											
A1 Pollution load (Sub-basin BS03)											
1) Pollution load produced	a1	kg/day		642	642	642	642	642	642		
2) Flow-out ratio	d-1			0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	d-2			0.9	0.9	0.9	0.9	0.9	0.9		
4) Run-off ratio	d1 (d1-1×d1-2)			0.81	0.81	0.81	0.81	0.81	0.81		
5) Run-off pollution load	D1= a1×d1	kg/day		520	520	520	520	520	520		
A2 Pollution load (Sub-basin BS04)											
1) Pollution load produced	a2	kg/day		1,700	1,700	1,700	1,700	1,700	1,700		
2) Flow-out ratio	d2-1			0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	d2-2			0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	d2 (d2-1×d2-2)			0.05	0.05	0.05	0.05	0.05	0.05		
5) Run-off pollution load	D2= a2×d2	kg/day		85	85	85	85	85	85		
A3 Pollution load (Sub-basin BS05)											
1) Pollution load produced	a3	kg/day		655	655	655	655	655	655		
2) Flow-out ratio	d3-1			0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	d3-2			0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	d3 (d3-1×d3-2)			0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D3= a3×d3	kg/day		138	138	138	138	138	138		
A4 Pollution load (Sub-basin BS06)											
1) Pollution load produced	a4	kg/day		446	446	446	446	446	446		
2) Flow-out ratio	d4-1			0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	d4-2			0.7	0.7	0.7	0.7	0.7	0.7		
4) Run-off ratio	d4 (d4-1×d4-2)			0.56	0.56	0.56	0.56	0.56	0.56		
5) Run-off pollution load	D4= a4×d4	kg/day		250	250	250	250	250	250		
A5 Pollution load (Sub-basin BS07)											
1) Pollution load produced	a5	kg/day		73	73	73	73	73	73		
2) Flow-out ratio	d5-1			0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	d5-2			0.9	0.9	0.9	0.9	0.9	0.9		
4) Run-off ratio	d5 (d5-1×d5-2)			0.81	0.81	0.81	0.81	0.81	0.81		
5) Run-off pollution load	D5= a5×d5	kg/day		59	59	59	59	59	59		
A6 Pollution load (Sub-basin BS10)											
1) Pollution load produced	a6	kg/day		1,293	1,293	1,293	1,293	1,293	1,293		
2) Flow-out ratio	d6-1			0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	d6-2			0.05	0.05	0.05	0.05	0.05	0.05		
4) Run-off ratio	d6 (d6-1×d6-2)			0.015	0.015	0.015	0.015	0.015	0.015		
5) Run-off pollution load	D6= a6×d6	kg/day		19	19	19	19	19	19		
A7 Pollution load (Sub-basin BS11)											
1) Pollution load produced	a7	kg/day		3,246	3,246	3,246	3,246	3,246	3,246		
2) Flow-out ratio	d7-1			0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	d7-2			0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	d7 (d7-1×d7-2)			0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D7= a7×d7	kg/day		325	325	325	325	325	325		
A8 Pollution load (Sub-basin BS12)											
1) Pollution load produced	a8	kg/day		5,588	5,588	5,588	5,588	5,588	5,588		
2) Flow-out ratio	d8-1			0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	d8-2			0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	d8 (d8-1×d8-2)			0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D8= a8×d8	kg/day		559	559	559	559	559	559		
A9 Pollution load (Sub-basin BS13)											
1) Pollution load produced	a9	kg/day		361	361	361	361	361	361		
2) Flow-out ratio	d9-1			0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	d9-2			0.7	0.7	0.7	0.7	0.7	0.7		
4) Run-off ratio	d9 (d9-1×d9-2)			0.56	0.56	0.56	0.56	0.56	0.56		
5) Run-off pollution load	D9= a9×d9	kg/day		202	202	202	202	202	202		
A10 Pollution load (Sub-basin BS14)											
1) Pollution load produced	a10	kg/day		5,144	5,144	5,144	5,144	5,144	5,144		
2) Flow-out ratio	d10-1			0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	d10-2			0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	d10 (d10-1×d10-2)			0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D10= a10×d10	kg/day		514	514	514	514	514	514		
A11 Pollution load (Sub-basin BS15)											
1) Pollution load produced	a11	kg/day		1,315	1,315	1,315	1,315	1,315	1,315		
2) Flow-out ratio	d11-1			0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	d11-2			0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	d11 (d11-1×d11-2)			0.42	0.42	0.42	0.42	0.42	0.42		
5) Run-off pollution load	D11= a11×d11	kg/day		468	468	468	468	468	468		
A12 Total run-off pollution load from domestic waste water	Dd=D1+…+D11	kg/day		3,139	3,139	3,139	3,139	3,139	3,139		
B. Industrial waste water											
B1 Pollution load from major products											
1) Pollution load produced	b1	kg/day		0	0	0	0	0	0		
2) Flow-out ratio	f1-1										
3) Flow-down ratio	f1-2										
4) Run-off ratio	f1 (f1-1×f1-2)			0	0	0	0	0	0		
5) Run-off pollution load	I1= b1×f1	kg/day		0	0	0	0	0	0		
B2 Pollution load from large and medium scale industries											
1) Pollution load produced	b2	kg/day		3,875	3,875	3,875	3,875	3,875	3,875		
2) Flow-out ratio	f2-1			0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	f2-2			0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	f2 (f2-1×f2-2)			0.4	0.4	0.4	0.4	0.4	0.4		
5) Run-off pollution load	I2= b2×f2	kg/day		1,550	1,550	1,550	1,550	1,550	1,550		
B3 Pollution load from small scale industries											
1) Pollution load produced	b3	kg/day		1,028	1,028	1,028	1,028	1,028	1,028		
2) Flow-out ratio	f3-1			0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	f3-2			0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	f3 (f3-1×f3-2)			0.4	0.4	0.4	0.4	0.4	0.4		
5) Run-off pollution load	I3= b3×f3	kg/day		411	411	411	411	411	411		
B4 Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day		1,961	1,961	1,961	1,961	1,961	1,961		
C. Agricultural pollution load											
C1 Pollution load from fields*											
1) Pollution load produced	e1	kg/day									
2) Flow-out ratio	g1-1										
3) Flow-down ratio	g1-2										
4) Run-off ratio	g1 (g1-1×g1-2)										
5) Run-off pollution load	A1= e1×g1	kg/day									
C2 Pollution load from livestock											
1) Pollution load produced	e2	kg/day		49,114	49,114	49,114	49,114	49,114	49,114		
2) Flow-out ratio	g2-1			0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	g2-2			0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	g2 (g2-1×g2-2)			0.05	0.05	0.05	0.05	0.05	0.05		
5) Run-off pollution load	A2= e2×g2	kg/day		2,456	2,456	2,456	2,456	2,456	2,456		
C3 Total run-off pollution load from agriculture	Ad=A1+A2	kg/day		2,456	2,456	2,456	2,456	2,456	2,456		
D. Other sources											
D1 Pollution load from others											
1) Pollution load produced	f1	kg/day		36,440	36,440	36,440	36,440	36,440	36,440		
2) Flow-out ratio	r51-1			0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r51-2			0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	g51 (g51-1×g51-2)			0.05	0.05	0.05	0.05	0.05	0.05		
5) Run-off pollution load	Od= f1×g51	kg/day		1,822	1,822	1,822	1,822	1,822	1,822		
III. Water quality at control point											
E. Water quality monitored											
1) 1994		mg/l		6.6	4.0	4.3	10.6	2.9	7.5	6.0	7.5
F. Result of calculation											
1) Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day		16,262	14,474	21,804	12,079	11,399	10,554	14,357	
2) Water flow	Q	m3/s		35.8	35.8	35.8	35.8	35.8	35.8	35.8	
3) Water quality	C=L/Q	mg/l		5.3	4.7	7.0	4.2	3.7	3.4	4.7	5.1

Note: *Pollution load from fields is included in other sources

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Table-4(5) Caluculation of Water Quality (BOD) at Canggu Tanibaogan (2020 : Case-II)

Item	notation	units	Jan	Feb	Mar	No..	Apr	Nov	Ave.Dry	355 Val
I.Pollution load from upstream										
1)Water quality of Padang at up stream	Cu	mg/l								
2)Water flow of Padang up stream	QC	m3/s								
3)Pollution load from upstream	L0=CU×QC	kg/day	16,247	14,474	21,674	13,073	11,393	10,554		
4)Run-off pollution load from upstream	L0=CU×Q0	kg/day	2,437	2,171	3,241	1,961	1,709	1,583		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin BS-9)										
1) Pollution load produced	a1	kg/day	219	219	219	219	219	219		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1=a1×r1	kg/day	79	79	79	79	79	79		
A2.Pollution load (Sub-basin BS-20)										
1) Pollution load produced	a2	kg/day	202	202	202	202	202	202		
2) Flow-out ratio	r2-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r2-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r2(r2-1×r2-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D2=a2×r2	kg/day	73	73	73	73	73	73		
A3.Total run-off pollution load from domestic waste water	Dd=D1+D2	kg/day	152	152	152	152	152	152		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	8,129	8,129	8,129	8,129	8,129	8,129		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r11 (r11-1×r11-1)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I1= b1 × r11	kg/day	2,926	2,926	2,926	2,926	2,926	2,926		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	80	80	80	80	80	80		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I2= b2× r12	kg/day	29	29	29	29	29	29		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	21	21	21	21	21	21		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I3= b3×r13	kg/day	8	8	8	8	8	8		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	3,144	3,144	3,144	3,144	3,144	3,144		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1×r21	kg/day								
C2.Pollution load from live-stock										
1) Pollution load produced	c2	kg/day	1,022	1,022	1,022	1,022	1,022	1,022		
2) Flow-out ratio	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r22-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r22(r22-1×r22-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	A2= c2 × r22	kg/day	41	41	41	41	41	41		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	41	41	41	41	41	41		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	760	760	760	760	760	760		
2) Flow-out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r31-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	Od= d1 x r31	kg/day	30	30	30	30	30	30		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	3.4	4.5	3.3	10.6	5.2	4.9	5.2	5.2
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	5,804	5,538	6,608	5,328	5,076	4,950	5,551	
2)Water flow	Q	m3/s	12.8	12.8	12.8	12.8	12.8	12.8	12.8	
3)Water quality	C=L/Q	mg/l	5.2	5.0	6.0	4.8	4.6	4.5	5.0	5.2

Note : *Pollution load from fields is included in other sources.

Table-4(6) Caluculation of Water Quality (BOD) at Karangpilang (2020 : Case-II)

Items		units	2010	Jan.	Feb.	Mar.	Apr.	May.	Av<Dry	75%Va.
I.Pollution load from upstream										
1)Water quality of Cangu Turbegue (100C)	C0	mg/l								
2)Water flow of Cangu Turbuegue	Q0	m3/s								
3)Pollution load from upstream	L0=C0 x Q0	kg/day	5.855	5.534	6.608	5.326	5.076	4.953		
4) Run-off pollution load from upstream	L0=C0 x Q0	kg/day	872	831	991	799	761	743		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B621)										
1) Pollution load produced	a1	kg/day	342	342	342	342	342	342		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r1 (r1-1x r1-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	D1= a1 x r1	kg/day	62	62	62	62	62	62		
A2.Pollution load (Sub-basin B622)										
1) Pollution load produced	a2	kg/day	1.097	1.097	1.097	1.097	1.097	1.097		
2) Flow-out ratio	r2-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r2-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r2 (r2-1x r2-2)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D2= a2 x r2	kg/day	296	296	296	296	296	296		
A3.Pollution load (Sub-basin B623)										
1) Pollution load produced	a3	kg/day	442	442	442	442	442	442		
2) Flow-out ratio	r3-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r3-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r3 (r3-1x r3-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	D3= a3 x r3	kg/day	199	199	199	199	199	199		
A4.Pollution load (Sub-basin B624)										
1) Pollution load produced	a4	kg/day	175	175	175	175	175	175		
2) Flow-out ratio	r4-1	-	0.6	0.6	0.6	0.6	0.6	0.6		
3) Flow-down ratio	r4-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r4 (r4-1x r4-2)	-	0.12	0.12	0.12	0.12	0.12	0.12		
5) Run-off pollution load	D4= a4 x r4	kg/day	21	21	21	21	21	21		
A5.Pollution load (Sub-basin B630)										
1) Pollution load produced	a5	kg/day	1.132	1.132	1.132	1.132	1.132	1.132		
2) Flow-out ratio	r5-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r5-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r5-3 (r5-1x r5-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D5= a5 x r5	kg/day	113	113	113	113	113	113		
A6.Pollution load (Sub-basin B631)										
1) Pollution load produced	a6	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r6-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r6-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r6-3 (r6-1x r6-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D6= a6 x r6	kg/day	0	0	0	0	0	0		
A7.Pollution load (Sub-basin B632)										
1) Pollution load produced	a7	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r7-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r7-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r7-3 (r7-1x r7-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	D7= a7 x r7	kg/day	0	0	0	0	0	0		
A8.Total run-off pollution load from domestic waste water	Dd=D1+...+D7	kg/day	691	691	691	691	691	691		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r11-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r11-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4) Run-off ratio	r11 (r11-1x r11-1)	-	0.2	0.2	0.2	0.2	0.2	0.2		
5) Run-off pollution load	I1= b1 x r11	kg/day	0	0	0	0	0	0		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	33.228	33.228	33.228	33.228	33.228	33.228		
2) Flow-out ratio	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r12-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4) Run-off ratio	r12 (r12-1x r12-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I2= b2 x r12	kg/day	5.815	5.815	5.815	5.815	5.815	5.815		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	6.586	6.586	6.586	6.586	6.586	6.586		
2) Flow-out ratio	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r13-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4) Run-off ratio	r13 (r13-1x r13-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I3= b3 x r13	kg/day	1.153	1.153	1.153	1.153	1.153	1.153		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	6.967	6.967	6.967	6.967	6.967	6.967		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1x r21-2)	-								
5) Run-off pollution load	A1= c1 x r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	6.934	6.934	6.934	6.934	6.934	6.934		
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r22 (r22-1x r22-2)	-	0.01	0.01	0.01	0.01	0.01	0.01		
5) Run-off pollution load	A2= c2 x r22	kg/day	69	69	69	69	69	69		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	69	69	69	69	69	69		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	10.358	10.358	10.358	10.358	10.358	10.358		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r31 (r31-1x r31-2)	-	0.01	0.01	0.01	0.01	0.01	0.01		
5) Run-off pollution load	Oc= d1 x r31	kg/day	104	104	104	104	104	104		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	15.7	11.1	11.2	14.0	7.9	7.9	11.3	14.0
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Oc	kg/day	8.702	8.662	8.822	8.630	8.592	8.574	8.664	
2)Water flow	Q	m3/s	12.8	12.8	12.8	12.8	12.8	12.8	12.8	
3)Water quality	C=L/Q	mg/l	7.9	7.8	8.0	7.8	7.8	7.8	7.8	7.9

Note : *Pollution load from fields is included in other sources

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Table-4(7) Calculation of Water Quality (BOD) at Ngagel (2020 : Case-II)

Items		units	Jan	Feb	Mar	Sep	Oct	Nov	Ave (2020)	1994 Ave
I.Pollution load from upstream										
1) Water quality of Kuningdingng (1045)	C0	mg/l								
2) Water flow of Kuningdingng	Q0	m3/s								
3) Pollution load from upstream	L0=C0×Q0	kg/day	18,762	18,642	18,822	18,630	18,593	18,576		
4) Run-off pollution load from upstream	l0=C0×Q0	kg/day	2,815	2,796	2,823	2,795	2,789	2,786		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B640)										
1) Pollution load produced	a1	kg/day	924	924	924	924	924	924		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1= a1 × r1	kg/day	333	333	333	333	333	333		
A2.Pollution load (Sub-basin B641)										
1) Pollution load produced	a2	kg/day	271	271	271	271	271	271		
2) Flow-out ratio	r2-1	-	0.6	0.6	0.6	0.6	0.6	0.6		
3) Flow-down ratio	r2-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r2 (r2-1×r2-2)	-	0.12	0.12	0.12	0.12	0.12	0.12		
5) Run-off pollution load	D2= a2 × r2	kg/day	33	33	33	33	33	33		
A3.Pollution load (Sub-basin B642)										
1) Pollution load produced	a3	kg/day	1,143	1,143	1,143	1,143	1,143	1,143		
2) Flow-out ratio	r3-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1×r3-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D3= a3 × r3	kg/day	240	240	240	240	240	240		
A4.Pollution load (Sub-basin B643)										
1) Pollution load produced	a4	kg/day	5,430	5,430	5,430	5,430	5,430	5,430		
2) Flow-out ratio	r4-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r4-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r4 (r4-1×r4-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D4= a4 × r4	kg/day	1,955	1,955	1,955	1,955	1,955	1,955		
A5.Pollution load (Sub-basin B644)										
1) Pollution load produced	a5	kg/day	2,625	2,625	2,625	2,625	2,625	2,625		
2) Flow-out ratio	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	-	0.7	0.7	0.7	0.7	0.7	0.7		
4) Run-off ratio	r5 (r5-1×r5-2)	-	0.63	0.63	0.63	0.63	0.63	0.63		
5) Run-off pollution load	D5= a5 × r5	kg/day	1,654	1,654	1,654	1,654	1,654	1,654		
A6.Total run-off pollution load from domestic waste water	Dd=D1+D2+D3+D4+D5	kg/day	4,215	4,215	4,215	4,215	4,215	4,215		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	684	684	684	684	684	684		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r11 (r11-1×r11-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I1= b1 × r11	kg/day	246	246	246	246	246	246		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	21,983	21,983	21,983	21,983	21,983	21,983		
2) Flow-out ratio	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I2= b2 × r12	kg/day	6,155	6,155	6,155	6,155	6,155	6,155		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	4,851	4,851	4,851	4,851	4,851	4,851		
2) Flow-out ratio	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I3=b3×r13	kg/day	1,358	1,358	1,358	1,358	1,358	1,358		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	7,759	7,759	7,759	7,759	7,759	7,759		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (c21-1×r21-2)	-								
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	2,203	2,203	2,203	2,203	2,203	2,203		
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.02	0.02	0.02	0.02	0.02	0.02		
5) Run-off pollution load	A2= c2 × r22	kg/day	44	44	44	44	44	44		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	44	44	44	44	44	44		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	5,435	5,435	5,435	5,435	5,435	5,435		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.02	0.02	0.02	0.02	0.02	0.02		
5) Run-off pollution load	Od= d1 × r31	kg/day	109	109	109	109	109	109		
III.Water quality at control point										
E.Water quality monitored										
1) 1994		mg/l	6.1	6.0	8.0	9.8	7.3	6.3	7.3	8.0
2) Average (1992-1996)										
3) Median (1992-1996)										
F.Result of calculation										
1) Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	14,931	14,925	14,959	14,920	14,914	14,911	14,925	
2) Water flow	Q	m3/s	12.8	12.8	12.8	12.8	12.8	12.8	12.8	
3) Water quality	C=L/Q	mg/l	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5

Note : *Pollution load from fields is included in other sources.

Table-4(S) Calculation of Water Quality (BOD) at Kayoon (2020 : Case-II)

Items	where	unit	Jan	Feb	Mar	Apr	Oct	Nov	Ave(Dry)	95%Vd
I. Pollution load from upstream										
1) Water quality of Jetis Bridge (L≠Q0)	C0	mg/l								
2) Water flow of Jetis Bridge	Q0	m3/s								
3) Pollution load from upstream	L0=C0xQ0	kg/day	14.931	14.925	14.929	14.920	14.914	14.921		
4) Run-off pollution load from upstream	L0=C0xQ0	kg/day	2.966	2.965	2.966	2.984	2.983	2.982		
II. Pollution load from sub-basin										
A. Domestic waste water										
A1 Pollution load (Sub-basin B645)										
1) Pollution load produced	a1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r1 (r1-1xr1-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1= a1 x r1	kg/day	0	0	0	0	0	0		
A2 Pollution load (Sub-basin B646)										
1) Pollution load produced	a2	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r2-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r2-2	-	0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	r2 (r2-1xr2-2)	-	0.54	0.54	0.54	0.54	0.54	0.54		
5) Run-off pollution load	D2= a2 x r2	kg/day	0	0	0	0	0	0		
A3 Total run-off pollution load from domestic waste water	Cd=D1+D2	kg/day	0	0	0	0	0	0		
B. Industrial waste water										
B1 Pollution load from major producers										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r11-1	-								
3) Flow-down ratio	r11-2	-								
4) Run-off ratio	r11 (r11-1xr11-2)	-	0	0	0	0	0	0		
5) Run-off pollution load	I1= b1 x r11	kg/day	0	0	0	0	0	0		
B2 Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	2.460	2.460	2.460	2.460	2.460	2.460		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r12 (r12-1xr12-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	I2= b2 x r12	kg/day	1.107	1.107	1.107	1.107	1.107	1.107		
B3 Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	580	580	580	580	580	580		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r13 (r13-1xr13-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	I3= b3 x r13	kg/day	261	261	261	261	261	261		
B4 Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	1.368	1.368	1.368	1.368	1.368	1.368		
C. Agricultural pollution load										
C1 Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1= c1 x r21	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	91	91	91	91	91	91		
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r22 (r22-1xr22-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	A2= c2 x r22	kg/day	2	2	2	2	2	2		
C3 Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	2	2	2	2	2	2		
D. Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	580	580	580	580	580	580		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r31 (r31-1xr31-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	Od= d1 x r31	kg/day	15	15	15	15	15	15		
III. Water quality at control point										
E. Water quality monitored										
1) 1994		mg/l				6.2				6.2
2) Average (1992-1996)										
3) Median (1992-1996)										
F. Result of calculation										
1) Total run-off pollution load	L=L0+Cd+Id+Ad+Od	kg/day	4.371	4.370	4.375	4.369	4.368	4.367	4.370	
2) Water flow	Q	m3/s							8.1	8.1
3) Water quality	C=L/Q	mg/l							6.3	6.3

Note : *Pollution load from fields is included in other sources

Table-4(9) Calculation of Water Quality (BOD) at Pelayaran (2020 : Case-II)

Items		units	Feb	Jul	Aug	Sep	Oct	Nov	Ave(Dry)	25 y.s.
I.Pollution load from upstream										
1)Water quality of intake of water canal	$C0$	mg/l			25.2					
2)Water flow of intake of water canal	QC	m3/s			6.0					
3)Pollution load from upstream	$L0=C0 \times Q0$	kg/day			12,960					
4)Run-off pollution load from upstream	$L0=C0 \times Q0$	kg/day			259					
II.Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load										
1)Pollution load produced	$d1$	kg/day	68	68	68	68	68	68		
2)Flow-out ratio	$r11-1$	-	0.9	0.9	0.9	0.9	0.9	0.9		
3)Flow-down ratio	$r11-2$	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	$r1 (r11-1 \times r1-2)$	-	0.18	0.18	0.18	0.18	0.18	0.18		
5)Run-off pollution load	$D1= d1 \times r1$	kg/day	12	12	12	12	12	12		
A2.Total run-off pollution load from domestic waste water	$D2=D1$	kg/day	12	12	12	12	12	12		
B.Industrial waste water										
B1.Pollution load from major producers										
1)Pollution load produced	$b1$	kg/day	84,000	84,000	84,000	84,000	84,000	84,000		
2)Flow-out ratio	$r11-1$	-	0.9	0.9	0.9	0.9	0.9	0.9		
3)Flow-down ratio	$r11-2$	-	0.02	0.02	0.02	0.02	0.02	0.02		
4)Run-off ratio	$r11 (r11-1 \times r11-1)$	-	0.018	0.018	0.018	0.018	0.018	0.018		
5)Run-off pollution load	$I1= b1 \times r11$	kg/day	1,512	1,512	1,512	1,512	1,512	1,512		
B2.Pollution load from large and medium scale industries										
1)Pollution load produced	$b2$	kg/day	164	164	164	164	164	164		
2)Flow-out ratio	$r12-1$	-	0.9	0.9	0.9	0.9	0.9	0.9		
3)Flow-down ratio	$r12-2$	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	$r12 (r12-1 \times r12-2)$	-	0.18	0.18	0.18	0.18	0.18	0.18		
5)Run-off pollution load	$I2= b2 \times r12$	kg/day	30	30	30	30	30	30		
B3.Pollution load from small scale industries										
1)Pollution load produced	$b3$	kg/day	33	33	33	33	33	33		
2)Flow-out ratio	$r13-1$	-	0.9	0.9	0.9	0.9	0.9	0.9		
3)Flow-down ratio	$r13-2$	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	$r13 (r13-1 \times r13-2)$	-	0.18	0.18	0.18	0.18	0.18	0.18		
5)Run-off pollution load	$I3= b3 \times r13$	kg/day	6	6	6	6	6	6		
B4.Total run-off pollution load from the industries	$I4=I1+I2+I3$	kg/day	1,547	1,547	1,547	1,547	1,547	1,547		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1)Pollution load produced	$c1$	kg/day								
2)Flow-out ratio	$r21-1$	-								
3)Flow-down ratio	$r21-2$	-								
4)Run-off ratio	$r21 (r21-1 \times r21-2)$	-								
5)Run-off pollution load	$A1= c1 \times r21$	kg/day								
C2.Pollution load from livestock										
1)Pollution load produced	$c2$	kg/day	56	56	56	56	56	56		
2)Flow-out ratio	$r22-1$	-	0.2	0.2	0.2	0.2	0.2	0.2		
3)Flow-down ratio	$r22-2$	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	$r22 (r22-1 \times r22-2)$	-	0.04	0.04	0.04	0.04	0.04	0.04		
5)Run-off pollution load	$A2= c2 \times r22$	kg/day	2	2	2	2	2	2		
C3.Total run-off pollution load from agriculture	$A3=A1+A2$	kg/day	2	2	2	2	2	2		
D.Other sources										
D1.Pollution load from others										
1)Pollution load produced	$d1$	kg/day	113	113	113	113	113	113		
2)Flow-out ratio	$r31-1$	-	0.2	0.2	0.2	0.2	0.2	0.2		
3)Flow-down ratio	$r31-2$	-	0.2	0.2	0.2	0.2	0.2	0.2		
4)Run-off ratio	$r31 (r31-1 \times r31-2)$	-	0.04	0.04	0.04	0.04	0.04	0.04		
5)Run-off pollution load	$O6= d1 \times r31$	kg/day	5	5	5	5	5	5		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l			12.9					12.9
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	$L=L0+D2+I4+A3+O6$	kg/day	1,566	1,566	1,826	1,566	1,566	1,566	1,610	
2)Water flow	Q	m3/s			3.2				3.2	
3)Water quality	$C=L/Q$	mg/l			6.6				6.0	

Note : *Pollution load from fields is included in other sources

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Table-4(10) Caluculation of Water Quality (BOD) at Porong (2020 : Case-II)

Items		units	Jun	Jul	Aug	Sep	Oct	Nov	Ave (Dry)	TSS Val
I.Pollution load from upstream										
1) Water quality of intake of river canal	CV	mg/l								
2) Water flow of intake of river canal	QC	m3/s								
3) Pollution load from upstream	LO=COxQO	kg/day								
4) Run-off pollution load from upstream	LO=COx r0	kg/day								
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load										
1) Pollution load produced	a1	kg/day	23	23	23	23	23	23		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r1 (r1-1x r1-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D1= a1 x r1	kg/day	17	17	17	17	17	17		
A2.Total run-off pollution load from domestic waste water	Od=D1	kg/day	17	17	17	17	17	17		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r11-1	-								
3) Flow-down ratio	r11-2	-								
4) Run-off ratio	r11 (r11-1x r11-1)	-	0	0	0	0	0	0		
5) Run-off pollution load	I1= b1 x r11	kg/day	0	0	0	0	0	0		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	55	55	55	55	55	55		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r12 (r12-1x r12-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	I2= b2 x r12	kg/day	40	40	40	40	40	40		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	11	11	11	11	11	11		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r13 (r13-1 x r13-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	I3= b3 x r13	kg/day	8	8	8	8	8	8		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	48	48	48	48	48	48		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1x r21-2)	-								
5) Run-off pollution load	A1= c1 x r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	19	19	19	19	19	19		
2) Flow-out ratio	r22-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r22-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r22 (r22-1x r22-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	A2= c1 x r22	kg/day	3.04	3.04	3.04	3.04	3.04	3.04		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	3.04	3.04	3.04	3.04	3.04	3.04		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	38	38	38	38	38	38		
2) Flow-out ratio	r31-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r31-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r31 (r31-1x r31-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	Od= d1 x r31	kg/day	6.00	6.00	6.00	6.00	6.00	6.00		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l				9.3				9.3
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of caluclation										
1)Total run-off pollution load	L=LO+Od+Id+Ad+Od	kg/day	73	73	73	73	73	73		73
2)Water flow	Q	m3/s		0.06						0.06
3)Water quality	C=L/Q	mg/l		14.0						14.0

Note : *Pollution load from fields is included in other sources.

Table-5(1) Calculation of Water Quality (BOD) at Bemlayu Bridge (2020 : Case-III)

Items		units	Jul	Oct	Aug	Nov	Jun	Nov	Nov (Dry)	20 Yrs
I.Pollution load from upstream										
1)Water quality	C0	mg/l								
2)Water flow	Q0	m3/s								
3)Pollution load from upstream	L0=C0×Q0	kg/day								
4) Run-off pollution load from upstream	L0	kg/day								
B. Pollution load from sub-basin										
A.Domestic waste water										
A1 Pollution load (Sub-basin B302)										
1) Pollution load produced	a1	kg/day	897	897	897	897	897	897		
2) Flow-out ratio	r1-1	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r1-2	-	0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	D1= a1 × r1	kg/day	27	27	27	27	27	27		
A2 Pollution load (Sub-basin B303)										
1) Pollution load produced	a2	kg/day	757	757	757	757	757	757		
2) Flow-out ratio	r2-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r2-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r2 (r2-1×r2-2)	-	0.2	0.2	0.2	0.2	0.2	0.2		
5) Run-off pollution load	D2= a2 × r2	kg/day	151	151	151	151	151	151		
A3 Pollution load (Sub-basin B320)										
1) Pollution load produced	a3	kg/day	4,864	4,864	4,864	4,864	4,864	4,864		
2) Flow-out ratio	r3-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1×r3-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D3= a3 × r3	kg/day	1,021	1,021	1,021	1,021	1,021	1,021		
A4 Pollution load (Sub-basin B321)										
1) Pollution load produced	a4	kg/day	5,090	5,090	5,090	5,090	5,090	5,090		
2) Flow-out ratio	r4-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r4-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r4 (r4-1×r4-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D4= a4 × r4	kg/day	1,069	1,069	1,069	1,069	1,069	1,069		
A5 Pollution load (Sub-basin B322)										
1) Pollution load produced	a5	kg/day	3,023	3,023	3,023	3,023	3,023	3,023		
2) Flow-out ratio	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r5-3 (r5-1×r5-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D5= a5 × r5	kg/day	2,177	2,177	2,177	2,177	2,177	2,177		
A6 Total run-off pollution load from domestic waste water	D6=D1+D2+D3+D4+D5	kg/day	4,445	4,445	4,445	4,445	4,445	4,445		
B.Industrial waste water										
B1 Pollution load from major producers										
1) Pollution load produced	b1	kg/day	165	165	165	165	165	165		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r11 (r11-1×r11-1)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	I1= b1 × r11	kg/day	74	74	74	74	74	74		
B2 Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	14,220	14,220	14,220	14,220	14,220	14,220		
2) Flow-out ratio	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12 (r12-2×r12-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I2= b2 × r12	kg/day	3,982	3,982	3,982	3,982	3,982	3,982		
B3 Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	2,745	2,745	2,745	2,745	2,745	2,745		
2) Flow-out ratio	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I3= b3 × r13	kg/day	769	769	769	769	769	769		
B4 Total run-off pollution load from the industries	I4=I1+I2+I3	kg/day	4,824	4,824	4,824	4,824	4,824	4,824		
C.Agricultural pollution load										
C1 Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	21,276	21,276	21,276	21,276	21,276	21,276		
2) Flow-out ratio	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r22-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	A2= c2 × r22	kg/day	638	638	638	638	638	638		
C3 Total run-off pollution load from agriculture	A3=A1+A2	kg/day	638	638	638	638	638	638		
D.Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	36,620	36,620	36,620	36,620	36,620	36,620		
2) Flow-out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r31-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	O6= d1 × r31	kg/day	1,099	1,099	1,098	1,099	1,099	1,099		
III.Water quality at control point										
E.Water quality monitored										
1) 1994		mg/l	8.3	9.4	9.6	8.4	3.8	7.5	8.2	6.4
2) Average(1992-1996)										
3) Median(1992-1996)										
F.Result of calculation										
1) Total run-off pollution load	L=L0+D6+I4+A3+O6	kg/day	11,007	11,007	11,007	11,007	11,007	11,007	11,007	
2) Water flow	Q	m3/s	10.0	10.0	10.0	10.0	10.0	10.0	10.0	
3) Water quality	C=L/Q	mg/l	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7

Note : *Pollution load from fields is included in other sources.

Items		units	Jan	Feb	Avg	Sep	Oct	Dec	Avg.Dry	75%Val
I.Pollution load from upstream										
1)Water quality of Lodoyo Dam (J6?)	C0	mg/l	2.0	2.7	4.3	6.6	4.3	3.8		
2)Water flow of Lodoyo Dam	Q0	m3/s	72.0	6.0	61.0	57.0	107.0	73.0		
3)Pollution load from upstream	L0=C0×Q0	kg/day	12.442	1.800	22.663	32.504	39.353	23.967		
4) Run-off pollution load from upstream	L0=C0×Q0	kg/day	2.495	280	4.533	6.501	7.951	4.793		
II. Pollution load from sub-basin										
A Domestic waste water										
A1.Pollution load (Sub-basin B14?)										
1) Pollution load produced	a1	kg/day	1.229	1.229	1.229	1.229	1.229	1.229		
2) Flow-out ratio	r1-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r1-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	D1= a1 × r1	kg/day	197	197	197	197	197	197		
A2.Pollution load (Sub-basin B150)										
1) Pollution load produced	a2	kg/day	1.661	1.661	1.661	1.661	1.661	1.661		
2) Flow-out ratio	r2-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r2-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r2 (r2-1×r2-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	D2= a2 × r2	kg/day	399	399	399	399	399	399		
A3.Pollution load (Sub-basin B153)										
1) Pollution load produced	a3	kg/day	732	732	732	732	732	732		
2) Flow-out ratio	r3-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r3-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r3 (r3-1×r3-2)	-	0.32	0.32	0.32	0.32	0.32	0.32		
5) Run-off pollution load	D3= a3 × r3	kg/day	234	234	234	234	234	234		
A4.Total run-off pollution load from domestic waste water	Dd=D1+D2+D3	kg/day	830	830	830	830	830	830		
B Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	6.221	6.221	6.221	6.221	6.221	6.221		
2) Flow-out ratio	r11-1	-	0.3	0.3	0.3	0.3	0.3	0.3		
3) Flow-down ratio	r11-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r11 (r11-1×r11-1)	-	0.06	0.06	0.06	0.06	0.06	0.06		
5) Run-off pollution load	I1= b1 × r11	kg/day	373	373	373	373	373	373		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	2.806	2.806	2.806	2.806	2.806	2.806		
2) Flow-out ratio	r12-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r12-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	I2= b2 × r12	kg/day	674	674	674	674	674	674		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	493	493	493	493	493	493		
2) Flow-out ratio	r13-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r13-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	I3=b3×r13	kg/day	118	118	118	118	118	118		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	1.166	1.166	1.166	1.166	1.166	1.166		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (c21-1×r21-2)	-								
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	11.258	11.258	11.258	11.258	11.258	11.258		
2) Flow-out ratio	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r22-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	A2= c2 × r22	kg/day	338	338	338	338	338	338		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	338	338	338	338	338	338		
D.Other sources										
O1.Pollution load from others										
1) Pollution load produced	d1	kg/day	10.620	10.620	10.620	10.620	10.620	10.620		
2) Flow-out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r31-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.03	0.03	0.03	0.03	0.03	0.03		
5) Run-off pollution load	Od= d1 × r31	kg/day	319	319	319	319	319	319		
III. Water quality at control point										
E. Water quality monitored										
1)1994		mg/l	2.8	3.8	4.3	7.3	2.6	3.5	4.1	4.3
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	5.140	2.931	7.184	9.152	10.602	7.445	7.076	
2)Water flow	Q	m3/s	62.6	62.6	62.6	62.6	62.6	62.6	62.6	
3)Water quality	C=L/Q	mg/l	1.0	0.5	1.3	1.7	2.0	1.4	1.3	1.7

Note : *Pollution load from fields is included in other sources.

Table-5(3) Caluculation of Water Quality (BOD) at Jogbriu Bridge (2020 : case-III)

Items		units	Jan	Feb	Mar	Oct	Nov	Dec	Ave./Des	75%Val
I.Pollution load from upstream										
1)Water quality of Ngerego Tanbangan (C0)	C0	mg/l	6.3	4.8	10.5	3.9	3.8	4.7		
2)Water flow of Ngerego Tanbangan	Q0	m3/s	141.0	56.9	55.6	650	52.4	41.9		
3)P. flution load from upstream	L0=C0xQ0	kg/day	76,326	23,508	50,448	24,902	17,204	17,068		
4) Run-off pollution load from upstream	L0=C0xQ0	kg/day	45,356	4,720	10,068	4,550	3,441	3,403		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B310)		kg/day								
1) Pollution load produced	a1	kg/day	2,511	2,511	2,511	2,511	2,511	2,511		
2) Flow-out ratio	r1-1		0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r1-2		0.1	0.1	0.1	0.1	0.1	0.1		
4) Run-off ratio	r1 (r1-1xr1-2)		0.08	0.08	0.08	0.08	0.08	0.08		
5) Run-off pollution load	D1= a1 x r1	kg/day	201	201	201	201	201	201		
A2.Pollution load (Sub-basin B311)		kg/day								
1) Pollution load produced	a2	kg/day	2,223	2,223	2,223	2,223	2,223	2,223		
2) Flow-out ratio	r2-1	%	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r2-2	%	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r2 (r2-1xr2-2)	%	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	D2= a2 x r2	kg/day	356	356	356	356	356	356		
A3.Pollution load (Sub-basin B312)		kg/day								
1) Pollution load produced	a3	kg/day	168	168	168	168	168	168		
2) Flow-out ratio	r3-1	%	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r3-2	%	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1xr3-2)	%	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D3= a3 x r3	kg/day	45	45	45	45	45	45		
A4.Pollution load (Sub-basin B313)		kg/day								
1) Pollution load produced	a4	kg/day	234	234	234	234	234	234		
2) Flow-out ratio	r4-1	%	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r4-2	%	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r4 (r4-1xr4-2)	%	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D4= a4 x r4	kg/day	63	63	63	63	63	63		
A5.Pollution load (Sub-basin B314)		kg/day								
1) Pollution load produced	a5	kg/day	11	11	11	11	11	11		
2) Flow-out ratio	r5-1	%	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	%	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r5-3 (r5-1xr5-2)	%	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	D5= a5x r5	kg/day	5	5	5	5	5	5		
A6.Pollution load (Sub-basin B315)		kg/day								
1) Pollution load produced	a6	kg/day	1,317	1,317	1,317	1,317	1,317	1,317		
2) Flow-out ratio	r6-1	%	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r6-2	%	0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	r6-3 (r6-1xr6-2)	%	0.48	0.48	0.48	0.48	0.48	0.48		
5) Run-off pollution load	D6= a6x r6	kg/day	632	632	632	632	632	632		
A7.Pollution load (Sub-basin B316)		kg/day								
1) Pollution load produced	a7	kg/day	150	150	150	150	150	150		
2) Flow-out ratio	r7-1	%	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r7-2	%	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r7-3 (r7-1xr7-2)	%	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D7= a7x r7	kg/day	108	108	108	108	108	108		
A8.Pollution load (Sub-basin B317)		kg/day								
1) Pollution load produced	a8	kg/day	2,899	2,899	2,899	2,899	2,899	2,899		
2) Flow-out ratio	r8-1	%	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r8-2	%	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r8-3 (r8-1xr8-2)	%	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D8= a8x r8	kg/day	609	609	609	609	609	609		
A9.Total run-off pollution load from domestic waste water	Cd=D1+...+D8	kg/day	2,019	2,019	2,019	2,019	2,019	2,019		
B.Industria waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	55,815	55,815	55,815	55,815	55,815	55,815		
2) Flow-out ratio	r11-1		0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r11-2	%	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r11 (r11-1xr11-1)	%	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	I1= b1 x r11	kg/day	1,395	1,395	1,395	1,395	1,395	1,395		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	3,799	3,799	3,799	3,799	3,799	3,799		
2) Flow-out ratio	r12-1	%	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r12-2	%	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r12 (r12-1xr12-2)	%	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	I2= b2x r12	kg/day	380	380	380	380	380	380		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	633	633	633	633	633	633		
2) Flow-out ratio	r13-1	%	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow-down ratio	r13-2	%	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r13 (r13-1xr13-2)	%	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	I3=b3xr13	kg/day	63	63	63	63	63	63		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	1,839	1,839	1,839	1,839	1,839	1,839		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	%								
3) Flow-down ratio	r21-2	%								
4) Run-off ratio	r21 (r21-1xr21-2)	%								
5) Run-off pollution load	A1= c1x r21	kg/day								
C2.Pollution load from livestock		kg/day								
1) Pollution load produced	c2	kg/day	24,838	24,838	24,838	24,838	24,838	24,838		
2) Flow-out ratio	r22-1	%	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	%	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r22(r22-1xr22-2)	%	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	A2= c1 x r22	kg/day	621	621	621	621	621	621		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	621	621	621	621	621	621		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	12,280	12,280	12,280	12,280	12,280	12,280		
2) Flow-out ratio	r31-1	%	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	%	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r31 (r31-1xr31-2)	%	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	Od= d1 x r31	kg/day	307	307	307	307	307	307		
III.Water quality at control point										
E. Water quality monitored										
1)1994		mg/l	3.5	3.8	11.9	3.4	7.7	4.5	5.8	7.7
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	50,135	9,505	14,876	9,166	8,226	8,188	11,682	
2)Water flow	Q	m3/s	58.2	58.2	58.2	58.2	58.2	58.2	58.2	
3)Water quality	C=L/Q	mg/l	6.3	1.9	3.0	1.8	1.6	1.6	2.3	3.2

Note : *Pollution load from fields is included in other sources.

Table-5(4) Calculation of Water Quality (BOD) at Padangan Bridge (2020 : Case-III)

I. Pollution load from upstream
II. Pollution load from sub-basin
III. Water quality at control point

Items	notes	unit							Ave/Dec	Std Val
I.Pollution load from upstream										
1)Water quality of Padungan (9%)	C0	mg/l								
2)Water flow of Padungan	Q0	m3/s								
3)Pollution load from upstream	L0=C0xQ0	kg/day	16.454	14.396	21.522	12.991	11.341	10.473		
4)Run-off pollution load from upstream	Ld=C0xQ0	kg/day	2.425	2.139	3.228	1.929	1.647	1.571		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B619)										
1) Pollution load produced	a1	kg/day	219	219	219	219	219	219		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r1 (r1-1xr1-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1=a1 x r1	kg/day	79	79	79	79	79	79		
A2.Pollution load (Sub-basin Bo20)										
1) Pollution load produced	a2	kg/day	202	202	202	202	202	202		
2) Flow-out ratio	r2-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r2-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r2 (r2-1xr2-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D2=a2 x r2	kg/day	73	73	73	73	73	73		
A3.Total run-off pollution load from domestic waste water	Od=D1+D2	kg/day	152	152	152	152	152	152		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	8.129	8.129	8.129	8.129	8.129	8.129		
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r11-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r11 (r11-1xr11-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I1=b1 x r11	kg/day	2.926	2.926	2.926	2.926	2.926	2.926		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	80	80	80	80	80	80		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12 (r12-1xr12-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I2=b2 x r12	kg/day	29	29	29	29	29	29		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	17	17	17	17	17	17		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13 (r13-1xr13-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I3=b3 x r13	kg/day	6	6	6	6	6	6		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	3.103	3.103	3.103	3.103	3.103	3.103		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1=c1 x r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	1.022	1.022	1.022	1.022	1.022	1.022		
2) Flow-out ratio	r22-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r22-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r22 (r22-1xr22-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	A2=c2 x r22	kg/day	41	41	41	41	41	41		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	41	41	41	41	41	41		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	760	760	760	760	760	760		
2) Flow-out ratio	r31-1	-	0.1	0.1	0.1	0.1	0.1	0.1		
3) Flow-down ratio	r31-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r31 (r31-1xr31-2)	-	0.04	0.04	0.04	0.04	0.04	0.04		
5) Run-off pollution load	Od=d1 x r31	kg/day	30	30	30	30	30	30		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	3.4	4.0	3.3	10.6	5.2	4.9	5.2	5.2
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Od+Id+Ad+Od	kg/day	5.750	5.484	6.554	5.274	5.022	4.896	5.497	
2)Water flow	Q	m3/s	12.8	12.8	12.6	12.8	12.8	12.8	12.8	
3)Water quality	V=L/Q	mg/l	5.2	5.0	5.9	4.8	4.5	4.4	5.0	5.2

Note : *Pollution load from fields is included in other sources

Item		units	Jun	Jul	Aug	Sep	Oct	Nov	Ave.(Dry)	1992.X.4
I.Pollution load from up stream										
1)Water quality of Cangso Tambangan (1996)	C0	mg/l								
2)Water flow of Cangso Tambangan	Q0	m³/s								
3.Pollution load from up stream	L0=C0×Q0	kg/day	5,750	5,484	6,554	5,274	5,022	6,596		
4) Run-off pollution load from up stream	L0=C0×Q0	kg/day	861	623	963	791	753	934		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load (Sub-basin B621)										
1) Pollution load produced	a1	kg/day	249	249	249	249	249	249		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	D1= a1 × r1	kg/day	45	45	45	45	45	45		
A2.Pollution load (Sub-basin B622)										
1) Pollution load produced	a2	kg/day	800	800	800	800	800	800		
2) Flow-out ratio	r2-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r2-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r2 (r2-1×r2-2)	-	0.27	0.27	0.27	0.27	0.27	0.27		
5) Run-off pollution load	D2= a2 × r2	kg/day	216	216	216	216	216	216		
A3.Pollution load (Sub-basin B623)										
1) Pollution load produced	a3	kg/day	322	322	322	322	322	322		
2) Flow-out ratio	r3-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r3-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r3 (r3-1×r3-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	D3= a3 × r3	kg/day	145	145	145	145	145	145		
A4.Pollution load (Sub-basin B624)										
1) Pollution load produced	a4	kg/day	126	126	126	126	126	126		
2) Flow-out ratio	r4-1	-	0.6	0.6	0.6	0.6	0.6	0.6		
3) Flow-down ratio	r4-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r4 (r4-1×r4-2)	-	0.12	0.12	0.12	0.12	0.12	0.12		
5) Run-off pollution load	D4= a4 × r4	kg/day	15	15	15	15	15	15		
A5.Pollution load (Sub-basin B630)										
1) Pollution load produced	a5	kg/day	825	825	825	825	825	825		
2) Flow-out ratio	r5-1	-	0.5	0.5	0.5	0.5	0.5	0.5		
3) Flow-down ratio	r5-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r5 (r5-1×r5-2)	-	0.1	0.1	0.1	0.1	0.1	0.1		
5) Run-off pollution load	D5= a5 × r5	kg/day	83	83	83	83	83	83		
A6.Pollution load (Sub-basin B631)										
1) Pollution load produced	a6	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r6-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r6-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r6 (r6-1×r6-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D6= a6 × r6	kg/day	0	0	0	0	0	0		
A7.Pollution load (Sub-basin B632)										
1) Pollution load produced	a7	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r7-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r7-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r7 (r7-1×r7-2)	-	0.24	0.24	0.24	0.24	0.24	0.24		
5) Run-off pollution load	D7= a7 × r7	kg/day	0	0	0	0	0	0		
A8.Total run-off pollution load from domestic waste water	Dd=D1+...+D7	kg/day	504	504	504	504	504	504		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r11-1	-	0.8	0.8	0.8	0.8	0.8	0.8		
3) Flow-down ratio	r11-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4) Run-off ratio	r11 (r11-1×r11-1)	-	0.2	0.2	0.2	0.2	0.2	0.2		
5) Run-off pollution load	I1= b1 × r11	kg/day	0	0	0	0	0	0		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	26,582	26,582	26,582	26,582	26,582	26,582		
2) Flow-out ratio	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r12-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I2= b2 × r12	kg/day	4,652	4,652	4,652	4,652	4,652	4,652		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	5,269	5,269	5,269	5,269	5,269	5,269		
2) Flow-out ratio	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r13-2	-	0.25	0.25	0.25	0.25	0.25	0.25		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.18	0.18	0.18	0.18	0.18	0.18		
5) Run-off pollution load	I3=b3×r13	kg/day	922	922	922	922	922	922		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	5,574	5,574	5,574	5,574	5,574	5,574		
C.Agricultural pollution load										
C1 Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1 × r21	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	6,934	6,934	6,934	6,934	6,934	6,934		
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r22(r22-1×r22-2)	-	0.01	0.01	0.01	0.01	0.01	0.01		
5) Run-off pollution load	A2= c2 × r22	kg/day	69	69	69	69	69	69		
C3 Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	69	69	69	69	69	69		
D.Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	10,358	10,358	10,358	10,358	10,358	10,358		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.01	0.01	0.01	0.01	0.01	0.01		
5) Run-off pollution load	Od= d1 × r31	kg/day	104	104	104	104	104	104		
III.Water quality at control point										
E.Water quality monitored										
1)1994		mg/l	15.7	11.1	11.2	14.0	7.9	7.9	11.3	14.0
2)Average(1992-1996)										
3)Min-Max(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	7,113	7,073	7,233	7,042	7,004	6,955	7,075	
2)Water flow	Q	m³/s	12.8	12.8	12.8	12.8	12.8	12.8	12.8	
3)Water quality	C=L/Q	mg/l	6.4	6.4	6.5	6.3	6.3	6.3	6.4	6.4

Note : *Pollution load from fields is included in other sources.

Items		unit								
I.Pollution load from up stream										
1)Water quality of Kanangpilang (1045)	C0	mg/l								
2)Water flow of Kanangpilang	Q0	m3/s								
3)Pollution load from upstream	L0=C0×Q0	kg/day	17.113	17.673	17.233	17.042	17.004	16.965	2.548	
4)Run-off pollution load from upstream	L0=C0×Q0	kg/day	2.567	2.361	2.585	2.556	2.551			
II. Pollution load from sub-basin										
A. Domestic waste water										
A1.Pollution load (Sub-basin BS40)										
1) Pollution load produced	a1	kg/day	717	717	717	717	717	717		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1= a1 × r1	kg/day	258	258	258	258	258	258		
A2.Pollution load (Sub-basin BS41)										
1) Pollution load produced	a2	kg/day	170	170	170	170	170	170		
2) Flow-out ratio	r2-1	-	0.6	0.6	0.6	0.6	0.6	0.6		
3) Flow-down ratio	r2-2	-	0.2	0.2	0.2	0.2	0.2	0.2		
4) Run-off ratio	r2 (r2-1×r2-2)	-	0.12	0.12	0.12	0.12	0.12	0.12		
5) Run-off pollution load	D2= a2 × r2	kg/day	20	20	20	20	20	20		
A3.Pollution load (Sub-basin BS42)										
1) Pollution load produced	a3	kg/day	887	887	887	887	887	887		
2) Flow-out ratio	r3-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r3-2	-	0.3	0.3	0.3	0.3	0.3	0.3		
4) Run-off ratio	r3 (r3-1×r3-2)	-	0.21	0.21	0.21	0.21	0.21	0.21		
5) Run-off pollution load	D3= a3 × r3	kg/day	186	186	186	186	186	186		
A4.Pollution load (Sub-basin BS43)										
1) Pollution load produced	a4	kg/day	4302	4302	4302	4302	4302	4302		
2) Flow-out ratio	r4-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r4-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r4 (r4-1×r4-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D4= a4 × r4	kg/day	1549	1549	1549	1549	1549	1549		
A5.Pollution load (Sub-basin BS44)										
1) Pollution load produced	a5	kg/day	2082	2082	2082	2082	2082	2082		
2) Flow-out ratio	r5-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r5-2	-	0.7	0.7	0.7	0.7	0.7	0.7		
4) Run-off ratio	r5-3 (r5-1×r5-2)	-	0.63	0.63	0.63	0.63	0.63	0.63		
5) Run-off pollution load	D5= a5 × r5	kg/day	1312	1312	1312	1312	1312	1312		
A6.Total run-off pollution load from domestic waste water	Dd=D1+D2+D3+D4+D5	kg/day	3325	3325	3325	3325	3325	3325		
B.Industria waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	547	547	547	547	547	547		
2) Flow-out ratio	rb1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	rb1-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	rb11 (rb1-1×rb1-1)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	I1= b1 × r1	kg/day	197	197	197	197	197	197		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	17.585	17.585	17.585	17.585	17.585	17.585		
2) Flow-out ratio	r12-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r12-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I2= b2× r12	kg/day	4.924	4.924	4.924	4.924	4.924	4.924		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	3.881	3.881	3.881	3.881	3.881	3.881		
2) Flow-out ratio	r13-1	-	0.7	0.7	0.7	0.7	0.7	0.7		
3) Flow-down ratio	r13-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.28	0.28	0.28	0.28	0.28	0.28		
5) Run-off pollution load	I3=b3×r13	kg/day	1.087	1.087	1.087	1.087	1.087	1.087		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	6.207	6.207	6.207	6.207	6.207	6.207		
C.Agricultural pollution load										
C1.Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1× r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	2.203	2.203	2.203	2.203	2.203	2.203		
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r22(r22-1×r22-2)	-	0.02	0.02	0.02	0.02	0.02	0.02		
5) Run-off pollution load	A2= c2 × r22	kg/day	44	44	44	44	44	44		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	44	44	44	44	44	44		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	5.435	5.435	5.435	5.435	5.435	5.435		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.02	0.02	0.02	0.02	0.02	0.02		
5) Run-off pollution load	Od= d1 × r31	kg/day	109	109	109	109	109	109		
III. Water quality at control point										
E. Water quality monitored										
1)954		mg/l	6.1	6.0	8.6	9.8	7.3	6.3	7.3	8.0
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	12.252	12.346	12.270	12.242	12.236	12.233	12.247	
2)Water flow	Q	m3/s	12.8	12.8	12.8	12.8	12.8	12.8	12.8	
3)Water quality	C=L/Q	mg/l	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1

Note : *Pollution load from fields is included in other sources

Table-5(8) Calculation of Water Quality (BOD) at Kayoon (2020 : case-III)

Items	symbol	units	Tr.	Dr.	Tr.	Mr.	Mr.	Mn.	Ave(Dry)	75%V.C
I.Pollution load from up stream										
1)Water quality of Jetis Bridge (4100)	C0	mg/l								
2)Water flow of Jetis Bridge	Q0	m3/s								
3)Pollution load from upstream	L0=C0xQ0	kg/day	12.252	12.236	12.276	12.242	12.236	12.233		
4) Run-off pollution load from upstream	L0=C0xQ0	kg/day	2.450	2.446	2.454	2.448	2.447	2.447		
II. Pollution load from sub-basin										
A.Domestic waste water										
A1 Pollution load (Sub-basin B645)										
1) Pollution load produced	a1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r1-2	-	0.4	0.4	0.4	0.4	0.4	0.4		
4) Run-off ratio	r1 (r1-1xr1-2)	-	0.36	0.36	0.36	0.36	0.36	0.36		
5) Run-off pollution load	D1= a1 x r1	kg/day	0	0	0	0	0	0		
A2 Pollution load (Sub-basin B646)										
1) Pollution load produced	a2	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r2-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r2-2	-	0.6	0.6	0.6	0.6	0.6	0.6		
4) Run-off ratio	r2 (r2-1xr2-2)	-	0.54	0.54	0.54	0.54	0.54	0.54		
5) Run-off pollution load	D2= a2 x r2	kg/day	0	0	0	0	0	0		
A3 Total run-off pollution load from domestic waste water	Dd=D1+D2	kg/day	0	0	0	0	0	0		
B.Industrial waste water										
B1 Pollution load from major producers										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow-out ratio	r11-1	-								
3) Flow-down ratio	r11-2	-								
4) Run-off ratio	r11 (r11-1xr11-1)	-	0	0	0	0	0	0		
5) Run-off pollution load	I1= b1 x r11	kg/day	0	0	0	0	0	0		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	2.460	2.460	2.460	2.460	2.460	2.460		
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r12-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r12 (r12-1xr12-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	I2= b2x r12	kg/day	1.107	1.107	1.107	1.107	1.107	1.107		
B3 Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	580	580	580	580	580	580		
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow-down ratio	r13-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r13 (r13-1xr13-2)	-	0.45	0.45	0.45	0.45	0.45	0.45		
5) Run-off pollution load	I3= b3x r13	kg/day	261	261	261	261	261	261		
B4 Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	1.368	1.368	1.368	1.368	1.368	1.368		
C.Agricultural pollution load										
C1 Pollution load from fields*										
1) Pollution load produced	c1	kg/day								
2) Flow-out ratio	r21-1	-								
3) Flow-down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1xr21-2)	-								
5) Run-off pollution load	A1= c1 x r21	kg/day								
C2 Pollution load from livestock										
1) Pollution load produced	c2	kg/day	91	91	91	91	91	91		
2) Flow-out ratio	r22-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r22-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r22 (r22-1xr22-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	A2= c2 x r22	kg/day	2	2	2	2	2	2		
C3 Total run-off pollution load from agriculture	Aa=A1+A2	kg/day	2	2	2	2	2	2		
D.Other sources										
D1 Pollution load from others										
1) Pollution load produced	d1	kg/day	580	580	580	580	580	580		
2) Flow-out ratio	r31-1	-	0.05	0.05	0.05	0.05	0.05	0.05		
3) Flow-down ratio	r31-2	-	0.5	0.5	0.5	0.5	0.5	0.5		
4) Run-off ratio	r31 (r31-1xr31-2)	-	0.025	0.025	0.025	0.025	0.025	0.025		
5) Run-off pollution load	Od= d1 x r31	kg/day	15	15	15	15	15	15		
III. Water quality at control point										
E.Water quality monitored										
1)1994		mg/l				6.2				6.2
2)Average(1992-1996)										
3)Median(1992-1996)										
F.Result of calculation										
1)Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	3.835	3.834	3.839	3.833	3.832	3.832	3.834	
2)Water flow	Q	m3/s				8.1				8.1
3)Water quality	C=L/Q	mg/l				5.5				5.5

Note : *Pollution load from fields is included in other sources

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Table-5(9) Calculation of Water Quality (BOD) at Pelayaran (2020 : Case-III)

Item		units	Jul	Aug	Sep	Oct	Nov	Ave(Dry)	Ave(Wet)
I. Pollution load from upstream									
1) Water quality of intake of water canal	C0	mg/l			25.0				
2) Water flow of intake of water canal	Q0	m³/s			6.0				
3) Pollution load from upstream	L0=C0×Q0	kg/day			12,960				
4) Run-off pollution load from upstream	L0=C0×Q0	kg/day			259				
II. Pollution load from sub-basin									
A. Domestic waste water									
A1 Pollution load									
1) Pollution load produced	a1	kg/day	36	36	36	36	36	36	
2) Flow-out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9	
3) Flow-down ratio	r1-2	-	0.2	0.2	0.2	0.2	0.2	0.2	
4) Run-off ratio	r1 (r1-1×r1-2)	-	0.18	0.18	0.18	0.18	0.18	0.18	
5) Run-off pollution load	D1= a1×r1	kg/day	6	6	6	6	6	6	
A2 Total run-off pollution load from domestic waste water	D2=D1	kg/day	6	6	6	6	6	6	
B. Industrial waste water									
B1 Pollution load from major producers									
1) Pollution load produced	b1	kg/day	67,200	67,200	67,200	67,200	67,200	67,200	
2) Flow-out ratio	r11-1	-	0.9	0.9	0.9	0.9	0.9	0.9	
3) Flow-down ratio	r11-2	-	0.02	0.02	0.02	0.02	0.02	0.02	
4) Run-off ratio	r11 (r11-1×r11-2)	-	0.018	0.018	0.018	0.018	0.018	0.018	
5) Run-off pollution load	I1= b1 × r11	kg/day	1,210	1,210	1,210	1,210	1,210	1,210	
B2 Pollution load from large and medium scale industries									
1) Pollution load produced	b2	kg/day	164	164	164	164	164	164	
2) Flow-out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9	
3) Flow-down ratio	r12-2	-	0.2	0.2	0.2	0.2	0.2	0.2	
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.18	0.18	0.18	0.18	0.18	0.18	
5) Run-off pollution load	I2= b2× r12	kg/day	30	30	30	30	30	30	
B3 Pollution load from small scale industries									
1) Pollution load produced	b3	kg/day	33	33	33	33	33	33	
2) Flow-out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9	
3) Flow-down ratio	r13-2	-	0.2	0.2	0.2	0.2	0.2	0.2	
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.18	0.18	0.18	0.18	0.18	0.18	
5) Run-off pollution load	I3= b3×r13	kg/day	6	6	6	6	6	6	
B4 Total run-off pollution load from the industries	I4=I1+I2+I3	kg/day	1,245	1,245	1,245	1,245	1,245	1,245	
C. Agricultural pollution load									
C1 Pollution load from fields*									
1) Pollution load produced	c1	kg/day							
2) Flow-out ratio	r21-1	-							
3) Flow-down ratio	r21-2	-							
4) Run-off ratio	C21 (r21-1×r21-2)	-							
5) Run-off pollution load	A3= c1×C1	kg/day							
C2 Pollution load from livestock									
1) Pollution load produced	c2	kg/day	56	56	56	56	56	56	
2) Flow-out ratio	r22-1	-	0.2	0.2	0.2	0.2	0.2	0.2	
3) Flow-down ratio	r22-2	-	0.2	0.2	0.2	0.2	0.2	0.2	
4) Run-off ratio	r22(r22-1×r22-2)	-	0.04	0.04	0.04	0.04	0.04	0.04	
5) Run-off pollution load	A2= c2 × r22	kg/day	2	2	2	2	2	2	
C3 Total run-off pollution load from agriculture	A4=A3+A2	kg/day	2	2	2	2	2	2	
D. Other sources									
D1 Pollution load from others									
1) Pollution load produced	d1	kg/day	113	113	113	113	113	113	
2) Flow-out ratio	r31-1	-	0.2	0.2	0.2	0.2	0.2	0.2	
3) Flow-down ratio	r31-2	-	0.2	0.2	0.2	0.2	0.2	0.2	
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.04	0.04	0.04	0.04	0.04	0.04	
5) Run-off pollution load	Od= d1 × r31	kg/day	5	5	5	5	5	5	
III. Water quality at control point									
E. Water quality monitored									
1) 1994		mg/l			12.9				12.9
2) Average(1992-1996)									
3) Median(1992-1996)									
F. Result of calculation									
1) Total run-off pollution load	L=L0+D2+I4+A4+Od	kg/day	1,258	1,258	1,517	1,258	1,258	1,258	1,301
2) Water flow	Q	m³/s			3.2				3.2
3) Water quality	C=L/Q	mg/l			5.5				5.5

Note : *Pollution load from fields is included in other sources

Table-5(10) Caluculation of Water Quality (BOD) at Porong (2020 : Case-III)

Items		units	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Ave.xDry	95%Val
I.Pollution load from upstream										
1) Water quality of intake of water canal	C0	mg/l								
2) Water flow of intake of water canal	Q0	m3/s								
3) Pollution load from upstream	L0=C0×Q0	kg/day								
4) Run-off pollution load from upstream	L0=C0×r0	kg/day								
II. Pollution load from sub-basin										
A.Domestic waste water										
A1.Pollution load										
1) Pollution load produced	a1	kg/day	12	12	12	12	12	12		
2) Flow out ratio	r1-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow down ratio	r1-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r1(r1-1×r1-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	D1= a1 × r1	kg/day	9	9	9	9	9	9		
A2.Total run-off pollution load from domestic waste water	Dd=D1	kg/day	9	9	9	9	9	9		
B.Industrial waste water										
B1.Pollution load from major producers										
1) Pollution load produced	b1	kg/day	0	0	0	0	0	0		
2) Flow out ratio	r11-1	-								
3) Flow down ratio	r11-2	-								
4) Run-off ratio	r11 (r11-1×r11-1)	-	0	0	0	0	0	0		
5) Run-off pollution load	I1= b1 × r11	kg/day	0	0	0	0	0	0		
B2.Pollution load from large and medium scale industries										
1) Pollution load produced	b2	kg/day	55	55	55	55	55	55		
2) Flow out ratio	r12-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow down ratio	r12-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r12 (r12-1×r12-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	I2= b2× r12	kg/day	40	40	40	40	40	40		
B3.Pollution load from small scale industries										
1) Pollution load produced	b3	kg/day	11	11	11	11	11	11		
2) Flow out ratio	r13-1	-	0.9	0.9	0.9	0.9	0.9	0.9		
3) Flow down ratio	r13-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r13 (r13-1×r13-2)	-	0.72	0.72	0.72	0.72	0.72	0.72		
5) Run-off pollution load	I3=b3×r13	kg/day	8	8	8	8	8	8		
B4.Total run-off pollution load from the industries	Id=I1+I2+I3	kg/day	48	48	48	48	48	48		
C.Agricultural pollution load										
C1.Pollution load from fields *										
1) Pollution load produced	c1	kg/day								
2) Flow out ratio	r21-1	-								
3) Flow down ratio	r21-2	-								
4) Run-off ratio	r21 (r21-1×r21-2)	-								
5) Run-off pollution load	A1= c1× r21	kg/day								
C2.Pollution load from livestock										
1) Pollution load produced	c2	kg/day	19	19	19	19	19	19		
2) Flow out ratio	r22-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow down ratio	r22-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r22 (r22-1×r22-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	A2= c1 × r22	kg/day	3.04	3.04	3.04	3.04	3.04	3.04		
C3.Total run-off pollution load from agriculture	Ad=A1+A2	kg/day	3.04	3.04	3.04	3.04	3.04	3.04		
D.Other sources										
D1.Pollution load from others										
1) Pollution load produced	d1	kg/day	38	38	38	38	38	38		
2) Flow out ratio	r31-1	-	0.2	0.2	0.2	0.2	0.2	0.2		
3) Flow down ratio	r31-2	-	0.8	0.8	0.8	0.8	0.8	0.8		
4) Run-off ratio	r31 (r31-1×r31-2)	-	0.16	0.16	0.16	0.16	0.16	0.16		
5) Run-off pollution load	Od= d1 × r31	kg/day	6.00	6.00	6.00	6.00	6.00	6.00		
III.Water quality at control point										
E.Water quality monitored										
1) 1964		mg/l			9.3					9.3
2) Average(1992-1996)										
3) Max.x(1992-1996)										
F.Result of calculation										
1) Total run-off pollution load	L=L0+Dd+Id+Ad+Od	kg/day	65	65	65	65	65	65		65
2) Water flow	Q	m3/s			0.06					0.06
3) Water quality	C=L/Q	mg/l			12.6					12.6

Note : *Pollution load from fields is included in other sources.

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