COST BENEFIT FLOW FOR MASTER PLAN
(Existing Basin)

River: Ratuwa (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	7,693	0	7,693	0	7,693	0
2 2000	7,693	0	7,693	0	6,994	0
3 2001	15,740	0	15,740	0	13,008	0
4 2002	38,086	0	38,086	0	28,615	0
5 2003	38,086	203	38,289	2,263	26,152	1,545
6 2004	38,086	406	38,492	4,525	23,901	2,810
7 2005	27,638	609	28,247	6,788	15,945	3,832
8 2006	27,638	757	28,395	8,430	14,571	4,326
9 2007	27,638	904	28,542	10,071	13,315	4,698
10 2008	27,638	1,052	28,690	11,713	12,167	4,968
11 2009	27,638	1,199	28,837	13,355	11,118	5,149
12 2010	27,638	1,347	28,985	14,997	10,159	5,256
13 2011	27,638	1,494	29,132	16,639	9,282	5,302
14 2012	27,638	1,642	29,280	18,281	8,481	5,295
15 2013	27,638	1,789	29,427	19,923	7,749	5,246
16 2014	27,638	1,936	29,574	21,565	7,080	5,162
17 2015	27,638	2,084	29,722	23,206	6,468	5,050
18 2016	27,638	2,231	29,869	24,848	5,909	4,916
19 2017	19,591	2,379	21,970	26,490	3,951	4,764
20 2018		2,483	2,483	27,654	406	4,522
21 2019		2,483	2,483	27,654	369	4,111
22 2020		2,483	2,483	27,654	336	3,737
23 2021		2,483	2,483	27,654	305	3,397
24 2022		2,483	2,483	27,654	277	3,088
25 2023		2,483	2,483	27,654	252	2,808
26 2024		2,483	2,483	27,654	229	2,552
27 2025		2,483	2,483	27,654	208	2,320
28 2026		2,483	2,483	27,654	189	2,109
29 2027		2,483	2,483	27,654	172	1,918
30 2028		2,483	2,483	27,654	157	1,743
31 2029		2,483	2,483	27,654	142	1,585
32 2030		2,483	2,483	27,654	129	1,441
33 2031		2,483	2,483	27,654	118	1,310
34 2032		2,483	2,483	27,654	107	1,191
35 2033		2,483	2,483	27,654	97	1,082
36 2034		2,483	2,483	27,654	88	984
37 2035		2,483	2,483	27,654	80	895
38 2036		2,483	2,483	27,654	73	813
39 2037		2,483	2,483	27,654	66	739
40 2038		2,483	2,483	27,654	60	672
41 2039		2,483	2,483	27,654	55	611
42 2040		2,483	2,483	27,654	50	555
43 2041		2,483	2,483	27,654	45	505
44 2042		2,483	2,483	27,654	41	459
45 2043		2,483	2,483	27,654	37	417
46 2044		2,483	2,483	27,654	34	379
47 2045		2,483	2,483	27,654	31	345
48 2046		2,483	2,483	27,654	28	314
49 2047		2,483	2,483	27,654	26	285
50 2048		2,483	2,483	27,654	23	259
Total	496,631	97,010	593,641	1,080,368	236,793	115,467

EIRR: 3.8%
B/C: 0.49
NPV(B-C): -121,326 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Future Basin)

River: Ratuwa (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	7,693	0	7,693	0	7,693	0
2 2000	7,693	0	7,693	0	6,994	0
3 2001	15,740	0	15,740	0	13,008	0
4 2002	38,086	0	38,086	0	28,615	0
5 2003	38,086	203	38,289	4,480	26,152	3,060
6 2004	38,086	406	38,492	8,960	23,901	5,563
7 2005	27,638	609	28,247	13,440	15,945	7,586
8 2006	27,638	757	28,395	16,691	14,571	8,565
9 2007	27,638	904	28,542	19,942	13,315	9,303
10 2008	27,638	1,052	28,690	23,192	12,167	9,836
11 2009	27,638	1,199	28,837	26,443	11,118	10,195
12 2010	27,638	1,347	28,985	29,694	10,159	10,408
13 2011	27,638	1,494	29,132	32,945	9,282	10,497
14 2012	27,638	1,642	29,280	36,196	8,481	10,485
15 2013	27,638	1,789	29,427	39,447	7,749	10,388
16 2014	27,638	1,936	29,574	42,698	7,080	10,222
17 2015	27,638	2,084	29,722	45,949	6,468	10,000
18 2016	27,638	2,231	29,869	49,200	5,909	9,734
19 2017	19,591	2,379	21,970	52,451	3,951	9,454
20 2018		2,483	2,483	54,755	406	8,953
21 2019		2,483	2,483	54,755	369	8,139
22 2020		2,483	2,483	54,755	336	7,399
23 2021		2,483	2,483	54,755	305	6,726
24 2022		2,483	2,483	54,755	277	6,115
25 2023		2,483	2,483	54,755	252	5,559
26 2024		2,483	2,483	54,755	229	5,054
27 2025		2,483	2,483	54,755	208	4,594
28 2026		2,483	2,483	54,755	189	4,177
29 2027		2,483	2,483	54,755	172	3,797
30 2028		2,483	2,483	54,755	157	3,452
31 2029		2,483	2,483	54,755	142	3,138
32 2030		2,483	2,483	54,755	129	2,853
33 2031		2,483	2,483	54,755	118	2,593
34 2032		2,483	2,483	54,755	107	2,358
35 2033		2,483	2,483	54,755	97	2,143
36 2034		2,483	2,483	54,755	88	1,948
37 2035		2,483	2,483	54,755	80	1,771
38 2036		2,483	2,483	54,755	73	1,610
39 2037		2,483	2,483	54,755	66	1,464
40 2038		2,483	2,483	54,755	60	1,231
41 2039		2,483	2,483	54,755	55	1,210
42 2040		2,483	2,483	54,755	50	1,100
43 2041		2,483	2,483	54,755	45	1,000
44 2042		2,483	2,483	54,755	41	909
45 2043		2,483	2,483	54,755	37	826
46 2044		2,483	2,483	54,755	34	751
47 2045		2,483	2,483	54,755	31	683
48 2046		2,483	2,483	54,755	28	621
49 2047		2,483	2,483	54,755	26	564
50 2048		2,483	2,483	54,755	23	513
Total	496,631	97,010	593,641	2,139,129	236,793	228,625

EIRR: 9.6%
B/C: 0.97
NPV(B-C): -8,168 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Existing Basin)

River: Lohadra (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	9,319	0	9,319	0	9,319	0
2 2000	9,319	0	9,319	0	8,472	0
3 2001	18,104	0	18,104	0	14,962	0
4 2002	45,173	0	45,173	0	33,939	0
5 2003	45,173	241	45,414	1,478	31,018	1,010
6 2004	45,173	482	45,655	2,957	28,348	1,836
7 2005	32,516	723	33,239	4,435	18,762	2,503
8 2006	32,516	896	33,412	5,499	17,146	2,822
9 2007	32,516	1,070	33,586	6,563	15,668	3,062
10 2008	32,516	1,243	33,759	7,627	14,317	3,235
11 2009	32,516	1,417	33,933	8,691	13,083	3,351
12 2010	32,516	1,590	34,106	9,756	11,954	3,419
13 2011	32,516	1,764	34,280	10,820	10,923	3,447
14 2012	32,516	1,937	34,453	11,884	9,980	3,442
15 2013	32,516	2,111	34,627	12,948	9,118	3,410
16 2014	32,516	2,284	34,800	14,012	8,331	3,354
17 2015	32,516	2,457	34,973	15,076	7,611	3,281
18 2016	32,516	2,631	35,147	16,140	6,954	3,193
19 2017	23,732	2,804	26,536	17,204	4,773	3,094
20 2018		2,931	2,931	17,981	479	2,940
21 2019		2,931	2,931	17,981	436	2,673
22 2020		2,931	2,931	17,981	396	2,430
23 2021		2,931	2,931	17,981	360	2,209
24 2022		2,931	2,931	17,981	327	2,008
25 2023		2,931	2,931	17,981	298	1,826
26 2024		2,931	2,931	17,981	271	1,660
27 2025		2,931	2,931	17,981	246	1,509
28 2026		2,931	2,931	17,981	224	1,372
29 2027		2,931	2,931	17,981	203	1,247
30 2028		2,931	2,931	17,981	185	1,134
31 2029		2,931	2,931	17,981	168	1,030
32 2030		2,931	2,931	17,981	153	937
33 2031		2,931	2,931	17,981	139	852
34 2032		2,931	2,931	17,981	126	774
35 2033		2,931	2,931	17,981	115	704
36 2034		2,931	2,931	17,981	104	640
37 2035		2,931	2,931	17,981	95	582
38 2036		2,931	2,931	17,981	86	529
39 2037		2,931	2,931	17,981	78	481
40 2038		2,931	2,931	17,981	71	437
41 2039		2,931	2,931	17,981	65	397
42 2040		2,931	2,931	17,981	59	361
43 2041		2,931	2,931	17,981	54	328
44 2042		2,931	2,931	17,981	49	298
45 2043		2,931	2,931	17,981	44	271
46 2044		2,931	2,931	17,981	40	247
47 2045		2,931	2,931	17,981	37	224
48 2046		2,931	2,931	17,981	33	204
49 2047		2,931	2,931	17,981	30	185
50 2048		2,931	2,931	17,981	27	168
Total	586,185	114,509	700,694	702,502	279,675	75,115

EIRR: 0.0%
B/C: 0.27
NPV(B-C): -204,559 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Future Basin)

River: Lohadra (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	9,319	0	9,319	0	9,319	0
2 2000	9,319	0	9,319	0	8,472	0
3 2001	18,104	0	18,104	0	14,962	0
4 2002	45,173	0	45,173	0	33,939	0
5 2003	45,173	241	45,414	2,321	31,018	1,585
6 2004	45,173	482	45,655	4,642	28,348	2,882
7 2005	32,516	723	33,239	6,963	18,762	3,930
8 2006	32,516	896	33,412	8,634	17,146	4,430
9 2007	32,516	1,070	33,586	10,304	15,668	4,807
10 2008	32,516	1,243	33,759	11,975	14,317	5,079
11 2009	32,516	1,417	33,933	13,646	13,083	5,261
12 2010	32,516	1,590	34,106	15,316	11,954	5,368
13 2011	32,516	1,764	34,280	16,987	10,923	5,413
14 2012	32,516	1,937	34,453	18,658	9,980	5,404
15 2013	32,516	2,111	34,627	20,328	9,118	5,353
16 2014	32,516	2,284	34,800	21,999	8,331	5,266
17 2015	32,516	2,457	34,973	23,670	7,611	5,151
18 2016	32,516	2,631	35,147	25,340	6,954	5,013
19 2017	23,732	2,804	26,536	27,011	4,773	4,858
20 2018		2,931	2,931	28,230	479	4,616
21 2019		2,931	2,931	28,230	436	4,196
22 2020		2,931	2,931	28,230	396	3,815
23 2021		2,931	2,931	28,230	360	3,468
24 2022		2,931	2,931	28,230	327	3,153
25 2023		2,931	2,931	28,230	298	2,866
26 2024		2,931	2,931	28,230	271	2,606
27 2025		2,931	2,931	28,230	246	2,369
28 2026		2,931	2,931	28,230	224	2,153
29 2027		2,931	2,931	28,230	203	1,958
30 2028		2,931	2,931	28,230	185	1,780
31 2029		2,931	2,931	28,230	168	1,618
32 2030		2,931	2,931	28,230	153	1,471
33 2031		2,931	2,931	28,230	139	1,337
34 2032		2,931	2,931	28,230	126	1,215
35 2033		2,931	2,931	28,230	115	1,105
36 2034		2,931	2,931	28,230	104	1,005
37 2035		2,931	2,931	28,230	95	913
38 2036		2,931	2,931	28,230	86	830
39 2037		2,931	2,931	28,230	78	755
40 2038		2,931	2,931	28,230	71	686
41 2039		2,931	2,931	28,230	65	624
42 2040		2,931	2,931	28,230	59	567
43 2041		2,931	2,931	28,230	54	515
44 2042		2,931	2,931	28,230	49	469
45 2043		2,931	2,931	28,230	44	426
46 2044		2,931	2,931	28,230	40	387
47 2045		2,931	2,931	28,230	37	352
48 2046		2,931	2,931	28,230	33	320
49 2047		2,931	2,931	28,230	30	291
50 2048		2,931	2,931	28,230	27	265
Total	586,185	114,509	700,694	1,102,928	279,675	117,931

EIRR: 2.8%
B/C: 0.42
NPV(B-C): -161,743 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Existing Basin)

River: Lakhandei (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	8,630	0	8,630	0	8,630	0
2 2000	8,630	0	8,630	0	7,845	0
3 2001	16,442	0	16,442	0	13,588	0
4 2002	41,509	0	41,509	0	31,186	0
5 2003	41,509	221	41,730	2,384	28,502	1,628
6 2004	41,509	443	41,952	4,767	26,049	2,960
7 2005	29,788	664	30,452	7,151	17,190	4,036
8 2006	29,788	823	30,611	8,861	15,708	4,547
9 2007	29,788	982	30,770	10,572	14,354	4,932
10 2008	29,788	1,141	30,929	12,282	13,117	5,209
11 2009	29,788	1,300	31,088	13,993	11,986	5,395
12 2010	29,788	1,459	31,247	15,703	10,952	5,504
13 2011	29,788	1,618	31,406	17,414	10,007	5,549
14 2012	29,788	1,777	31,565	19,124	9,143	5,540
15 2013	29,788	1,935	31,723	20,835	8,354	5,486
16 2014	29,788	2,094	31,882	22,545	7,632	5,397
17 2015	29,788	2,253	32,041	24,256	6,973	5,279
18 2016	29,788	2,412	32,200	25,967	6,371	5,137
19 2017	21,976	2,571	24,547	27,677	4,415	4,978
20 2018		2,688	2,688	28,939	440	4,732
21 2019		2,688	2,688	28,939	400	4,302
22 2020		2,688	2,688	28,939	363	3,911
23 2021		2,688	2,688	28,939	330	3,555
24 2022		2,688	2,688	28,939	300	3,232
25 2023		2,688	2,688	28,939	273	2,938
26 2024		2,688	2,688	28,939	248	2,671
27 2025		2,688	2,688	28,939	226	2,428
28 2026		2,688	2,688	28,939	205	2,207
29 2027		2,688	2,688	28,939	186	2,007
30 2028		2,688	2,688	28,939	169	1,824
31 2029		2,688	2,688	28,939	154	1,658
32 2030		2,688	2,688	28,939	140	1,508
33 2031		2,688	2,688	28,939	127	1,371
34 2032		2,688	2,688	28,939	116	1,246
35 2033		2,688	2,688	28,939	105	1,133
36 2034		2,688	2,688	28,939	96	1,030
37 2035		2,688	2,688	28,939	87	936
38 2036		2,688	2,688	28,939	79	851
39 2037		2,688	2,688	28,939	72	774
40 2038		2,688	2,688	28,939	65	703
41 2039		2,688	2,688	28,939	59	639
42 2040		2,688	2,688	28,939	54	581
43 2041		2,688	2,688	28,939	49	528
44 2042		2,688	2,688	28,939	45	480
45 2043		2,688	2,688	28,939	41	437
46 2044		2,688	2,688	28,939	37	397
47 2045		2,688	2,688	28,939	34	361
48 2046		2,688	2,688	28,939	30	328
49 2047		2,688	2,688	28,939	28	298
50 2048		2,688	2,688	28,939	25	271
Total	537,661	105,031	642,692	1,130,640	256,586	120,915

EIRR: 3.6%
B/C: 0.47
NPV(B-C): -135,672 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Future Basin)

River: Lakhandei (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	8,630	0	8,630	0	8,630	0
2 2000	8,630	0	8,630	0	7,845	0
3 2001	16,442	0	16,442	0	13,588	0
4 2002	41,509	0	41,509	0	31,186	0
5 2003	41,509	221	41,730	5,148	28,502	3,516
6 2004	41,509	443	41,952	10,297	26,049	6,394
7 2005	29,788	664	30,452	15,445	17,190	8,719
8 2006	29,788	823	30,611	19,140	15,708	9,822
9 2007	29,788	982	30,770	22,835	14,354	10,653
10 2008	29,788	1,141	30,929	26,530	13,117	11,251
11 2009	29,788	1,300	31,088	30,224	11,986	11,653
12 2010	29,788	1,459	31,247	33,919	10,952	11,888
13 2011	29,788	1,618	31,406	37,614	10,007	11,985
14 2012	29,788	1,777	31,565	41,309	9,143	11,966
15 2013	29,788	1,935	31,723	45,003	8,354	11,851
16 2014	29,788	2,094	31,882	48,698	7,632	11,658
17 2015	29,788	2,253	32,041	52,393	6,973	11,402
18 2016	29,788	2,412	32,200	56,088	6,371	11,097
19 2017	21,976	2,571	24,547	59,782	4,415	10,752
20 2018		2,688	2,688	62,508	440	10,221
21 2019		2,688	2,688	62,508	400	9,291
22 2020		2,688	2,688	62,508	363	8,447
23 2021		2,688	2,688	62,508	330	7,679
24 2022		2,688	2,688	62,508	300	6,981
25 2023		2,688	2,688	62,508	273	6,346
26 2024		2,688	2,688	62,508	248	5,769
27 2025		2,688	2,688	62,508	226	5,245
28 2026		2,688	2,688	62,508	205	4,768
29 2027		2,688	2,688	62,508	186	4,335
30 2028		2,688	2,688	62,508	169	3,940
31 2029		2,688	2,688	62,508	154	3,582
32 2030		2,688	2,688	62,508	140	3,257
33 2031		2,688	2,688	62,508	127	2,961
34 2032		2,688	2,688	62,508	116	2,691
35 2033		2,688	2,688	62,508	105	2,447
36 2034		2,688	2,688	62,508	96	2,224
37 2035		2,688	2,688	62,508	87	2,022
38 2036		2,688	2,688	62,508	79	1,838
39 2037		2,688	2,688	62,508	72	1,671
40 2038		2,688	2,688	62,508	65	1,519
41 2039		2,688	2,688	62,508	59	1,381
42 2040		2,688	2,688	62,508	54	1,256
43 2041		2,688	2,688	62,508	49	1,141
44 2042		2,688	2,688	62,508	45	1,038
45 2043		2,688	2,688	62,508	41	943
46 2044		2,688	2,688	62,508	37	858
47 2045		2,688	2,688	62,508	34	780
48 2046		2,688	2,688	62,508	30	709
49 2047		2,688	2,688	62,508	28	644
50 2048		2,688	2,688	62,508	25	586
Total	537,661	105,031	642,692	2,442,183	256,586	261,176

EIRR: 10.2%
B/C: 1.02
NPV(B-C): 4,589 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Existing Basin)

River: Narayani (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	8,265	0	8,265	0	8,265	0
2 2000	8,265	0	8,265	0	7,514	0
3 2001	15,895	0	15,895	0	13,136	0
4 2002	39,901	0	39,901	0	29,978	0
5 2003	39,901	213	40,114	2,444	27,398	1,669
6 2004	39,901	426	40,327	4,888	25,040	3,035
7 2005	28,677	639	29,316	7,232	16,548	4,138
8 2006	28,677	792	29,469	9,088	15,122	4,664
9 2007	28,677	944	29,621	10,844	13,819	5,059
10 2008	28,677	1,097	29,774	12,601	12,627	5,344
11 2009	28,677	1,250	29,927	14,357	11,538	5,535
12 2010	28,677	1,403	30,080	16,113	10,543	5,648
13 2011	28,677	1,556	30,233	17,870	9,633	5,694
14 2012	28,677	1,709	30,386	19,626	8,802	5,685
15 2013	28,677	1,862	30,539	21,383	8,042	5,631
16 2014	28,677	2,015	30,692	23,139	7,347	5,539
17 2015	28,677	2,168	30,845	24,895	6,713	5,418
18 2016	28,677	2,321	30,998	26,652	6,133	5,273
19 2017	21,046	2,474	23,520	28,408	4,230	5,109
20 2018		2,586	2,586	29,697	423	4,856
21 2019		2,586	2,586	29,697	384	4,414
22 2020		2,586	2,586	29,697	350	4,013
23 2021		2,586	2,586	29,697	318	3,648
24 2022		2,586	2,586	29,697	289	3,317
25 2023		2,586	2,586	29,697	263	3,015
26 2024		2,586	2,586	29,697	239	2,741
27 2025		2,586	2,586	29,697	217	2,492
28 2026		2,586	2,586	29,697	197	2,265
29 2027		2,586	2,586	29,697	179	2,059
30 2028		2,586	2,586	29,697	163	1,872
31 2029		2,586	2,586	29,697	148	1,702
32 2030		2,586	2,586	29,697	135	1,547
33 2031		2,586	2,586	29,697	123	1,407
34 2032		2,586	2,586	29,697	111	1,279
35 2033		2,586	2,586	29,697	101	1,162
36 2034		2,586	2,586	29,697	92	1,057
37 2035		2,586	2,586	29,697	84	961
38 2036		2,586	2,586	29,697	76	873
39 2037		2,586	2,586	29,697	69	794
40 2038		2,586	2,586	29,697	63	722
41 2039		2,586	2,586	29,697	57	656
42 2040		2,586	2,586	29,697	52	597
43 2041		2,586	2,586	29,697	47	542
44 2042		2,586	2,586	29,697	43	493
45 2043		2,586	2,586	29,697	39	448
46 2044		2,586	2,586	29,697	35	407
47 2045		2,586	2,586	29,697	32	370
48 2046		2,586	2,586	29,697	29	337
49 2047		2,586	2,586	29,697	27	306
50 2048		2,586	2,586	29,697	24	278
Total	517,298	101,053	618,351	1,160,245	246,839	124,071

EIRR: 4.0%
B/C: 0.50
NPV(B-C): -122,768 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Future Basin)

River: Narayani (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	8,265	0	8,265	0	8,265	0
2 2000	8,265	0	8,265	0	7,514	0
3 2001	15,895	0	15,895	0	13,136	0
4 2002	39,901	0	39,901	0	29,978	0
5 2003	39,901	213	40,114	5,279	27,398	3,605
6 2004	39,901	426	40,327	10,557	25,040	6,555
7 2005	28,677	639	29,316	15,836	16,548	8,939
8 2006	28,677	792	29,469	19,630	15,122	10,073
9 2007	28,677	944	29,621	23,424	13,819	10,927
10 2008	28,677	1,097	29,774	27,217	12,627	11,543
11 2009	28,677	1,250	29,927	31,011	11,538	11,956
12 2010	28,677	1,403	30,080	34,805	10,543	12,199
13 2011	28,677	1,556	30,233	38,599	9,633	12,299
14 2012	28,677	1,709	30,386	42,392	8,802	12,280
15 2013	28,677	1,862	30,539	46,186	8,042	12,162
16 2014	28,677	2,015	30,692	49,980	7,347	11,965
17 2015	28,677	2,168	30,845	53,774	6,713	11,703
18 2016	28,677	2,321	30,998	57,567	6,133	11,389
19 2017	21,046	2,474	23,520	61,361	4,230	11,036
20 2018		2,586	2,586	64,146	423	10,488
21 2019		2,586	2,586	64,146	384	9,535
22 2020		2,586	2,586	64,146	350	8,668
23 2021		2,586	2,586	64,146	318	7,880
24 2022		2,586	2,586	64,146	289	7,164
25 2023		2,586	2,586	64,146	263	6,512
26 2024		2,586	2,586	64,146	239	5,920
27 2025		2,586	2,586	64,146	217	5,382
28 2026		2,586	2,586	64,146	197	4,893
29 2027		2,586	2,586	64,146	179	4,448
30 2028		2,586	2,586	64,146	163	4,044
31 2029		2,586	2,586	64,146	148	3,676
32 2030		2,586	2,586	64,146	135	3,342
33 2031		2,586	2,586	64,146	123	3,038
34 2032		2,586	2,586	64,146	111	2,762
35 2033		2,586	2,586	64,146	101	2,511
36 2034		2,586	2,586	64,146	92	2,283
37 2035		2,586	2,586	64,146	84	2,075
38 2036		2,586	2,586	64,146	76	1,886
39 2037		2,586	2,586	64,146	69	1,715
40 2038		2,586	2,586	64,146	63	1,559
41 2039		2,586	2,586	64,146	57	1,417
42 2040		2,586	2,586	64,146	52	1,288
43 2041		2,586	2,586	64,146	47	1,171
44 2042		2,586	2,586	64,146	43	1,065
45 2043		2,586	2,586	64,146	39	968
46 2044		2,586	2,586	64,146	35	880
47 2045		2,586	2,586	64,146	32	800
48 2046		2,586	2,586	64,146	29	727
49 2047		2,586	2,586	64,146	27	661
50 2048		2,586	2,586	64,146	24	601
Total	517,298	101,053	618,351	2,506,130	246,839	267,993

EIRR: 10.9%
B/C: 1.09
NPV(B-C): 21,154 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Existing Basin)

River: Tinau (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	10,102	0	10,102	0	10,102	0
2 2000	10,102	0	10,102	0	9,184	0
3 2001	25,061	0	25,061	0	20,712	0
4 2002	54,402	0	54,402	0	40,873	0
5 2003	54,402	290	54,692	2,771	37,356	1,893
6 2004	54,402	580	54,982	5,543	34,140	3,442
7 2005	40,683	871	41,554	8,314	23,456	4,693
8 2006	40,683	1,088	41,771	10,387	21,435	5,330
9 2007	40,683	1,305	41,988	12,459	19,588	5,812
10 2008	40,683	1,522	42,205	14,531	17,899	6,163
11 2009	40,683	1,739	42,422	16,604	16,355	6,402
12 2010	40,683	1,956	42,639	18,676	14,945	6,546
13 2011	40,683	2,173	42,856	20,749	13,655	6,611
14 2012	40,683	2,390	43,073	22,821	12,477	6,611
15 2013	40,683	2,607	43,290	24,894	11,400	6,555
16 2014	40,683	2,824	43,507	26,966	10,415	6,455
17 2015	40,683	3,041	43,724	29,039	9,516	6,320
18 2016	40,683	3,258	43,941	31,111	8,693	6,155
19 2017	25,723	3,475	29,198	33,184	5,251	5,968
20 2018		3,612	3,612	34,494	591	5,640
21 2019		3,612	3,612	34,494	537	5,127
22 2020		3,612	3,612	34,494	488	4,661
23 2021		3,612	3,612	34,494	444	4,237
24 2022		3,612	3,612	34,494	403	3,852
25 2023		3,612	3,612	34,494	367	3,502
26 2024		3,612	3,612	34,494	333	3,184
27 2025		3,612	3,612	34,494	303	2,894
28 2026		3,612	3,612	34,494	276	2,631
29 2027		3,612	3,612	34,494	250	2,392
30 2028		3,612	3,612	34,494	228	2,174
31 2029		3,612	3,612	34,494	207	1,977
32 2030		3,612	3,612	34,494	188	1,797
33 2031		3,612	3,612	34,494	171	1,634
34 2032		3,612	3,612	34,494	156	1,485
35 2033		3,612	3,612	34,494	141	1,350
36 2034		3,612	3,612	34,494	129	1,227
37 2035		3,612	3,612	34,494	117	1,116
38 2036		3,612	3,612	34,494	106	1,014
39 2037		3,612	3,612	34,494	97	922
40 2038		3,612	3,612	34,494	88	838
41 2039		3,612	3,612	34,494	80	762
42 2040		3,612	3,612	34,494	73	693
43 2041		3,612	3,612	34,494	66	630
44 2042		3,612	3,612	34,494	60	573
45 2043		3,612	3,612	34,494	55	521
46 2044		3,612	3,612	34,494	50	473
47 2045		3,612	3,612	34,494	45	430
48 2046		3,612	3,612	34,494	41	391
49 2047		3,612	3,612	34,494	37	356
50 2048		3,612	3,612	34,494	34	323
Total	722,390	141,086	863,476	1,347,363	343,608	143,764

EIRR: 2.8%
B/C: 0.42
NPV(B-C): -199,844 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Future Basin)

River: Tinau (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	10,102	0	10,102	0	10,102	0
2 2000	10,102	0	10,102	0	9,184	0
3 2001	25,061	0	25,061	0	20,712	0
4 2002	54,402	0	54,402	0	40,873	0
5 2003	54,402	290	54,692	6,152	37,356	4,202
6 2004	54,402	580	54,982	12,305	34,140	7,640
7 2005	40,683	871	41,554	18,457	23,456	10,419
8 2006	40,683	1,088	41,771	23,058	21,435	11,832
9 2007	40,683	1,305	41,988	27,659	19,588	12,903
10 2008	40,683	1,522	42,205	32,260	17,899	13,681
11 2009	40,683	1,739	42,422	36,861	16,355	14,211
12 2010	40,683	1,956	42,639	41,462	14,945	14,532
13 2011	40,683	2,173	42,856	46,062	13,655	14,677
14 2012	40,683	2,390	43,073	50,663	12,477	14,675
15 2013	40,683	2,607	43,290	55,264	11,400	14,553
16 2014	40,683	2,824	43,507	59,865	10,415	14,331
17 2015	40,683	3,041	43,724	64,466	9,516	14,030
18 2016	40,683	3,258	43,941	69,067	8,693	13,664
19 2017	25,723	3,475	29,198	73,668	5,251	13,250
20 2018		3,612	3,612	76,577	591	12,521
21 2019		3,612	3,612	76,577	537	11,383
22 2020		3,612	3,612	76,577	488	10,348
23 2021		3,612	3,612	76,577	444	9,407
24 2022		3,612	3,612	76,577	403	8,552
25 2023		3,612	3,612	76,577	367	7,774
26 2024		3,612	3,612	76,577	333	7,068
27 2025		3,612	3,612	76,577	303	6,425
28 2026		3,612	3,612	76,577	276	5,841
29 2027		3,612	3,612	76,577	250	5,310
30 2028		3,612	3,612	76,577	228	4,827
31 2029		3,612	3,612	76,577	207	4,388
32 2030		3,612	3,612	76,577	188	3,990
33 2031		3,612	3,612	76,577	171	3,627
34 2032		3,612	3,612	76,577	156	3,297
35 2033		3,612	3,612	76,577	141	2,997
36 2034		3,612	3,612	76,577	129	2,725
37 2035		3,612	3,612	76,577	117	2,477
38 2036		3,612	3,612	76,577	106	2,252
39 2037		3,612	3,612	76,577	97	2,047
40 2038		3,612	3,612	76,577	88	1,861
41 2039		3,612	3,612	76,577	80	1,692
42 2040		3,612	3,612	76,577	73	1,538
43 2041		3,612	3,612	76,577	66	1,398
44 2042		3,612	3,612	76,577	60	1,271
45 2043		3,612	3,612	76,577	55	1,156
46 2044		3,612	3,612	76,577	50	1,051
47 2045		3,612	3,612	76,577	45	955
48 2046		3,612	3,612	76,577	41	868
49 2047		3,612	3,612	76,577	37	789
50 2048		3,612	3,612	76,577	34	718
Total	722,390	141,086	863,476	2,991,145	343,608	319,156

EIRR: 9.2%
B/C: 0.93
NPV(B-C): -24,452 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Existing Basin)

River: West Rapti (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	2,620	0	2,620	0	2,620	0
2 2000	2,620	0	2,620	0	2,382	0
3 2001	7,841	0	7,841	0	6,480	0
4 2002	15,451	0	15,451	0	11,609	0
5 2003	15,451	82	15,533	972	10,610	664
6 2004	15,451	165	15,616	1,943	9,696	1,207
7 2005	11,893	247	12,140	2,915	6,853	1,646
8 2006	11,893	311	12,204	3,663	6,262	1,880
9 2007	11,893	374	12,267	4,411	5,723	2,058
10 2008	11,893	438	12,331	5,159	5,229	2,188
11 2009	11,893	501	12,394	5,907	4,778	2,277
12 2010	11,893	564	12,457	6,655	4,366	2,332
13 2011	11,893	628	12,521	7,403	3,990	2,359
14 2012	11,893	691	12,584	8,151	3,645	2,361
15 2013	11,893	755	12,648	8,899	3,331	2,343
16 2014	11,893	818	12,711	9,647	3,043	2,309
17 2015	11,893	882	12,775	10,395	2,780	2,262
18 2016	11,893	945	12,838	11,142	2,540	2,204
19 2017	6,671	1,009	7,680	11,890	1,381	2,139
20 2018		1,044	1,044	12,310	171	2,013
21 2019		1,044	1,044	12,310	155	1,830
22 2020		1,044	1,044	12,310	141	1,663
23 2021		1,044	1,044	12,310	128	1,512
24 2022		1,044	1,044	12,310	117	1,375
25 2023		1,044	1,044	12,310	106	1,250
26 2024		1,044	1,044	12,310	96	1,136
27 2025		1,044	1,044	12,310	88	1,033
28 2026		1,044	1,044	12,310	80	939
29 2027		1,044	1,044	12,310	72	854
30 2028		1,044	1,044	12,310	66	776
31 2029		1,044	1,044	12,310	60	705
32 2030		1,044	1,044	12,310	54	641
33 2031		1,044	1,044	12,310	49	583
34 2032		1,044	1,044	12,310	45	530
35 2033		1,044	1,044	12,310	41	482
36 2034		1,044	1,044	12,310	37	438
37 2035		1,044	1,044	12,310	34	398
38 2036		1,044	1,044	12,310	31	362
39 2037		1,044	1,044	12,310	28	329
40 2038		1,044	1,044	12,310	25	299
41 2039		1,044	1,044	12,310	23	272
42 2040		1,044	1,044	12,310	21	247
43 2041		1,044	1,044	12,310	19	225
44 2042		1,044	1,044	12,310	17	204
45 2043		1,044	1,044	12,310	16	186
46 2044		1,044	1,044	12,310	14	169
47 2045		1,044	1,044	12,310	13	154
48 2046		1,044	1,044	12,310	12	140
49 2047		1,044	1,044	12,310	11	127
50 2048		1,044	1,044	12,310	10	115
Total	208,821	40,777	249,598	480,761	99,098	51,216

EIRR: 4.2%
B/C: 0.52
NPV(B-C): -47,882 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Future Basin)

River: West Rapti (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	2,620	0	2,620	0	2,620	0
2 2000	2,620	0	2,620	0	2,382	0
3 2001	7,841	0	7,841	0	6,480	0
4 2002	15,451	0	15,451	0	11,609	0
5 2003	15,451	82	15,533	2,216	10,610	1,513
6 2004	15,451	165	15,616	4,431	9,696	2,751
7 2005	11,893	247	12,140	6,647	6,853	3,752
8 2006	11,893	311	12,204	8,352	6,262	4,286
9 2007	11,893	374	12,267	10,057	5,723	4,692
10 2008	11,893	438	12,331	11,762	5,229	4,988
11 2009	11,893	501	12,394	13,468	4,778	5,192
12 2010	11,893	564	12,457	15,173	4,366	5,318
13 2011	11,893	628	12,521	16,878	3,990	5,378
14 2012	11,893	691	12,584	18,584	3,645	5,383
15 2013	11,893	755	12,648	20,289	3,331	5,343
16 2014	11,893	818	12,711	21,994	3,043	5,265
17 2015	11,893	882	12,775	23,700	2,780	5,158
18 2016	11,893	945	12,838	25,405	2,540	5,026
19 2017	6,671	1,009	7,680	27,110	1,381	4,876
20 2018		1,044	1,044	28,067	171	4,589
21 2019		1,044	1,044	28,067	155	4,172
22 2020		1,044	1,044	28,067	141	3,793
23 2021		1,044	1,044	28,067	128	3,448
24 2022		1,044	1,044	28,067	117	3,134
25 2023		1,044	1,044	28,067	106	2,849
26 2024		1,044	1,044	28,067	96	2,590
27 2025		1,044	1,044	28,067	88	2,355
28 2026		1,044	1,044	28,067	80	2,141
29 2027		1,044	1,044	28,067	72	1,946
30 2028		1,044	1,044	28,067	66	1,769
31 2029		1,044	1,044	28,067	60	1,608
32 2030		1,044	1,044	28,067	54	1,462
33 2031		1,044	1,044	28,067	49	1,329
34 2032		1,044	1,044	28,067	45	1,208
35 2033		1,044	1,044	28,067	41	1,099
36 2034		1,044	1,044	28,067	37	999
37 2035		1,044	1,044	28,067	34	908
38 2036		1,044	1,044	28,067	31	825
39 2037		1,044	1,044	28,067	28	750
40 2038		1,044	1,044	28,067	25	682
41 2039		1,044	1,044	28,067	23	620
42 2040		1,044	1,044	28,067	21	564
43 2041		1,044	1,044	28,067	19	513
44 2042		1,044	1,044	28,067	17	466
45 2043		1,044	1,044	28,067	16	424
46 2044		1,044	1,044	28,067	14	385
47 2045		1,044	1,044	28,067	13	350
48 2046		1,044	1,044	28,067	12	318
49 2047		1,044	1,044	28,067	11	289
50 2048		1,044	1,044	28,067	10	263
Total	208,821	40,777	249,598	1,096,136	99,098	116,772

EIRR: 11.8%
B/C: 1.18
NPV(B-C): 17,674 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Existing Basin)

River: Babai (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	6,581	0	6,581	0	6,581	0
2 2000	6,581	0	6,581	0	5,983	0
3 2001	10,990	0	10,990	0	9,083	0
4 2002	30,104	0	30,104	0	22,618	0
5 2003	30,104	161	30,265	3,445	20,671	2,353
6 2004	30,104	321	30,425	6,891	18,892	4,279
7 2005	21,167	482	21,649	10,336	12,220	5,834
8 2006	21,167	595	21,762	12,758	11,167	6,547
9 2007	21,167	708	21,875	15,181	10,205	7,082
10 2008	21,167	821	21,988	17,603	9,325	7,465
11 2009	21,167	933	22,100	20,026	8,521	7,721
12 2010	21,167	1,046	22,213	22,448	7,786	7,868
13 2011	21,167	1,159	22,326	24,871	7,114	7,923
14 2012	21,167	1,272	22,439	27,293	6,500	7,906
15 2013	21,167	1,385	22,552	29,715	5,939	7,825
16 2014	21,167	1,498	22,665	32,138	5,426	7,694
17 2015	21,167	1,611	22,778	34,560	4,957	7,521
18 2016	21,167	1,724	22,891	36,983	4,529	7,317
19 2017	16,758	1,837	18,595	39,405	3,344	7,087
20 2018		1,926	1,926	41,323	315	6,757
21 2019		1,926	1,926	41,323	286	6,142
22 2020		1,926	1,926	41,323	260	5,584
23 2021		1,926	1,926	41,323	237	5,076
24 2022		1,926	1,926	41,323	215	4,615
25 2023		1,926	1,926	41,323	196	4,195
26 2024		1,926	1,926	41,323	178	3,814
27 2025		1,926	1,926	41,323	162	3,467
28 2026		1,926	1,926	41,323	147	3,152
29 2027		1,926	1,926	41,323	134	2,865
30 2028		1,926	1,926	41,323	121	2,605
31 2029		1,926	1,926	41,323	110	2,368
32 2030		1,926	1,926	41,323	100	2,153
33 2031		1,926	1,926	41,323	91	1,957
34 2032		1,926	1,926	41,323	83	1,779
35 2033		1,926	1,926	41,323	75	1,617
36 2034		1,926	1,926	41,323	69	1,470
37 2035		1,926	1,926	41,323	62	1,337
38 2036		1,926	1,926	41,323	57	1,215
39 2037		1,926	1,926	41,323	51	1,105
40 2038		1,926	1,926	41,323	47	1,004
41 2039		1,926	1,926	41,323	43	913
42 2040		1,926	1,926	41,323	39	830
43 2041		1,926	1,926	41,323	35	755
44 2042		1,926	1,926	41,323	32	686
45 2043		1,926	1,926	41,323	29	624
46 2044		1,926	1,926	41,323	26	567
47 2045		1,926	1,926	41,323	24	515
48 2046		1,926	1,926	41,323	22	469
49 2047		1,926	1,926	41,323	20	426
50 2048		1,926	1,926	41,323	18	387
Total	385,226	75,262	460,488	1,614,666	184,142	172,874

EIRR: 9.3%
B/C: 0.94
NPV(B-C): -11,268 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Future Basin)

River: Babai (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	6,581	0	6,581	0	6,581	0
2 2000	6,581	0	6,581	0	5,983	0
3 2001	10,990	0	10,990	0	9,083	0
4 2002	30,104	0	30,104	0	22,618	0
5 2003	30,104	161	30,265	5,444	20,671	3,718
6 2004	30,104	321	30,425	10,887	18,892	6,760
7 2005	21,167	482	21,649	16,331	12,220	9,218
8 2006	21,167	595	21,762	20,158	11,167	10,344
9 2007	21,167	708	21,875	23,986	10,205	11,189
10 2008	21,167	821	21,988	27,813	9,325	11,795
11 2009	21,167	933	22,100	31,640	8,521	12,199
12 2010	21,167	1,046	22,213	35,468	7,786	12,431
13 2011	21,167	1,159	22,326	39,295	7,114	12,521
14 2012	21,167	1,272	22,439	43,123	6,500	12,491
15 2013	21,167	1,385	22,552	46,950	5,939	12,363
16 2014	21,167	1,498	22,665	50,778	5,426	12,156
17 2015	21,167	1,611	22,778	54,605	4,957	11,884
18 2016	21,167	1,724	22,891	58,433	4,529	11,561
19 2017	16,758	1,837	18,595	62,260	3,344	11,198
20 2018		1,926	1,926	65,290	315	10,675
21 2019		1,926	1,926	65,290	286	9,705
22 2020		1,926	1,926	65,290	260	8,823
23 2021		1,926	1,926	65,290	237	8,021
24 2022		1,926	1,926	65,290	215	7,292
25 2023		1,926	1,926	65,290	196	6,629
26 2024		1,926	1,926	65,290	178	6,026
27 2025		1,926	1,926	65,290	162	5,478
28 2026		1,926	1,926	65,290	147	4,980
29 2027		1,926	1,926	65,290	134	4,527
30 2028		1,926	1,926	65,290	121	4,116
31 2029		1,926	1,926	65,290	110	3,742
32 2030		1,926	1,926	65,290	100	3,402
33 2031		1,926	1,926	65,290	91	3,092
34 2032		1,926	1,926	65,290	83	2,811
35 2033		1,926	1,926	65,290	75	2,556
36 2034		1,926	1,926	65,290	69	2,323
37 2035		1,926	1,926	65,290	62	2,112
38 2036		1,926	1,926	65,290	57	1,920
39 2037		1,926	1,926	65,290	51	1,746
40 2038		1,926	1,926	65,290	47	1,587
41 2039		1,926	1,926	65,290	43	1,443
42 2040		1,926	1,926	65,290	39	1,311
43 2041		1,926	1,926	65,290	35	1,192
44 2042		1,926	1,926	65,290	32	1,084
45 2043		1,926	1,926	65,290	29	985
46 2044		1,926	1,926	65,290	26	896
47 2045		1,926	1,926	65,290	24	814
48 2046		1,926	1,926	65,290	22	740
49 2047		1,926	1,926	65,290	20	673
50 2048		1,926	1,926	65,290	18	612
Total	385,226	75,262	460,488	2,551,172	184,142	273,142

EIRR: 14.8%
B/C: 1.48
NPV(B-C): 88,999 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Existing Basin)

River: Khutiya (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	1,486	0	1,486	0	1,486	0
2 2000	1,486	0	1,486	0	1,351	0
3 2001	3,543	0	3,543	0	2,928	0
4 2002	7,860	0	7,860	0	5,905	0
5 2003	7,860	42	7,902	257	5,397	175
6 2004	7,860	84	7,944	514	4,933	319
7 2005	5,842	126	5,968	770	3,369	435
8 2006	5,842	157	5,999	961	3,078	493
9 2007	5,842	188	6,030	1,152	2,813	537
10 2008	5,842	219	6,061	1,343	2,571	569
11 2009	5,842	250	6,092	1,534	2,349	591
12 2010	5,842	282	6,124	1,725	2,146	604
13 2011	5,842	313	6,155	1,915	1,961	610
14 2012	5,842	344	6,186	2,106	1,792	610
15 2013	5,842	375	6,217	2,297	1,637	605
16 2014	5,842	406	6,248	2,488	1,496	596
17 2015	5,842	437	6,279	2,679	1,367	583
18 2016	5,842	469	6,311	2,870	1,249	568
19 2017	3,785	500	4,285	3,060	771	550
20 2018		520	520	3,184	85	521
21 2019		520	520	3,184	77	473
22 2020		520	520	3,184	70	430
23 2021		520	520	3,184	64	391
24 2022		520	520	3,184	58	356
25 2023		520	520	3,184	53	323
26 2024		520	520	3,184	48	294
27 2025		520	520	3,184	44	267
28 2026		520	520	3,184	40	243
29 2027		520	520	3,184	36	221
30 2028		520	520	3,184	33	201
31 2029		520	520	3,184	30	182
32 2030		520	520	3,184	27	166
33 2031		520	520	3,184	25	151
34 2032		520	520	3,184	22	137
35 2033		520	520	3,184	20	125
36 2034		520	520	3,184	19	113
37 2035		520	520	3,184	17	103
38 2036		520	520	3,184	15	94
39 2037		520	520	3,184	14	85
40 2038		520	520	3,184	13	77
41 2039		520	520	3,184	11	70
42 2040		520	520	3,184	10	64
43 2041		520	520	3,184	9	58
44 2042		520	520	3,184	9	53
45 2043		520	520	3,184	8	48
46 2044		520	520	3,184	7	44
47 2045		520	520	3,184	6	40
48 2046		520	520	3,184	6	36
49 2047		520	520	3,184	5	33
50 2048		520	520	3,184	5	30
Total	103,984	20,309	124,293	124,374	49,484	13,275

EIRR: 0.0%
B/C: 0.27
NPV(B-C): -36,209 (NRs.1,000)

COST BENEFIT FLOW FOR MASTER PLAN
(Future Basin)

River: Khutiya (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	1,486	0	1,486	0	1,486	0
2 2000	1,486	0	1,486	0	1,351	0
3 2001	3,543	0	3,543	0	2,928	0
4 2002	7,860	0	7,860	0	5,905	0
5 2003	7,860	42	7,902	534	5,397	365
6 2004	7,860	84	7,944	1,068	4,933	663
7 2005	5,842	126	5,968	1,602	3,369	904
8 2006	5,842	157	5,999	1,999	3,078	1,026
9 2007	5,842	188	6,030	2,396	2,813	1,118
10 2008	5,842	219	6,061	2,793	2,571	1,185
11 2009	5,842	250	6,092	3,190	2,349	1,230
12 2010	5,842	282	6,124	3,587	2,146	1,257
13 2011	5,842	313	6,155	3,984	1,961	1,269
14 2012	5,842	344	6,186	4,381	1,792	1,269
15 2013	5,842	375	6,217	4,778	1,637	1,258
16 2014	5,842	406	6,248	5,175	1,496	1,239
17 2015	5,842	437	6,279	5,572	1,367	1,213
18 2016	5,842	469	6,311	5,969	1,249	1,181
19 2017	3,785	500	4,285	6,366	771	1,145
20 2018		520	520	6,623	85	1,083
21 2019		520	520	6,623	77	984
22 2020		520	520	6,623	70	895
23 2021		520	520	6,623	64	814
24 2022		520	520	6,623	58	740
25 2023		520	520	6,623	53	672
26 2024		520	520	6,623	48	611
27 2025		520	520	6,623	44	556
28 2026		520	520	6,623	40	505
29 2027		520	520	6,623	36	459
30 2028		520	520	6,623	33	417
31 2029		520	520	6,623	30	380
32 2030		520	520	6,623	27	345
33 2031		520	520	6,623	25	314
34 2032		520	520	6,623	22	285
35 2033		520	520	6,623	20	259
36 2034		520	520	6,623	19	236
37 2035		520	520	6,623	17	214
38 2036		520	520	6,623	15	195
39 2037		520	520	6,623	14	177
40 2038		520	520	6,623	13	161
41 2039		520	520	6,623	11	146
42 2040		520	520	6,623	10	133
43 2041		520	520	6,623	9	121
44 2042		520	520	6,623	9	110
45 2043		520	520	6,623	8	100
46 2044		520	520	6,623	7	91
47 2045		520	520	6,623	6	83
48 2046		520	520	6,623	6	75
49 2047		520	520	6,623	5	68
50 2048		520	520	6,623	5	62
Total	103,984	20,309	124,293	258,698	49,484	27,612

EIRR: 4.8%
B/C: 0.56
NPV(B-C): -21,871 (NRs.1,000)

ESTIMATION OF INUNDATION/SEDIMENTATION DAMAGES

(unit: Rs.1000)

Return period	General asset			Agricultural crops			Livestock		Infrastructure		Total direct damage	Indirect		Grand total
	Thatched house	Wooden house	Total	Sedimentation	Paddy	Total								
(Lakhandei River without Project)														
100	42,941	23,672	66,612	2,733	12,736	15,469	5%	773	40%	26,645	109,500	10%	10,950	120,450
50	40,035	22,754	62,789	1,809	11,504	13,314	5%	666	40%	25,116	101,884	10%	10,188	112,072
20	36,318	21,493	57,811	1,545	9,832	11,377	5%	569	40%	23,124	92,881	10%	9,288	102,169
10	33,726	20,806	54,532	1,240	8,525	9,764	5%	488	40%	21,813	86,598	10%	8,660	95,257
5	30,205	19,720	49,926	748	7,271	8,020	5%	401	40%	19,970	78,317	10%	7,832	86,148
2	13,107	9,067	22,174	242	2,810	3,052	5%	153	40%	8,870	34,248	10%	3,425	37,673
1.05	6,421	6,145	12,566	0	1,222	1,222	5%	61	40%	5,026	18,875	10%	1,887	20,762
(Lakhandei River with Project)														
100	36,896	20,369	57,265	842	9,752	10,594	5%	530	40%	22,906	91,295	10%	9,129	100,424
50	33,172	18,423	51,594	842	8,582	9,424	5%	471	40%	20,638	82,127	10%	8,213	90,340
20	28,414	16,606	45,020	836	7,057	7,893	5%	395	40%	18,008	71,316	10%	7,132	78,448
10	23,564	14,629	38,194	661	6,028	6,689	5%	334	40%	15,277	60,495	10%	6,049	66,544
5	18,023	12,918	30,940	613	5,069	5,681	5%	284	40%	12,376	49,282	10%	4,928	54,210
2	0	0	0	0	0	0	5%	0	40%	0	0	10%	0	0
1.05	0	0	0	0	0	0	5%	0	40%	0	0	10%	0	0
(Babai River without Project)														
100	21,190	2,816	24,006	2,472	35,620	38,092	11%	4,190	40%	9,602	75,890	10%	7,589	83,479
50	19,125	2,533	21,658	2,472	33,688	36,160	11%	3,978	40%	8,663	70,459	10%	7,046	77,505
20	16,581	2,181	18,762	2,472	28,567	31,040	11%	3,414	40%	7,505	60,721	10%	6,072	66,793
10	14,528	1,881	16,409	2,439	23,227	25,667	11%	2,823	40%	6,564	51,463	10%	5,146	56,610
5	10,751	1,354	12,105	2,265	17,167	19,432	11%	2,138	40%	4,842	38,516	10%	3,852	42,368
2	8,813	1,280	10,093	1,638	11,637	13,275	11%	1,460	40%	4,037	28,865	10%	2,887	31,752
1.05	0	0	0	0	0	0	11%	0	40%	0	0	10%	0	0
(Babai River with Project)														
100	21,190	2,816	24,006	1,085	35,620	36,705	11%	4,038	40%	9,602	74,350	10%	7,435	81,785
50	19,125	2,533	21,658	1,085	33,688	34,773	11%	3,825	40%	8,663	68,919	10%	6,892	75,811
20	16,581	2,181	18,762	1,085	28,567	29,652	11%	3,262	40%	7,505	59,181	10%	5,918	65,099
10	14,081	1,841	15,922	1,071	23,227	24,298	11%	2,673	40%	6,369	49,261	10%	4,926	54,188
5	10,342	1,301	11,643	1,063	16,591	17,654	11%	1,942	40%	4,657	35,896	10%	3,590	39,485
2	0	0	0	0	0	0	11%	0	40%	0	0	10%	0	0
1.05	0	0	0	0	0	0	11%	0	40%	0	0	10%	0	0

ESTIMATION OF ANNUAL AVERAGE BENEFIT

Return period (yr.)	Probability	Probability of occurance	Damage amount (Rs.1000)	Mean damage (Rs.1000)	Ann. ave. damage (Rs.1000/yr)	Cummulative damage (Rs.1000/yr)	Ann. ave. benefit (Rs.1000/yr)
(Lakhandei River without Project)							
100	0.010	0.010	120,450	116,261	1,163	50,173	28,893
50	0.020	0.030	112,072	107,120	3,214	49,010	28,684
20	0.050	0.050	102,169	98,713	4,936	45,797	28,002
10	0.100	0.100	95,257	90,703	9,070	40,861	26,692
5	0.200	0.300	86,148	61,910	18,573	31,791	23,659
2	0.500	0.452	37,673	29,217	13,217	13,217	13,217
1.05	0.952		20,762				
(Lakhandei River with Project)							
100	0.010	0.010	100,424	95,382	954	21,280	
50	0.020	0.030	90,340	84,394	2,532	20,326	
20	0.050	0.050	78,448	72,496	3,625	17,794	
10	0.100	0.100	66,544	60,377	6,038	14,169	
5	0.200	0.300	54,210	27,105	8,132	8,132	
2	0.500	0.452	0	0	0	0	
1.05	0.952		0				
(Babai River without Project)							
100	0.010	0.010	83,479	80,492	805	29,303	12,813
50	0.020	0.030	77,505	72,149	2,164	28,498	12,796
20	0.050	0.050	66,793	61,701	3,085	26,334	12,745
10	0.100	0.100	56,610	49,489	4,949	23,249	12,642
5	0.200	0.300	42,368	37,060	11,118	18,300	12,377
2	0.500	0.452	31,752	15,876	7,182	7,182	7,182
1.05	0.952		0				
(Babai River with Project)							
100	0.010	0.010	81,785	78,798	788	16,490	
50	0.020	0.030	75,811	70,455	2,114	15,702	
20	0.050	0.050	65,099	59,643	2,982	13,589	
10	0.100	0.100	54,188	46,836	4,684	10,606	
5	0.200	0.300	39,485	19,743	5,923	5,923	
2	0.500	0.452	0	0	0	0	
1.05	0.952		0				

BANK PROTECTION BENEFIT

Site code	Protection length	Erosion width	Protected area	Unit value of land	Building loss	Farmer's profit loss	Public facility loss	Unit area property loss	Total direct benefit	Indirect benefit	Total benefit
	(m)	(m)	(ha)	(Rs.1000/ha)	(Rs.1000/ha)	(Rs.1000/ha)	(Rs.1000/ha)	(Rs.1000/ha)	(Rs.1000)	(Rs.1000)	(Rs.1000)
(LAKHANDEI RIVER)											
S_1	600	19	1.321	270.0	30.2	3.4	12.1	45.6	416.8	41.7	458.4
S_2	550	19	1.226	270.0	114.1	3.4	45.6	163.1	530.7	53.1	583.8
S_3	400	19	0.941	270.0	114.1	3.4	45.6	163.1	407.3	40.7	448.0
S_4	450	19	1.036	270.0	42.0	3.4	16.8	62.1	343.9	34.4	378.3
S_5	350	19	0.846	270.0	42.0	3.4	16.8	62.1	280.8	28.1	308.9
S_6	350	19	0.846	270.0	42.0	3.4	16.8	62.1	280.8	28.1	308.9
S_7	200	19	0.561	270.0	42.0	3.4	16.8	62.1	186.2	18.6	204.8
S_8	100	19	0.371	270.0	42.0	3.4	16.8	62.1	123.1	12.3	135.4
S_9	700	19	1.511	270.0	42.0	3.4	16.8	62.1	501.7	50.2	551.8
S_{10}	400	19	0.941	270.0	42.0	3.4	16.8	62.1	312.4	31.2	343.6
S_{11}	910	19	1.910	270.0	10.0	3.4	4.0	17.4	548.7	54.9	603.6
S_{12}	500	19	1.131	270.0	29.0	3.4	11.6	44.0	354.9	35.5	390.4
S_{13}	800	19	1.701	270.0	29.0	3.4	11.6	44.0	533.9	53.4	587.3
S_{14}	355	19	0.855	270.0	10.0	3.4	4.0	17.4	245.7	24.6	270.3
S_{15}	760	19	1.625	270.0	20.3	3.4	8.1	31.7	490.1	49.0	539.1
S_{16}	950	19	1.986	270.0	11.5	3.4	4.6	19.4	574.7	57.5	632.1
S_{17}	200	19	0.561	270.0	11.5	3.4	4.6	19.4	162.2	16.2	178.5
S_{18}	2,700	19	5.311	270.0	17.3	3.4	6.9	27.5	1,580.1	158.0	1,738.1
S_{19}	200	19	0.561	270.0	11.5	3.4	4.6	19.4	162.2	16.2	178.5
S_{20}	600	19	1.321	270.0	17.3	3.4	6.9	27.5	392.9	39.3	432.2
S_{21}	1,100	19	2.271	270.0	17.3	3.4	6.9	27.5	675.6	67.6	743.1
S_{22}	600	19	1.321	270.0	17.3	3.4	6.9	27.5	392.9	39.3	432.2
S_{23}	150	19	0.466	270.0	11.5	3.4	4.6	19.4	134.7	13.5	148.2
S_{24}	870	19	1.834	270.0	11.5	3.4	4.6	19.4	530.7	53.1	583.7
S_{25}	365	19	0.874	270.0	11.5	3.4	4.6	19.4	253.0	25.3	278.3
S_{26}	400	19	0.941	270.0	11.5	3.4	4.6	19.4	272.2	27.2	299.4
	15,560		34.3						10,688.1	1,068.8	11,757

BANK PROTECTION BENEFIT

Site code	Protection length	Erosion width	Protected area	Unit value of land	Building loss	Farmer's profit loss	Public facility loss	Unit area property loss	Total direct benefit	Indirect benefit	Total benefit
	(m)	(m)	(ha)	(Rs.1000/ha)	(Rs.1000/ha)	(Rs.1000/ha)	(Rs.1000/ha)	(Rs.1000/ha)	(Rs.1000)	(Rs.1000)	(Rs.1000)
(BABAI RIVER)											
S_1	1,250	52	7.852	240.0	7.6	5.6	3.0	16.2	2,011.5	201.2	2,212.7
S_2 / E_1	500	52	3.952	240.0	7.6	5.6	3.0	16.2	1,012.4	101.2	1,113.7
S_2 / E_2	400	52	3.432	240.0	3.4	5.6	1.4	10.3	859.1	85.9	945.0
S_8	450	52	3.692	240.0	3.4	5.6	1.4	10.3	924.2	92.4	1,016.6
S_9	550	52	4.212	240.0	7.6	5.6	3.0	16.2	1,079.0	107.9	1,186.9
S_{10}	1,050	52	6.812	240.0	3.4	5.6	1.4	10.3	1,705.2	170.5	1,875.7
S_{11}	500	52	3.952	240.0	7.6	5.6	3.0	16.2	1,012.4	101.2	1,113.7
S_{12}	750	52	5.252	240.0	0.4	5.6	0.2	6.2	1,292.8	129.3	1,422.1
S_{13}	355	52	3.198	240.0	7.6	5.6	3.0	16.2	819.3	81.9	901.2
S_{14}	1,200	52	7.592	240.0	0.4	5.6	0.2	6.2	1,868.8	186.9	2,055.7
S_{15}	1,170	52	7.436	240.0	7.6	5.6	3.0	16.2	1,905.0	190.5	2,095.5
S_{16}	1,500	52	9.152	240.0	6.4	5.6	2.6	14.6	2,329.8	233.0	2,562.8
S_{17} / E_5	1,450	52	8.892	240.0	7.6	5.6	3.0	16.2	2,278.0	227.8	2,505.8
S_{18}	415	52	3.510	240.0	7.6	5.6	3.0	16.2	899.2	89.9	989.1
S_{19}	1,300	52	8.112	240.0	6.4	5.6	2.6	14.6	2,065.1	206.5	2,271.6
S_{20}	350	52	3.172	240.0	8.1	5.6	3.3	16.9	815.0	81.5	896.5
S_{21}	1,100	52	7.072	240.0	8.1	5.6	3.3	16.9	1,817.1	181.7	1,998.8
S_{22}	650	52	4.732	240.0	8.1	5.6	3.3	16.9	1,215.8	121.6	1,337.4
S_{23}	550	52	4.212	240.0	3.7	5.6	1.5	10.8	1,056.4	105.6	1,162.0
S_{24}	760	52	5.304	240.0	3.7	5.6	1.5	10.8	1,330.2	133.0	1,463.3
S_{25}	1,650	52	9.932	240.0	3.7	5.6	1.5	10.8	2,490.9	249.1	2,740.0
S_{26}	500	52	3.952	240.0	3.7	5.6	1.5	10.8	991.2	99.1	1,090.3
E_2	350	52	3.172	240.0	3.4	5.6	1.4	10.3	794.0	79.4	873.4
E_3	350	52	3.172	240.0	3.4	5.6	1.4	10.3	794.0	79.4	873.4
E_4	250	52	2.652	240.0	3.4	5.6	1.4	10.3	663.9	66.4	730.2
	19,350		134.4						34,030.2	3,403.0	37,433

COST BENEFIT FLOW

(Existing Basin)

River: Lakhandei (Unit: NRs. 1,000)

Year		Economic cost/benefit				Discounted (10%)	
		Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1	1999	0	0	0	0	0	0
2	2000	0	0	0	0	0	0
3	2001	43,491	0	43,491	0	35,943	0
4	2002	141,510	0	141,510	0	106,319	0
5	2003	112,483	795	113,278	16,400	77,371	11,282
6	2004	96,757	1,427	98,184	29,436	60,965	18,278
7	2005	0	1,971	1,971	40,650	1,113	22,946
8	2006	0	1,971	1,971	40,650	1,012	20,860
9	2007		1,971	1,971	40,650	920	18,964
10	2008		1,971	1,971	40,650	836	17,240
11	2009		1,971	1,971	40,650	760	15,672
12	2010		1,971	1,971	40,650	691	14,248
13	2011		1,971	1,971	40,650	628	12,952
14	2012		1,971	1,971	40,650	571	11,775
15	2013		1,971	1,971	40,650	519	10,704
16	2014		1,971	1,971	40,650	472	9,731
17	2015		1,971	1,971	40,650	429	8,847
18	2016		1,971	1,971	40,650	390	8,042
19	2017		1,971	1,971	40,650	355	7,311
20	2018		1,971	1,971	40,650	322	6,647
21	2019		1,971	1,971	40,650	293	6,042
22	2020		1,971	1,971	40,650	266	5,493
23	2021		1,971	1,971	40,650	242	4,994
24	2022		1,971	1,971	40,650	220	4,540
25	2023		1,971	1,971	40,650	200	4,127
26	2024		1,971	1,971	40,650	182	3,752
27	2025		1,971	1,971	40,650	165	3,411
28	2026		1,971	1,971	40,650	150	3,101
29	2027		1,971	1,971	40,650	137	2,819
30	2028		1,971	1,971	40,650	124	2,563
31	2029		1,971	1,971	40,650	113	2,330
32	2030		1,971	1,971	40,650	103	2,118
33	2031		1,971	1,971	40,650	93	1,925
34	2032		1,971	1,971	40,650	85	1,750
35	2033		1,971	1,971	40,650	77	1,591
36	2034		1,971	1,971	40,650	70	1,446
37	2035		1,971	1,971	40,650	64	1,315
38	2036		1,971	1,971	40,650	58	1,195
39	2037		1,971	1,971	40,650	53	1,087
40	2038		1,971	1,971	40,650	48	988
41	2039		1,971	1,971	40,650	44	898
42	2040		1,971	1,971	40,650	40	817
43	2041		1,971	1,971	40,650	36	742
44	2042		1,971	1,971	40,650	33	675
45	2043		1,971	1,971	40,650	30	613
46	2044		1,971	1,971	40,650	27	558
47	2045		1,971	1,971	40,650	25	507
48	2046		1,971	1,971	40,650	22	461
49	2047		1,971	1,971	40,650	20	419
50	2048		1,971	1,971	40,650	18	381
Total		394,241	88,956	483,197	1,834,437	292,652	278,075

EIRR: 9.5%
B/C: 0.95
NPV(B-C): -14,577 (NRs.1,000)

COST BENEFIT FLOW
(Future Basin)

River: Lakhandei (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	0	0	0	0	0	0
2 2000	0	0	0	0	0	0
3 2001	43,491	0	43,491	0	35,943	0
4 2002	141,510	0	141,510	0	106,319	0
5 2003	112,483	795	113,278	35,424	77,371	24,195
6 2004	96,757	1,427	98,184	63,583	60,965	39,480
7 2005	0	1,971	1,971	87,804	1,113	49,563
8 2006	0	1,971	1,971	87,804	1,012	45,057
9 2007		1,971	1,971	87,804	920	40,961
10 2008		1,971	1,971	87,804	836	37,237
11 2009		1,971	1,971	87,804	760	33,852
12 2010		1,971	1,971	87,804	691	30,775
13 2011		1,971	1,971	87,804	628	27,977
14 2012		1,971	1,971	87,804	571	25,434
15 2013		1,971	1,971	87,804	519	23,122
16 2014		1,971	1,971	87,804	472	21,020
17 2015		1,971	1,971	87,804	429	19,109
18 2016		1,971	1,971	87,804	390	17,372
19 2017		1,971	1,971	87,804	355	15,792
20 2018		1,971	1,971	87,804	322	14,357
21 2019		1,971	1,971	87,804	293	13,052
22 2020		1,971	1,971	87,804	266	11,865
23 2021		1,971	1,971	87,804	242	10,786
24 2022		1,971	1,971	87,804	220	9,806
25 2023		1,971	1,971	87,804	200	8,914
26 2024		1,971	1,971	87,804	182	8,104
27 2025		1,971	1,971	87,804	165	7,367
28 2026		1,971	1,971	87,804	150	6,697
29 2027		1,971	1,971	87,804	137	6,089
30 2028		1,971	1,971	87,804	124	5,535
31 2029		1,971	1,971	87,804	113	5,032
32 2030		1,971	1,971	87,804	103	4,574
33 2031		1,971	1,971	87,804	93	4,159
34 2032		1,971	1,971	87,804	85	3,781
35 2033		1,971	1,971	87,804	77	3,437
36 2034		1,971	1,971	87,804	70	3,124
37 2035		1,971	1,971	87,804	64	2,840
38 2036		1,971	1,971	87,804	58	2,582
39 2037		1,971	1,971	87,804	53	2,347
40 2038		1,971	1,971	87,804	48	2,134
41 2039		1,971	1,971	87,804	44	1,940
42 2040		1,971	1,971	87,804	40	1,764
43 2041		1,971	1,971	87,804	36	1,603
44 2042		1,971	1,971	87,804	33	1,458
45 2043		1,971	1,971	87,804	30	1,325
46 2044		1,971	1,971	87,804	27	1,205
47 2045		1,971	1,971	87,804	25	1,095
48 2046		1,971	1,971	87,804	22	996
49 2047		1,971	1,971	87,804	20	905
50 2048		1,971	1,971	87,804	18	823
Total	394,241	88,956	483,197	3,962,383	292,652	600,641

EIRR: 20.8%
B/C: 2.05
NPV(B-C): 307,989 (NRs.1,000)

COST BENEFIT FLOW

(Existing Basin)

River: Babai (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	0	0	0	0	0	0
2 2000	40,450	0	40,450	0	36,773	0
3 2001	129,602	0	129,602	0	107,109	0
4 2002	94,551	0	94,551	0	71,038	0
5 2003	94,551	763	95,314	17,368	65,101	11,726
6 2004	87,628	1,527	89,155	34,335	55,358	21,320
7 2005	0	2,234	2,234	50,246	1,261	28,363
8 2006	0	2,234	2,234	50,246	1,146	25,784
9 2007		2,234	2,234	50,246	1,042	23,440
10 2008		2,234	2,234	50,246	947	21,309
11 2009		2,234	2,234	50,246	861	19,372
12 2010		2,234	2,234	50,246	783	17,611
13 2011		2,234	2,234	50,246	712	16,010
14 2012		2,234	2,234	50,246	647	14,554
15 2013		2,234	2,234	50,246	588	13,231
16 2014		2,234	2,234	50,246	535	12,028
17 2015		2,234	2,234	50,246	486	10,935
18 2016		2,234	2,234	50,246	442	9,941
19 2017		2,234	2,234	50,246	402	9,037
20 2018		2,234	2,234	50,246	365	8,216
21 2019		2,234	2,234	50,246	332	7,469
22 2020		2,234	2,234	50,246	302	6,790
23 2021		2,234	2,234	50,246	274	6,173
24 2022		2,234	2,234	50,246	249	5,611
25 2023		2,234	2,234	50,246	227	5,101
26 2024		2,234	2,234	50,246	206	4,638
27 2025		2,234	2,234	50,246	187	4,216
28 2026		2,234	2,234	50,246	170	3,833
29 2027		2,234	2,234	50,246	155	3,484
30 2028		2,234	2,234	50,246	141	3,167
31 2029		2,234	2,234	50,246	128	2,880
32 2030		2,234	2,234	50,246	116	2,618
33 2031		2,234	2,234	50,246	106	2,380
34 2032		2,234	2,234	50,246	96	2,163
35 2033		2,234	2,234	50,246	87	1,967
36 2034		2,234	2,234	50,246	79	1,788
37 2035		2,234	2,234	50,246	72	1,625
38 2036		2,234	2,234	50,246	66	1,478
39 2037		2,234	2,234	50,246	60	1,343
40 2038		2,234	2,234	50,246	54	1,221
41 2039		2,234	2,234	50,246	49	1,110
42 2040		2,234	2,234	50,246	45	1,009
43 2041		2,234	2,234	50,246	41	918
44 2042		2,234	2,234	50,246	37	834
45 2043		2,234	2,234	50,246	34	758
46 2044		2,234	2,234	50,246	31	689
47 2045		2,234	2,234	50,246	28	627
48 2046		2,234	2,234	50,246	25	570
49 2047		2,234	2,234	50,246	23	518
50 2048		2,234	2,234	50,246	21	471
Total	446,782	100,582	547,364	2,262,327	349,040	340,325

EIRR: 9.7%

B/C: 0.98

NPV(B-C): -8,715 (NRs.1,000)

COST BENEFIT FLOW

(Future Basin)

River: Babai (Unit: NRs. 1,000)

Year	Economic cost/benefit				Discounted (10%)	
	Project cost	Maintenance cost	Total cost	Benefit	(C) Cost	(B) Benefit
1 1999	0	0	0	0	0	0
2 2000	40,450	0	40,450	0	36,773	0
3 2001	129,602	0	129,602	0	107,109	0
4 2002	94,551	0	94,551	0	71,038	0
5 2003	94,551	763	95,314	27,125	65,101	18,527
6 2004	87,628	1,527	89,155	54,250	55,358	33,685
7 2005	0	2,234	2,234	79,389	1,261	44,813
8 2006	0	2,234	2,234	79,389	1,146	40,739
9 2007		2,234	2,234	79,389	1,042	37,035
10 2008		2,234	2,234	79,389	947	33,669
11 2009		2,234	2,234	79,389	861	30,608
12 2010		2,234	2,234	79,389	783	27,825
13 2011		2,234	2,234	79,389	712	25,296
14 2012		2,234	2,234	79,389	647	22,996
15 2013		2,234	2,234	79,389	588	20,906
16 2014		2,234	2,234	79,389	535	19,005
17 2015		2,234	2,234	79,389	486	17,277
18 2016		2,234	2,234	79,389	442	15,707
19 2017		2,234	2,234	79,389	402	14,279
20 2018		2,234	2,234	79,389	365	12,981
21 2019		2,234	2,234	79,389	332	11,801
22 2020		2,234	2,234	79,389	302	10,728
23 2021		2,234	2,234	79,389	274	9,753
24 2022		2,234	2,234	79,389	249	8,866
25 2023		2,234	2,234	79,389	227	8,060
26 2024		2,234	2,234	79,389	206	7,327
27 2025		2,234	2,234	79,389	187	6,661
28 2026		2,234	2,234	79,389	170	6,056
29 2027		2,234	2,234	79,389	155	5,505
30 2028		2,234	2,234	79,389	141	5,005
31 2029		2,234	2,234	79,389	128	4,550
32 2030		2,234	2,234	79,389	116	4,136
33 2031		2,234	2,234	79,389	106	3,760
34 2032		2,234	2,234	79,389	96	3,418
35 2033		2,234	2,234	79,389	87	3,107
36 2034		2,234	2,234	79,389	79	2,825
37 2035		2,234	2,234	79,389	72	2,568
38 2036		2,234	2,234	79,389	66	2,335
39 2037		2,234	2,234	79,389	60	2,122
40 2038		2,234	2,234	79,389	54	1,929
41 2039		2,234	2,234	79,389	49	1,754
42 2040		2,234	2,234	79,389	45	1,595
43 2041		2,234	2,234	79,389	41	1,450
44 2042		2,234	2,234	79,389	37	1,318
45 2043		2,234	2,234	79,389	34	1,198
46 2044		2,234	2,234	79,389	31	1,089
47 2045		2,234	2,234	79,389	28	990
48 2046		2,234	2,234	79,389	25	900
49 2047		2,234	2,234	79,389	23	818
50 2048		2,234	2,234	79,389	21	744
Total	416,782	100,582	547,364	3,574,477	349,040	537,714

EIRR: 15.2%
B/C: 1.54
NPV(B-C): 188,674 (NRs.1,000)

D. OTHER DOCUMENTS

SUPPORTING REPORT

D. OTHER DOCUMENTS

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DOC.1

SCOPE OF WORK

FOR

THE STUDY ON FLOOD MITIGATION PLAN

FOR

SELECTED RIVERS IN THE TERAI PLAIN

IN

THE KINGDOM OF NEPAL

AGREED UPON BETWEEN

DEPARTMENT OF IRRIGATION, MINISTRY OF WATER RESOURCES
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Kathmandu, 6 August 1997

Mr.Mahendra Nath Aryal
Director General,
Department of Irrigation,
Ministry of Water Resources,
Kingdom of Nepal

Mr. Hidetomi Oi
Team Leader,
The Preparatory Study Team,
Japan International Cooperation Agency,
Japan

I . INTRODUCTION

In response to the request of His Majesty's Government of Nepal (hereinafter referred to as "HMG/N"), the Government of Japan has decided to conduct the Study on Flood Mitigation Plan for Selected Rivers in the Terai Plain in the Kingdom of Nepal (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of HMG/N.

The present document sets forth the scope of work with regard to the Study.

II . OBJECTIVES OF THE STUDY

The objectives of the Study are

1. to formulate a master plan for flood mitigation for selected rivers in the Terai plain,
2. to conduct a feasibility study for the priority (urgent) project(s) identified in the Master Plan, and
3. to carry out technology transfer to the counterpart personnel of HMG/N in the course of the Study.

III . STUDY AREA

The Study area of the Master Plan shall cover the selected rivers in the Terai plain in the Kingdom of Nepal (hereinafter referred to as "Nepal").

The Feasibility Study shall be carried out for the priority (urgent) project(s) identified as a result of the Master Plan Study.

Ⅳ. SCOPE OF THE STUDY

In order to achieve the above objectives, the Study will cover the following items:

[Phase I] Formulation of the Master Plan

(1) Collection and review of existing data and information

(a) Natural condition (topography, meteorology, hydrology, geology)
(b) Existing facilities and measures related to flood mitigation
(c) Reports and documents on projects related flood mitigation
(d) Existing flood forecasting, warning and evacuation system
(e) Laws and regulations related to river management
(f) Land use and vegetation
(g) Environmental policy
(h) National and regional socio-economy
(i) Development plans and policies
(j) Remote sensing and geographic information system
(k) Others

(2) Field Reconnaissance

(a) Topography
(b) Geology
(c) Existing facilities and measures related to flood control and drainage
(d) Existing flood forecasting, warning and evacuation system
(e) Water use
(f) Land use and vegetation
(g) Soil erosion in the catchment
(h) Sediment in the river course
(i) Environment
(j) Community
(k) Disaster prevention system
(l) Others

(3) Field survey of flood mark and flood damage

(4) Study and analysis of field survey

(5) Formulation of the Master Plan

(a) Structural measures

(b) Non-structural measures

(c) Cost estimation

(6) Initial environmental examination (IEE)

(7) Evaluation

(a) Economic evaluation

(b) Social evaluation

(8) Selection of priority project(s)

[Phase II] Feasibility study

(1) Supplementary data collection

(2) Field survey

(3) Study and analysis

(4) Preliminary design of structural measures

(5) Preliminary plan of non-structural measures

(6) Work execution plan

(7) Operation and maintenance plan

(8) Cost estimation

(9) Environmental impact assessment (EIA)

(10) Evaluation

(11) Implementation plan

V. SCHEDULE OF THE STUDY

The Study shall be carried out in accordance with the attached tentative study schedule.

Ⅵ. REPORTS

JICA will prepare and submit the following reports in English to HMG/N.

1. Inception Report
Thirty (30) copies at the beginning of the first work period in Nepal

2. Interim Report
Thirty (30) copies at the beginning of the second work period in Nepal

3. Progress Report
Thirty (30) copies at the end of the second work period in Nepal

4. Draft Final Report
Thirty (30) copies at the forth work period in Nepal
HMG/N will present its comments to JICA within one(1) month after the receipt of the Draft Final Report

5. Final Report
Sixty (60) copies within two (2) months after JICA's receipt of comments on the Draft Final Report

Ⅶ. UNDERTAKINGS OF HIS MAJESTY'S GOVERNMENT OF NEPAL

1. To facilitate the smooth conduct of the Study, HMG/N shall take necessary measures:

(1) to secure the safety of the Japanese study team;
(2) to permit the members of the Japanese study team to enter, leave and sojourn in Nepal for the duration of their assignment therein, and exempt them from alien registration requirements and consular fees;
(3) to exempt the members of the Japanese study team from taxes, duties and other charges on equipment, machinery and other materials brought into Nepal for the conduct of the Study;
(4) to exempt the members of the Japanese study team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese study team for their services in connection with the implementation of the Study;
(5) to provide necessary facilities to the Japanese study team for remittance as well as utilization of the

funds introduced into Nepal from Japan in connection with the implementation of the Study;
(6) to secure permission for entry into private properties or restricted areas for the conduct of the Study;
(7) to secure permission for the Japanese study team to take all data and documents (including photographs) related the Study out of Nepal to Japan and;
(8) to provide medical services as needed. Its expenses will be chargeable to members of the Japanese study team.

2. HMG/N shall bear claims, if any arise, against members of the Japanese study team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese study team.

3. Department of Irrigation, Ministry of Water Resources (hereinafter referred to as "DOI") shall act as a counterpart agency to the Japanese study team and also as a coordinating body in relations with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

4. DOI shall, at its own expense, provide the Japanese study team with the following, in cooperation with other organizations concerned:
(1) available data and information related to the Study,
(2) counterpart personnel,
(3) office spaces with necessary equipment (telephones, facsimile and furnitures) in Kathmandu,
(4) credentials or identification cards.

Ⅷ. UNDERTAKINGS OF JICA

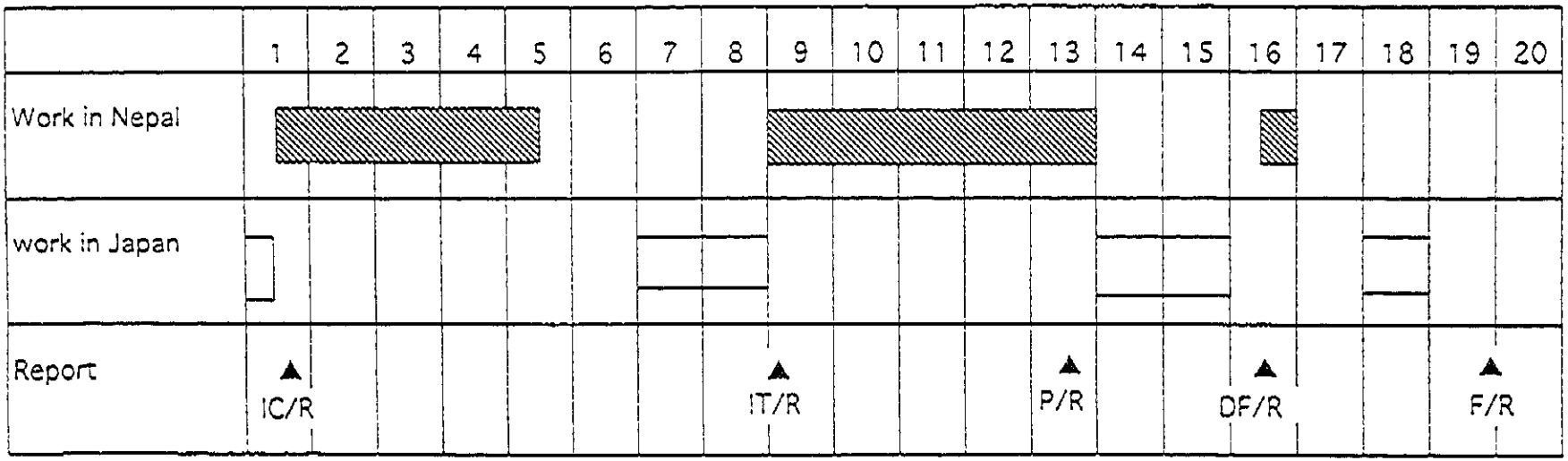
For the implementation of the Study, JICA shall take the following measures:
(1) to dispatch, at its own expense, study team to Nepal, and
(2) to pursue technology transfer to the Nepali counterpart personnel in the course of the Study.

Ⅸ. OTHERS

JICA and DOI shall consult with each other in respect of any matter that may arise from or in connection with the Study.

Appendix 1

TENTATIVE SCHEDULE



IC/R: Inception Report
P/R: Progress Report
IT/R: Interim Report
DF/R: Draft Final Report
F/R: Final Report

D-1.7

MINUTES OF MEETINGS

ON

THE SCOPE OF WORK

FOR

THE STUDY ON FLOOD MITIGATION PLAN

FOR

SELECTED RIVERS IN THE TERAI PLAIN

IN

THE KINGDOM OF NEPAL

Kathmandu, 6 August 1997

Mr. Mahendra Nath Aryal
Director General,
Department of Irrigation,
Ministry of Water Resources,
Kingdom of Nepal

Mr. Hidetomi Oi
Team Leader,
The Preparatory Study Team,
Japan International Cooperation Agency,
Japan

In response to the request of His Majesty's Government of Nepal (hereinafter referred to as "HMG/N"), the Government of Japan has decided to conduct the Study on Flood Mitigation Plan in Terai Plain in the Kingdom of Nepal (hereinafter referred to as "the Study") through the Japan International Cooperation Agency (hereinafter referred to as "JICA").

The Japanese Preparatory Study Team (hereinafter referred to as "the Study Team"), headed by Mr. Hidetomi Oi, visited the Kingdom of Nepal from 28 July to 7 August 1997 to discuss the scope of work of the Study. This Minutes of Meetings summarizes the results of a series of meetings held between the Study Team and the Department of Irrigation, Ministry of Water Resources (hereinafter referred to as "DOI") and other authorities concerned.

The list of attendants at the meetings is shown in Appendix-2.

1. Both sides agreed that the title of the Study shall be revised to "the Study on Flood Mitigation Plan for Selected Rivers in the Terai Plain in the Kingdom of Nepal".

2. Both sides agreed that the Study shall cover eight (8) rivers running through the Terai Plain, selected from each of five (5) administrative regions: Eastern, Central, Western, Mid-western and Far-western regions. The selected rivers are listed in Appendix-1.

3. Both sides agreed that the Study shall focus basically on the downstream areas. However, in view of the significant effect of sediment discharge from upstream catchment upon flooding in the downstream areas, the Study shall include the recommendation on measures for watershed management to reduce sediment discharge. Further, a specific river shall be selected for an integrated study for flood mitigation to cover the whole basin.

4. Both sides agreed that the Master Plan shall be prepared, in principle, based upon the available data (such as aerial photograph, topographical map, hydrological data, geological data, land use, flood damage in the past and so on) as well as interviews with local people in the study area.

5. Both sides agreed that materials available locally would be used wherever appropriate, and measures suitable for local conditions would be applied to the maximum extent in the design of structural measures in the Study.

6. It was confirmed that the followings would be included in the relevant items mentioned under (Phase II) Feasibility Study.

- Geology
- Geomorphology
- Hydrology

7. As for the Final Report, DOI agreed to make it open to the public for the maximum use of the study result as per rules and regulations of HMG/Nepal.

8. It was confirmed that the Study by JICA and the study proposed to the Government of Netherlands are not duplicated: the former focuses on engineering aspects selecting priority rivers, while the latter focuses on institutional aspects selecting a few rivers other than those selected for the Study.

9. The Study Team requested DOI to provide following items as the undertakings of HMG/Nepal.

1) available data and information related to the Study
2) counterpart personnel
3) office spaces with necessary equipment (telephone, photocopy machine, facsimile and furniture)
4) credentials or identification cards
5) vehicles

DOI accepted the above mentioned undertakings except for the photocopy machine and vehicles.

10. Both sides agreed to establish the steering committee for an effective and efficient implementation of the Study. The committee will be comprised of the representatives of DOI, Department of Soil Conservation under the Ministry of Forest and Soil Conservation, Water Induced Disaster Prevention Technical Center and other

agencies concerned.

The Director General, DOI, will function as the convenor of the steering committee and the Deputy Director General, River training, Environment and Mechanical Division of DOI will function as the member secretary of the committee.

11. DOI requested the Study Team to carry out counterpart training in Japan. The Study Team agreed to convey the request to JICA headquarters.

12. DOI requested the Study Team to hold a seminar as a part of technology transfer in the course of the Study. The Study Team agreed to convey the request to JICA headquarters.

Appendix - 1

List of Selected Rivers for the Study

S. No.	Name of River	Development Region	Size of River	Justification
1	Ratuwa	Eastern	Small	Siltation, Erosion, Protection of Bhutanese Refugee Camp
2	Lohendra	Eastern	Small	Siltation, Erosion
3	Lakhandehi	Central	Small	Siltation, Erosion
4	Narayani	Central	Big	Erosion, Loss of Agricultural Land
5	Tinau	Western	Medium	Erosion, Inhabitants near Banks, Inundation, Soil Conservation Undertaken in Catchment Area
6	West Rapti	Mid Western	Medium	Inundation, Changing Course
7	Babai	Mid Western	Medium	Inundation, Erosion, Changing Course, Poorest Region
8	Khutiya	Far Western	Small	Erosion, Inundation, Poorest Region

Appendix-2

List of attendants at meetings

Nepali side

Ministry of Water Resources (MOWR)

Mr. Y.L. Vaidya	Special Secretary

Department of Irrigation (DOI)

Mr. Mahendra Nath Aryal	Director General
Mr. A.K.Bhattacharya	Senior Divisional Engineer
Mr. Prajwal P. Pradhan	Senior Divisional Engineer
Mr. Krishna Raj Timilshena	Senior Divisional Engineer
Mr. Mukti N. Manandhar	Project Manager
Mr. Rajesh Shrestha	Engineer

Water Induced Disaster Prevention Technical Center (DPTC)

Mr. Nobuya Kawashima	JICA Expart
Mr. K. R. Pathak	Engineer

Japanese side

JICA Preparatory Study Team

Mr. Hidetomi Oi	Leader
Mr. Dai Masuda	Study Planning
Mr. Takeshi Wakai	Flood Control Planning
Mr. Yuki Matsuo	Natural and Social Environment
Mr. Toshinori Oshita	Facilities Planning

JICA Nepal Office

Mr. Eiichiro Cho	Assistant Resident Representative
Mr. Shiva P. Acharya	Chief Program Officer

List of persons met during the field trip

Eastern Regional Irrigation Directorate	
Mr. R.S. Shah	Senior Divisional Engineer
Mr. J. Shrestha	Engineer
Jhapa District Irrigation Office	
Mr. S. Chapagain	Engineer
Department of Soil Conservation	
Mr. Robin Bogati	Chief, Planing Office)
Udaypur District Soil Conservation Office	
Mr. S.N. Chaudhari	Chief
Saptari District Soil Conservation Office	
Mr. R.H. Panta	Chief
Siraha District Soil Conservation Office	
Mr. R.P. Yadav	Chief
D.P.T.C.	
Mr. K.K. Karki	Soil Conservation Assistant
Hadiya Khola Protection User's Group	
Mr. S.R. Chandhari	Chairman
Hadiya Village Development Committee	
Mr. D.R. Chaudhari	Chairman
Gher Khola Protection User's Group	
Mr. K.L. Chandhari	Secretary
Mr. K.B. Subedi	Treasurer
GTZ (Deutsche Gesellschaft Fur Technische Zusammenarbeit)	
Mr. D. Zuerzan	Expert
Kapilvastu District Irrigation Office	
Mr. N. Jha	Overseer

MINUTES OF MEETING
ON
INCEPTION REPORT
FOR
THE STUDY ON FLOOD MITIGATION PLAN
FOR
SELECTED RIVERS IN THE TERAI PLAIN
IN
THE KINGDOM OF NEPAL

Kathmandu, 10 December 1997

Mr. Mahendra Nath Aryal
Director General,
Department of Irrigation,
Ministry of Water Resources,
Kingdom of Nepal

Mr. Noboru Jitsuhiro
Team Leader,
Study Team,
Japan International Cooperation Agency

Mr. Hidetomi Oi
Chairman,
Advisory Committee,
Japan International Cooperation Agency

The JICA Study Team headed by Mr. N. Jitsuhiro submitted thirty(30) copies of Inception Report for the Study on Flood Mitigation Plan for Selected Rivers in the Terai Plain in the Kingdom of Nepal to the Department of Irrigation of Ministry of Water Resources (hereinafter referred to as "DOI"), a counterpart agency to the JICA Study Team and a coordinating body as well in relation with other governmental and non-governmental organizations.

The JICA Study Team explained the contents of the report to the officials concerned of DOI and discussed on the principal matters to start the Study in Nepal. Comments and discussions made between both sides, DOI and the JICA Study Team, are summarized below.

1. **Inception Report:** DOI agreed, in principle, to the contents of the Inception Report which was prepared in line with the Scope of Work agreed by DOI and the Preparatory Study Team of JICA and the Minutes of Meetings signed on 6 August 1997. Some comments raised on the Inception Report are as follows:
   1) Seminars described in item (2) of 2.2 and the Technology Transfer Seminar in item (2) of 3.2.3 are different programs. The former will be carried out at each stage of the Study (3 times in total) for the purpose of technology transfer for the counterpart personnel, while the latter will be carried out for technology transfer for a wider audience including local people, officials of local governments, NGOs, etc. in addition to the counterpart personnel.
   2) Constitution or style of the Draft Final Report and the Final Report will be decided later taking into account the convenience in the use of these reports by different users.

2. **Data and Information for the Study:** The JICA Study Team presented detailed items of data and information required for the Study. Further explanations on the required data and information will be given by the respective experts of the JICA Study Team in the course of the Study.

3. **Counterpart Personnel:** DOI presented a list of the counterpart personnel in the central office in Kathmandu and district offices responsible for the related rivers subject to the Study. The list is shown in ATTACHMENT-1.

4. **Office Space:** Office space for the JICA Study Team with necessary equipment

(telephone, facsimile and basic office furniture) will be provided in the same building as DOI in Kathmandu.

5. **Credentials or Identification Cards:** Identification cards for the members of the JICA Study Team are not necessary as far as they have passport. Credential or authorization letter for the members of the JICA Study Team will be issued by DOI, in case deemed necessary, for their smooth implementation of the Study in Kathmandu and field.

6. **Steering Committee:** A steering committee for the Study will be organized soon. The Steering Committee will be comprised of representatives from related governmental agencies such as DOI and Water Induced Disaster Prevention Technical Center(DPTC) of Ministry of Water Resources, Department of Soil Conservation of Ministry of Soil Conservation and Forest, Ministry of Local Development, and Ministry of Population & Environment.

A list of attendants to the meeting is shown in ATTACHMENT-2.

Consultant Counterpart
for the Study of
Flood Mitigation Plan in Terai Plain
in the Kingdom of Nepal

MUKTI NARAYAN MANANDHAR - Co-ordinator (Contact Counterpart)
Project Manager,
River Training Project
Jawalakhel, Lalitpur

RAJESH RAJ SHRESTHA - Attach Officer (Office & Field)
Engineer
River Training Project
Jawalakhel, Lalitpur

S.No	Rivers	Region & District	Name	Contact Counterpart
1	Ratuwa river	Eastern, Jhapa	P.Poudyal	Chief, DIO, Jhapa
2	Lohendra river	Eastern, Morang	N. Lama	Chief, DIO, Morang
3	Lakhandehi rver	Central, Sarlahi	U.K. Jha	Chief, DIO, Sarlahi
4	Narayani river	Central, Chitwan	B.K. Pradhan	Chief, DIO, Chitwan
5	Tinau river	Western, Rupandehi	D.N. Mishra	Chief, DIO, Rupandehi
6	West Rapti	Mid-Western, Banke	M.L. Kalu Shrestha	Chief, DIO, Banke
7	Babai river	Mid-Western, Banke		S.D.E., Babai I.P.
8	Khutia river	Far-Western, Kailali	G.S. Singh	Chief, DIO, Kailali

D-3.4

ATTACHMENT-1

ATTACHMENT-2

LIST OF ATTENDANTS

Department of Irrigation (DOI)

1)	Mr. M. N. Aryal	Director General
2)	Mr. A. N. Mishra	Deputy Director General
3)	Mr. M. N. Manandhar	In-charge, River Training Project
4)	Mr. R. R. Shrestha	Engineer, River Training Project

Water Induced Disaster Prevention Technical Center (DPTC)

1)	Mr. Nobuya Kawashima	Expert on River Engineering

Advisory Committee of JICA

1)	Mr. Hidetomi Oi	Chairman
2)	Mr. Takeshi Wakai	Member

JICA Study Team

1)	Mr. Noboru Jitsuhiro	Team Leader/ Flood Mitigation
2)	Mr. Takuro Terashima	Co-Leader/ River
3)	Mr. Eiichi Hayakawa	Sabo

JICA

1)	Mr. Dai Masuda	Task Manager
2)	Mr. Koji Yamada	Assistant Resident Representative/ JICA, Nepal Office

MINUTES OF MEETING

THE STUDY ON FLOOD MITIGATION PLAN FOR SELECTED RIVERS IN THE TERAI PLAIN IN THE KINGDOM OF NEPAL

Kathmandu, March 24, 1998

Mr. Mahendra Nath Aryal
Director General,
Department of Irrigation,
Ministry of Water Resources,
Kingdom of Nepal

Mr. Noboru Jitsuhiro
Team Leader,
Study Team,
Japan International Cooperation Agency

The JICA Study Team for the Study on Flood Mitigation Plan for Selected Rivers in the Terai Plain in the Kingdom of Nepal headed by Mr. Noboru. Jitsuhiro (hereinafter referred to as "JICA Study Team") reported the study results on (1) basic frame of Master Plan and (2) selection of Priority Projects, and (3) some findings made so far to the Steering Committee for the said Study chaired by Mr. Mahendra Nath Aryal, Director General, Department of Irrigation of the Ministry of Water Resources (hereinafter referred to as "Steering Committee") held on 23 March, 1998.

Results of discussions in the Steering Committee are summarized below.

1. **Basic Frame of Master Plan:** Basic Frame proposed by the JICA Study Team was accepted by the Steering Committee in principle. Major comments raised are as follows:
   - The target figures of the Ninth Plan such as poverty alleviation and macro economy are not definite ones. These are still under examination and will be soon finalized.
   - Role of Ministry of Local Development in flood mitigation activities for rivers in Terai Plain should also be clarified.

2. **Selection of Priority Projects:** The Babai (class-B) and Lakhandei (class-C) rivers proposed for feasibility study by the JICA Study Team were accepted by the Steering Committee. Comments were raised to include the Narayani river (class-A) as an additional river subject to the feasibility study. The JICA Study Team explained the reasons why the Narayani river was not selected mainly from implementation aspects of the study. The Steering Committee expressed a desire of implementation of feasibility study for the Narayani river, separately from the present study, under the JICA's technical cooperation program.

3. **Organizational and Institutional Study:** A study on organization and institution to be assisted by Netherlands is not started yet, and the schedule is not definite yet.

Discussion paper prepared by the JICA Study Team for the Steering Committee is attached hereto as ATTACHMENT-1 and a list of attendants to the meeting in ATTACHMENT-2.

ATTACHMENT-2.

List of Attendants
in the
Second Steering Committee Meeting
for
The Study on Flood Mitigation Plan
for
Selected Rivers in Terai Plain
in the
Kingdom of Nepal
(March 23, 1998)

Nepalese Side :

1.	Mr. Mahendra Nath Aryal Director General, Department of Irrigation	-	Convener
2.	Mr. Sarada Prashad Sharma Deputy Director General, DOI	-	Member
3.	Mr. Madhu Sudhan Poudel Project Manager, Water Induced Disaster Prevention Technical Centre	-	Member
4.	Mr. Narayan Prashad Bhattarai Senior Divisional Engineer, Ministry of Water Resources	-	Member
5.	Mr. Purushottam Kuwar Under Secretary, Ministry of Population and Environment	-	Member
6.	Mr. Bishnu Das Shrestha Senior Divisional Geologist, Department of Soil Conservation	-	Member
7.	Mr. Amoda Nanda Mishra Deputy Director General, DOI	-	Member Secretary
8.	Mr. Shankar K. C. Section Officer, Ministry of Local Development	-	Representative

Observer :

1. Mr. Jaya Ram Sharma
Senior Divisional Engineer, River Training Division

Consultant Counterparts :

1. Mr. Mukti Narayan Manandhar
   Project Manager, River Training Project

2. Mr. Rajesh Raj Shrestha
   Engineer, River Training Project

Japanese Side :

JICA Study team :

1.	Mr. Noburu Jitshuhiro	-	Team Leader
2.	Mr. Takuro Terashima	-	Co-Leader
3.	Mr. Tatsumi Tanabe	-	Member
4.	Mr. Kunihiko Okada	-	Member

JICA Nepal Office :

1. Mr. Koji Yamada

2. Mr. Sourab B. Rana

MINUTES OF MEETING
ON
INTERIM REPORT
FOR
THE STUDY ON FLOOD MITIGATION PLAN
FOR
SELECTED RIVERS IN THE TERAI PLAIN
IN
THE KINGDOM OF NEPAL

Kathmandu, 12 July 1998

Mr. Mahendra Nath Aryal
Director General,
Department of Irrigation,
Ministry of Water Resources,
Kingdom of Nepal

Mr. Noboru Jitsuhiro
Team Leader,
Study Team,
Japan International Cooperation Agency

Mr. Hidetomi Oi
Chairman,
Advisory Committee,
Japan International Cooperation Agency

The JICA Study Team headed by Mr. N. Jitsuhiro submitted thirty(30) copies of Interim Report for the Study on Flood Mitigation Plan for Selected Rivers in the Terai Plain in the Kingdom of Nepal (hereinafter referred to as "the Study") to the Department of Irrigation of Ministry of Water Resources (hereinafter referred to as "DOI"), a counterpart agency to the JICA Study Team and a coordinating body as well in relation with other governmental and non-governmental organizations.

The JICA Study Team explained the contents of the report to the Steering Committee for the Study chaired by Mr. Mahendra Nath Aryal and discussed on the flood mitigation master plan. Comments and discussions made between both sides are summarized below.

1. **Flood Mitigation Master Plan:** The Steering Committee accepted, in principle, the flood mitigation master plan presented in the Interim Report.

2. **Regular Technical Meeting:** Regular technical meetings were proposed to explain and discuss on the master plan of the respective river basins and feasibility study as well. The meeting will be programmed later between DOI and the JICA Study Team.

3. **Sediment Study:** Study and consideration are needed further on the sediment problems especially for riverbed raising under the master plan conditions.

4. **Implementation Arrangement:** Careful arrangement through DOI should be taken for the publicity of the plan to the local communities and organizations. Schedule and organization for the implementation would be revised based on the studies in this stage.

A list of attendants to the meeting is shown in ATTACHMENT-1.

ATTACHMENT - I

List of Attendants
in the
Third Steering Committee Meeting
for
The Study on Flood Mitigation Plan
for
Selected Rivers in the Terai Plain
in the
Kingdom of Nepal
(July 6, 1998)

Nepalese Side:

1.	Mr. Mahendra Nath Aryal Director General, Department of Irrigation	-	Convener
2.	Mr. Madhu Sudhan Poudel Project Manager Water Induced Disaster Prevention Technical Centre	-	Member
3.	Mr. Narayan Prashad Bhattari Senior Divisional Engineer Ministry of Water Resources	-	Member
4.	Mr. Bishnu Das Shrestha Senior Divisional Geologist Department of Soil Conservation	-	Member
5.	Mr. Mahesh Raj Sharma Under Secretary Ministry Local Development	-	Member
6.	Mr. Amoda Nanda Mishra Deputy Director General Department of Irrigation	-	Member Secretary
7.	Mr. Keshab Dhoj Adhakari Engineer, Planning Division Department of Irrigation	-	Representative

Observer :

1. Mr. Jaya Ram Sharma
Senior Divisional Engineer
River Training Division, DOI

Consultant Counterparts :

1. Mr. Mukti Narayan Manandhar
   Project Manager, River Training Project
2. Mr. Raju Kunwar
   Engineer, River Training Division
3. Mr. Rajesh Raj Shrestha
   Engineer, River Training Project
4. Mr. Hridaya Kumar Jha
   Asst. Soil Conservation Officer, Environment Section

Japanese Side :

JICA Study Team :

1.	Mr. Noburu Jitshuhiro	-	Team Leader
2.	Mr. Takuro Terashima	-	Co-Leader
3.	Mr. Eiichi Hayakawa	-	Member
4.	Mr. Hideki Araki	-	Member
5.	Mr. Takashi Yokokawa	-	Member
6.	Mr. Katsuhiko Masaki	-	Member
7.	Mr. Keith Openshaw	-	Member
8.	Mr. Makoto Kodama	-	Member

JICA Advisory Committee :

1.	Mr. Hidetomi Oi	-	Chairman
2.	Mr. Takesi Wakai	-	Member

JICA Nepal Office :

1. Mr. Hiroyasu Tonokaw
2. Mr. Sourab B. Rana

REGULAR DISCUSSION ON FLOOD MITIGATION PLAN

1. Purpose: Regular Discussion was held on specific themes related with the flood mitigation plan of the rivers in Terai plain, aiming to improve understanding of the flood mitigation plan to be proposed and make the plan practical, through discussions and exchange of knowledge and know-how.

2. Attendants: Officials of DOI: as listed in Table D6.1

3. Schedule and Program: Regular Discussion was held for two hours from 11:00 to 13:00 on Friday (except for Aug.12) as shown below.

No.	Date	Theme
1st.	July 24 (Fri.)	Implementation program
2nd.	Aug.12 (Wed.)	Watershed management
3rd.	Aug.21 (Fri.)	Community development
4th	Aug.28 (Fri.)	Characteristics of rivers in alluvial plain (1)
5th	Sep.04 (Fri.)	Rainfall and runoff analyses
6th	Sep.18 (Fri.)	Characteristics of rivers in alluvial plain (2)
7th	Oct.09 (Fri.)	Flood mitigation plan (F/S)
8th	Oct.30 (Fri.)	Facility plan (F/S)
9th	Nov.13(Fri)	Evaluation and others (F/S)

PARTICIPATION LIST

1ST MEETING : July 24, 1998 (Friday)

1.	Mr. Amondananda N. Mishra	DDG, River Training Division
2.	Dr. N.K. Lal	SDE, Planning Division
3.	Mr. Mukti Narayan Manandhar	Proj. Project Incharge, RTP
4.	Mr. Raju Kunwar	Engineer, River Training Division
5.	Mr. P.N. Singh	SDE, Surface Division

2ND MEETING : August 21, 1998 (Friday)

1.	Mr. A.N. Mishra	DDG, River Training Division
2.	Dr. N.K. Lal	SDE, Planning Division
3.	Mr. S. Sijapati	SDE, MOWR
4.	Mr. Samanta M. Sthapit	SDE, CRID
5.	Mr. J.R. Sharma	SDE, River Training Division
6.	Mr. K.D. Adhikari	Engineer, Planning Division
7.	Mr. S. Karna	Engineer, DOI
8.	Mr. Ram P. Bhandari	Engineer, IMTP
9.	Mr. Hridaya Kumar Jha	Asst. Soil Cconservation Officer, River Training Division
10.	Mr. M.N. Manandhar	Proj. Project Incharge, RTP
11.	Mr. P.N. Singh	SDE, Surface Division
12.	Mr. Raju Kunwar	Engineer, River Training Division
13.	Mr. Madhav Baral	Engineer, Planning Division

3RD MEETING : August 12, 1998 (Wednesday)

1.	Mr. A.N. Mishra	DDG, River Training Division
2.	Dr. N.K. Lal	SDE, Planning Division
3.	Mr. Bhuvan Prasad Ojha	SDE, Surface Irrigation Division
4.	Mr. Prajwal Prasad Pradhan	Proj. Incharge, Rajapur I.P.
5.	Mr. S.M. Sthapit	SDE, CRID
6.	Mr. M.N. Manandhar	Proj. Project Incharge, RTP
7.	Mr. Sudhir Man Baisyat	SDE, Planning Division
8.	Mr. R. P. Bhandari	Engineer, IMTP
9.	Mr. Yaduv	Engineer, SISP
10.	Mr. Raju Kunwar	Engineer, River Training Division
11.	Mr. Mathura Dangol	Project Incharge, IDS

12.	Mr. Jaya Ram Sharma	SDE, River Training Division

4TH MEETING : August 28, 1998 (Friday)

1.	Mr. A. N. Mishra	DDG, River Training Division
2.	Mr. S. M. Sthapit	SDE, CRID
3.	Mr. B. P. Ojha	SDE, Surface Irrigation Division
4.	Mr. P. P. Pradhan	Proj. Incharge, Rajapur I.P.
5.	Mr. M. Dangol	Project Incharge, IDS
6.	Mr. S. M. Baisyat	SDE, Planning Division
7.	Mr. Surendra Mehar Shrestha	SDE, DOI
8.	Mr. Mahajan Yadav	Engineer, NISP
9.	Mr. R. P. Bhandari	Engineer, IMTP
10.	Mr. M. N. Manandhar	Proj. Project Incharge, RTP
11.	Mr. Raju Kunwar	Engineer, River Training Division
12.	Mr. H. K. Jha	Asst. Soil Conservation Officer, River Training Div.

5TH MEETING : September 4, 1998 (Friday)

1.	Mr. B. P. Ojha	SDE, Surface Irrigation Division
2.	Mr. S. M. Baisyat	SDE, Planning Division
3.	Mr. M. Dangol	Project Incharge, IDS
4.	Mr. Ashim Kumar Bhattacharya	R.T.D.
5.	Mr. M. N. Manandhar	Proj. Project Incharge, RTP
6.	Mr. S. M. Shrestha	SDE, DOI
7.	Mr. S. M. Sthapit	SDE, CRID
8.	Mr. Suman Sijapati	SDE, MOWR
9.	Mr. Prakash Pokhrel	SDE, DOI
10.	Mr. Khagendra Bhattacha	Engineer, CRID
11.	Mr. R. P. Bhandari	Engineer, IMTP
12.	Mr. S. L. Shrestha	SDE, IMTP
13.	Mr. Raju Kunwar	Engineer, River Training Division
14.	Mr. H. K. Jha	Asst. Soil Conservation Officer, River Training Div.

6TH MEETING : September 18, 1998 (Friday)

1.	Mr. A.N. Mishra	DDG, River Training Division
2.	Mr. M. Dangol	Project Incharge, IDS

3.	Mr. J.R. Sharma	SDE, River Training Division
4.	Mr. B.P. Ojha	SDE, Surface Irrigation Division
5.	Mr. S.M. Baisyat	SDE, Planning Division
6.	Mr. S.M. Sthapit	SDE, CRID
7.	Mr. S.M. Shrestha	SDE, DOI
8.	Mr. M.N. Manandhar	Proj. Project Incharge, RTP
9.	Mr. Narayan Gajurel	Senior Statistician DOI
10.	Mr. Keshav D. Adhikari	Engineer, Planning Division
11.	Mr. Madhav Belbase	Engineer, Planning Division
12.	Mr. Madhav Baral	Engineer, Planning Division
13.	Mr. Purna Shrestha	Engineer, Planning Division
14.	Mr. Mahajan Yadav	Engineer, SISP
15.	Mr. Raju Kunwar	Engineer, River Training Division

7TH MEETING : October 9, 1998 (Friday)

1.	Mr. A.N. Mishra	DDG, River Training Division
2.	Mr. Uma Kant Jha	Superintending Engineer, DOI
3.	Mr. Sital Babu Regmi	Superintending Engineer, DOI
4.	Mr. J. R. Sharma	SDE, River Training Division
5.	Mr. M. Dangol	Project Incharge, IDS
6.	Mr. S.M. Baisyat	SDE, Planning Division
7.	Mr. M.N. Manandhar	Proj. Project Incharge, RTP
8.	Mr. Madhav Belbase	Engineer, Planning Division
9.	Mr. Madhav Baral	Engineer, Planning Division
10.	Mr. Keshav Dhoj Adhikari	Engineer, Planning Division
11.	Mr. Raju Kunwar	Engineer, River Training Division

8TH MEETING : October 30, 1998 (Friday)

1.	Mr. A.N. Mishra	DDG, River Training Division
2.	Mr. J. R. Sharma	SDE, River Training Division
3.	Mr. S.M. Sthapit	SDE, CRID
4.	Mr. A.K. Pokhrela	SDE, DOI
5.	Mr. S.K. Thapa	SDE, DOI
6.	Mr. M. Dangol	Project Incharge, IDS
7.	Mr. S.P. Singh	SDE, DOI
8.	Mr. S.M. Shrestha	SDE, DOI
9.	Mr. S.L. Shrestha	SDE, IMTP

10.	Mr. R. Khadga	SDE, DOI
11.	Mr. M.N. Manandhar	Proj. Project Incharge, RTP
12.	Mr. Madhav Belbase	Engineer, Planning Division
13.	Mr. Keshav Dhoj Adhikari	Engineer, Planning Division
14.	Mr. N. Tamrakar	Engineer, IMTP
15.	Mr. Raju Kunwar	Engineer, River Training Division

9TH MEETING : November 13, 1998 (Friday)

1.	Mr. S. B. Regmi	Superintending Engineer DOI
2.	Mr. B. P. Ojha	SDE, Surface Irrigation Division
3.	Mr. A. K. Pokhrela	SDE, DOI
4.	Mr. S. K. Thapa	SDE, DOI
5.	Mr. M. N. Manandhar	Proj. Project Incharge, RTP
6.	Mr. Keshav Dhoj Adhikari	Engineer, Planning Division
7.	Mr. Madhav Baral	Engineer, Planning Division
8.	Mr. Raju Kunwar	Engineer, River Training Division

List of Abbreviations

SDE	Senior District Engineer
IP	Irrigation Project
CRID	Central Regional Irrigation Directorate
RTP	River Training Project
IMTP	Irrigation Management Transfer Project
SISP	Second Irrigation Sector Project
IDS	Institutional Development Section
MOWR	Ministry of Water Resources
SC	Soil Conservation

TECHNOLOGY TRANSFER SEMINAR ON FLOOD MITIGATION IN TERAI PLAIN IN THE KINGDOM OF NEPAL

DOC.7

PROGRAM SCHEDULE

February 15-16, 1999

Date: February 15, 1999 (Monday) ***Venue: Hotel Himalaya***

Time	Session	Activities
9:00- 9:30	Opening Session	Registration of Participants
9:30-10:15		Chief Guest: Dr. R.N. Vaidya, Hon.Member, NPC Chairperson: Mr. Y.L.Vaidya, Special Secretary, MOWR - Welcome Address and Need of the Seminar: Mr. M. N. Aryal, Director General/DOI - Objectives and Expected Outputs of the Seminar Mr. A. N. Mishra, Dy. Director General/DOI - Few Words from : Executive Secretary, Water and Energy Commission Director General, Department of Soil Conservation Director General, Department of Roads Joint Secretary, Ministry of Population and Environment His Excellency Ambassador of Japan to Nepal Resident Representative, JICA Nepal Office Chairman, JICA Advisory Committee Chief Guest 's Remark - Chairperson's Remark Rapporteuring
10:15-10:30	**Tea Break**	
10:30-12:30	First Technical Session	Chairperson, DG, Department of Soil Conservation Lecturer : Mr Jitsuhiro. Theme : Flood mitigation plan for selected rivers in the Terai plain Chairperson's Remark Rapporteuring
12:30-13:30	**Lunch Break**	
13:30-15.00	Second Technical Session	Chairperson, DDG Surface Irrigation/DOI Lecturer: Dr. Egashira Theme : Approach to flood mitigation in Nepal Chairperson's Remark Rapporteuring
15:00-15:10	**Tea Break**	
15:10-16:10	Third Technical Session	Chairperson, DDG Ground Water/DOI Lecturer: Mr. B. K. Upreti Theme : Bio-engineering for flood mitigation Chairperson's Remark Rapporteuring

PROGRAM SCHEDULE

Date: February 16, 1999 (Tuesday) *Venue: Hotel Himalaya*

Time	Session	Activities
10:00-11:30	First Technical Session	Chairperson, DG Department of Roads Lecturer: Mr. P. N. Singh Theme : Flood mitigation in Nepal Chairperson's Remark Rapporteuring
11:30-11:40		**Tea Break**
11:40-12:10	Second Technical Session	Chairperson, DDG, Planning Division/DOI Lecturer: Mr. Okamoto Theme : Natural Disaster in Japan Chairperson's Remark Rapporteuring
12:10-13:30		**Lunch Break**
13:30-14:20	Third Technical Session	Chairperson, JS MOPE Lecturer: Mr. Wakai and Mr. Kawashima Theme : Remarks of flood mitigation through experience in Nepal Chairperson's Remark Rapporteuring
14:20-14:30		**Tea Break**
14:30-15:20	Fourth Technical Session	Chairperson, DDG River Training/DOI Lecturer: Dr. Egashira Theme : Characteristics of rivers in the alluvial plain Chairperson's Remark Rapporteuring
15:20-15:40	Closing address	Chairperson DG/DOI - Seminar Remarks : from participant - Few words from Team Leader, JICA Study Team, - Vote of Thanks : Mr. A. N. Mishra DDG River Training/DOI - Chairperson's Remarks and Conclusion of the Seminar Rapporteuring

List of
Invitees during Inaugural Ceremony

(NEPALISE)

1	Mr. B. R. Regmi	Secretary	Ministry of Water Resources
2	Mr. Yadav Lal Vaidya	Special Secretary	Ministry of Water Resources
3	Mr. Mahesh Man Shrestha	Joint Secretary	Ministry of Water Resources
4	Mr. Ratneswor Lal Kayastha	Joint Secretary	Ministry of Water Resources
5	Mr. Som Nath Poudel	Executive Secretary	Water & Energy Com. Secretariat
6	Mr. Mahendra Nath Aryal	Director General	Department of Irrigation
7	Mr. Indra Bahadur Shrestha	Dy. Director General	Department of Irrigation
8	Mr. Sarada Prasad Sharma	Dy. Director General	Department of Irrigation
9	Mr. Ram Prasad Satyal	Dy. Director General	Department of Irrigation
10	Mr. Jitendra Ghimire	Dy. Director General	Department of Irrigation
11	Mr. Amoda Nanda Mishra	Dy. Director General	Department of Irrigation
12	Mr. Komal Prasad Timilsena	Co-ordinator	NISP
13	Mr. Sital Babu Regmi	Superintending Er.	Department of Irrigation
14	Mr. Sundar Man Shrestha	Superintending Er.	Department of Irrigation
15	Mr. Chandan Mal Tated	Superintending Er.	Department of Irrigation
16	Mr. Keshav Sharma	Director	CRID
17	Mr. Kedar Prakash Rijal	Project Director	DPTC
18	Mr. Mohan Prasad Wagley	Director General	Depart of Soil Conservation
19	Mr. Niranjan Chalise	Director General	Department of Roads
20	Mr. Ananta Raj Pandey	Joint Secretary	Ministry of Popu. And Env.
21	Mr. B. R. Adhikari	Project Director	SISP

(JAPANESE)

1	Mr. Tomohiko Yanase	Ambassador	Embassy of Japan
2	Mr. Tadanori Ishizuka	Second Secretary	Embassy of Japan
3	Mr. Masao Okamoto	Chief Adviser	DPTC
4	Mr. Nobuya Kawashima	Expert on River Engr.	DPTC
5	Dr. Shinji Egashira	Professor	Ritsumeikan University
6	Mr. Ken Hasegawa	Representative	JICA/Nepal Office
7	Mr. Kazuhisa Arai	Ass. Resident Representative	JICA/Nepal Office
8	Mr. Hidetomi Oi	Chairman	JICA/Advisory Committee
9	Mr. Takeshi Wakai	Member	JICA/Advisory Committee
10	Mr. Noboru Jitsuhiro	Leader	JICA/Study Team
11	Mr. Takuro Terashima	Member	JICA/Study Team

List of Participants

a. District Irrigation Offices:

1 Mr. Narendra Lama, SDE, DIO, Morang
2 Mr. Suman Sijapati, SDE, DIO, Sarlahi
3 Mr. Suvash Chandra Varma, SDE, DIO, Chitwan
4 Mr. Ramesh Man Tuladhar, SDE, DIO, Rupandehi
5 Mr. Rhishee Ram Sharma, SDE, DIO, Banke
6 Mr. Kishori Prasad Singh, SDE, DIO, Bardia
7 Mr. Navaraj Shrestha, SDE, DIO, Kailali
8 Mr. Prakash Poudel, SDE, DIO, Jhapa

b. Regional Irrigation Directorates:

9 Mr. Tara Man Gurung, SDE, CRID
10 Mr. Krishna Raj Timelsena, SDE, ERID
11 Mr. Satya Narayan Prasad, SDE, WRID
12 Mr. Ram Sundar Shah, SDE, FWRID
13 Mr. Pradeep Raj Pandey, SDE, MWRID

c. Steering Committee and other Agencies:

14 Mr. Gopal Bahadur Katuwal, SDE, Ministry of Water Resources
15 Mr. Mahesh Raj Sharma, Under Secretary, Ministry of Local Development
16 Mr. Puruswottam Kunwar, Under Secretary, Ministry of Population & Environment
17 Mr. Bishnu Das Shrestha, SDG, Department of Soil Conservation
18 Mr. Damodar Bhattarai, SDE, DPTC
19 Mr. Jeeban Thanju, SDE, Water & Energy Commission

d. Department of Irrigation and RT Projects:

20 Mr. Ajaya Kumar Pokharel, SDE, Depatment of Irrigation
21 Mr. Mukti Narayan Manandhar, Project Manager, River Training Project
22 Mr. Bhuwan Ojha, SDE, Department of Irrigation
23 Mr. Mathura Dangol, Project Manager, IDS Project
24 Mr. Prajwal Prasad Pradhan, Project Manager, Rajapur I.P.
25 Mr. Sarba Dev Prasad Jayaswal, Project Manager, Bakraha R.T.P.
26 Mr. Raju Kunwar, Engineer, Department of Irrigation
27 Mr. Keshav Dhoj Adhikari, Engineer, Department of Irrigation
28 Dr. Narendra K. Lal, Porject Co-ordinator, IMTP
29 Mr. Niranjan Tamrakar, Engineer, IMTP-Moderator
30 Mr. Hridaya Kumar Jha, Asst. SCO, Department of Irrigation

MINUTES OF MEETING
ON
DRAFT FINAL REPORT
FOR
THE STUDY ON FLOOD MITIGATION PLAN
FOR
SELECTED RIVERS IN THE TERAI PLAIN
IN
THE KINGDOM OF NEPAL

Kathmandu, 17 February 1999

Mr. Mahendra Nath Aryal
Director General,
Department of Irrigation,
Ministry of Water Resources,
Kingdom of Nepal

Mr. Noboru Jitsuhiro
Team Leader,
Study Team,
Japan International Cooperation Agency

Mr. Hidetomi Oi
Chairman,
Advisory Committee,
Japan International Cooperation Agency

The JICA Study Team headed by Mr. N. Jitsuhiro submitted thirty (30) copies of Draft Final Report for the Study on Flood Mitigation Plan for Selected Rivers in the Terai Plain in the Kingdom of Nepal (hereinafter referred to as "the Study") to the Department of Irrigation of Ministry of Water Resources (hereinafter referred to as "DOI"), a counterpart agency to the JICA Study Team and a coordinating body as well in relation with other governmental and non-governmental organizations.

The JICA Study Team explained the contents of the report to the Steering Committee held on 12 February 1999 chaired by Mr. Mahendra Nath Aryal, and discussed on the Draft Final Report. Comments and discussions made between both sides are summarized below.

1. **The Steering Committee accepted**, in principle, the results of master plan and feasibility studies described in the Draft Final Report. Specific comments on the Report will be given to the Study Team by 18 February 1999.

2. **The Steering Committee and the JICA Study Team confirmed** on the proposed flood mitigation plan as follows:

- **Designation of river boundary line (RBL)** is a key to start flood mitigation activities in field.
- **Forest and grass belts** are new initiatives proposed for sustainable flood mitigation activities with participation of local communities. Appropriate species for the forest and grass belts should be discussed carefully for respective sites. The grass belt can be replaced by forest belt.
- **Community should be convinced** of the plan, and awareness-raising and capability-building should be emphasized more and planned in advance, since the role of community in flood mitigation is of vital importance.
- **The Department of Irrigation (DOI)** will be the overall coordinating agency for the entire flood mitigation. The project work can be implemented at any places on priority basis and at any size as fund available. Steady efforts to cope with flooding are essential.
- **Priority should be given** to the proposed project (flood mitigation of the Lakhandei and Babai river basins) for implementation, seeking for any possible internal and external resources and technical assistance.

A list of attendants to the meeting is shown in ATTACHMENT-1.

ATTACHMENT – 1

List of Attendants in the
5th Steering Committee Meeting for
The Study on Flood Mitigation Plan for
Selected Rivers in the Terai Plain in the Kingdon of Nepal
(Feb.12, 1999)

Nepalese Side:

1.	Mr. Mahendra Nath Aryal Director General, Department of Irrigation	-	Chairman
2.	Mr. Gopal Bahadur Katuwal Senior Divisional Engineer Ministry of Water Resources	-	Member
3.	Mr. Basant K. Rimal Under Secretary Department of Soil Conservation	-	Member
4.	Mr. Mahesh Raj Sharma Under Secretary Ministry of Local Development	-	Member
5.	Mr. Amoda Nanda Mishra Deputy Director General Department of Irrigation	-	Member Secretary
6.	Mr. Keshab Dhoj Adhikari Engineer, Dept. of Irrigation	-	Representative
7.	Mr. Damodar Bhattarai Senior Divisional Engineer Water Induced Disaster Prevention Technical Centre	-	Representative

Observer:

1.	Mr. A.K. Pokhrel Senior Divisional Engineer River Training, Environment & Mechanical Division		

Consult Counterparts:

1. Mr. Mukti Narayan Manandhar
   Project Manager, River Training Project

2. Mr. Raju Kunwar
   Engineer,
   River Training, Environment & Mechanical Division

3. Mr. Hridaya Kumar Jha
   Asst. Soil Conservation Officer
   Environment Section

Japanese Side:

JICA Study Team:

1.	Mr. Noboru Jitsuhiro	-	Team Leader
2.	Mr. Takuro Terashima	-	Co-Leader

JICA Advisory Committee:

1.	Mr. Hidetomi Oi	-	Chairman
2.	Mr. Takesi Wakai	-	Member

JICA Nepal Office:

1. Mr. Sourab B. Rana