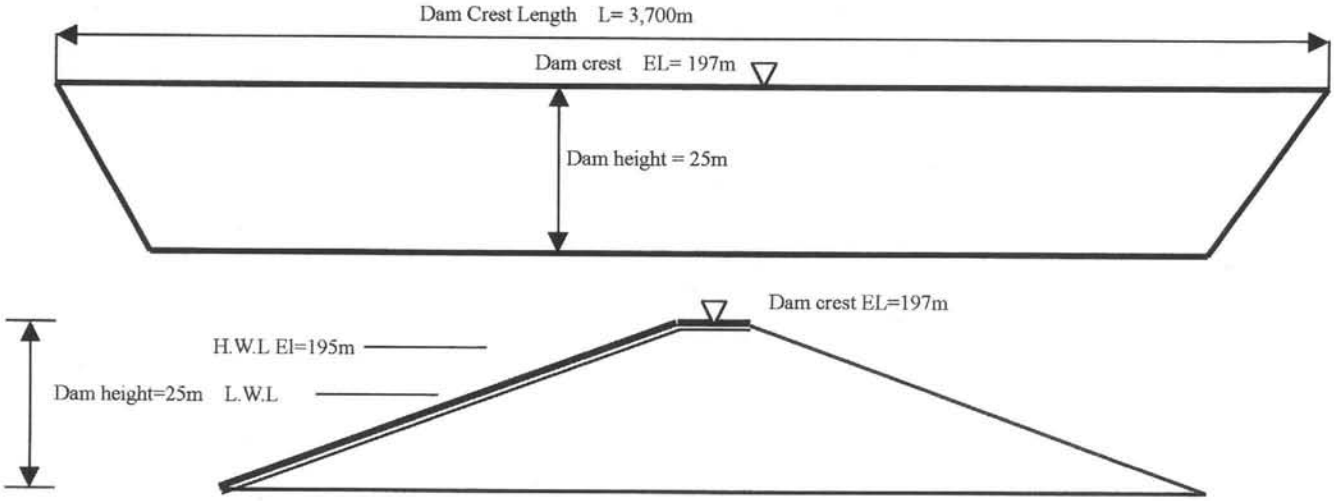
Proposed Dam Site on Marahoue River

Proposed Dam Site on Marahoue River



Project Description

MARAHOUE RIVER INTEGRATED DEVELOPMENT PROJECT
(Recovery Plan of the Storage in the Kossou Reservoir)

Purpose: Hydropower/ Irrigation/ Fishery Development/ Maintaining Normal Function of River (Environmental Conservation: E.C.)

Production from the project :

- Hydropower: Increasing energy production of Kossou P.S. = 84 GWH
  Small hydropower: $P_{max.}$= 1.7 MW / Energy production=15 GWH
  Total annual energy production =99 GWH
- Irrigation for paddy field (Continuos constant): 5.2 m^3/s (5,200 ha)
- River maintenance discharge (Continuos constant) 1.8 m^3/s

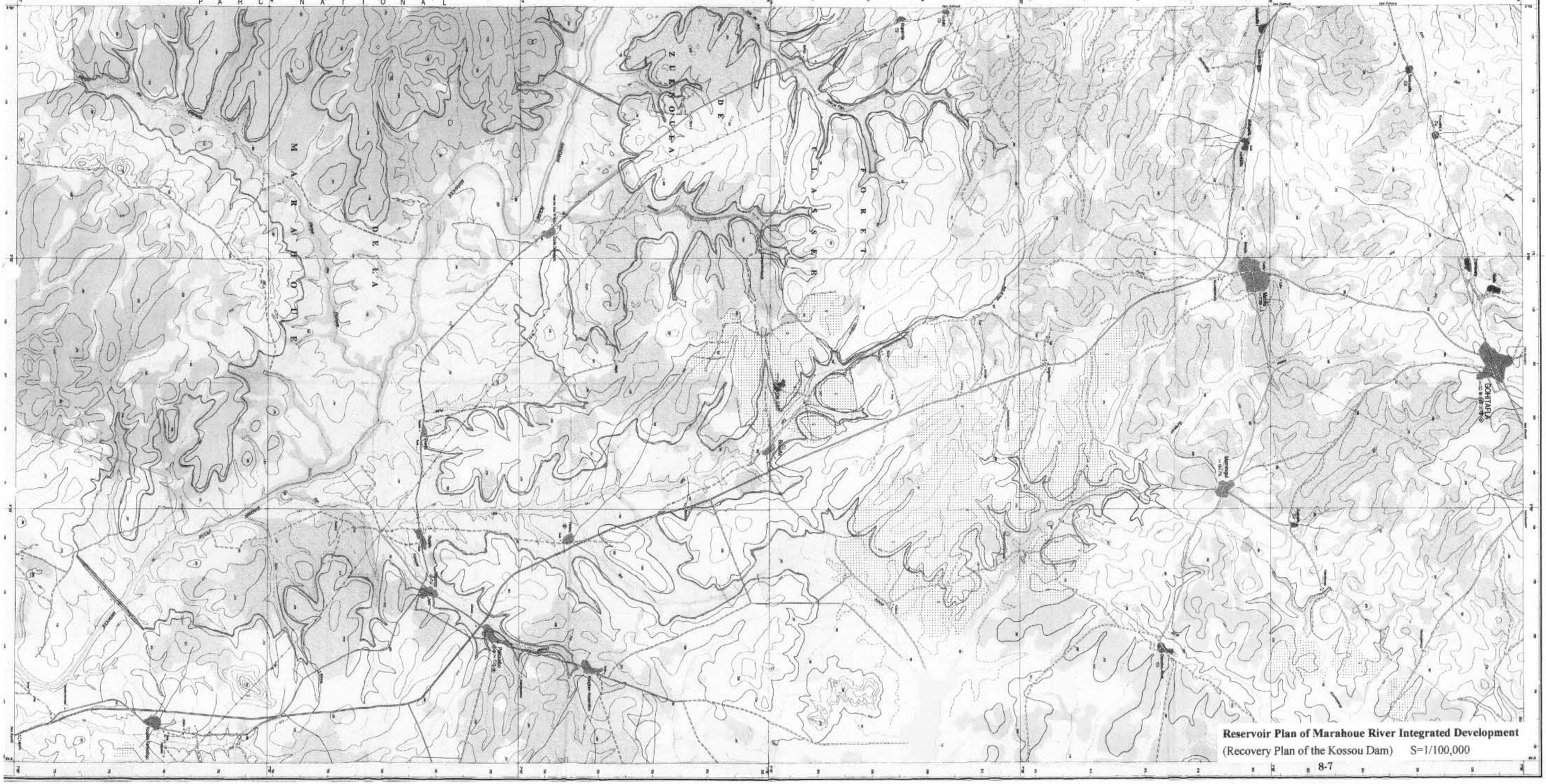
Catchment area = 18,000 km^2
Dam (H×L): 25m×3,700m
Reservoir: Surface area = 340 km^2
Total Capacity=2,500 MCM
Effective capacity =1,500MCM
Reservoir: HWL=195m/ LWL=188m
Available develop. Discharge=41 m^3/s
Diversion water to Kossou Dam = 34 m^3/s
Discharge on Marahoue river = 7 m^3/s
Construction cost =51,300 M FCFA
- Hydropower : 42,500 MFCFA (83%)
- Power unit cost : 429 FCFA/ KWH
- Irrigation /River : 8,800 MFCFA (17%)

Project process
- Development study (F/S): 1.5-2 years
- Detailed design (D/D): 1-1.5 years
- Construction: 4-5 years

Figure S.11.1-3

Outline of Marahoue River Integrated Development Project

(Recovery Plan of the Storage in the Kossou Reservoir)



Reservoir Plan of Marahoue River Integrated Development
(Recovery Plan of the Kossou Dam) S=1/100,000

CHAPTER 2 WATER DEMAND AND SUPPLY

2.1 Water W Demand

2.1.1 Prerequisite

(Domestic Water)

(1) Forecast Population in 2015

・Yearly rate ; Whole country = 3.1～3.6% (Abidjan ＝3.9%)
(Whole country ; 2000≒16 Million→ 2015 ≒ 27 Million)
(Abidjan ; 2000≒3.60 Million → 2015≒6.40Million)
(Yamoussoukro ; 2015 ≒ 330,000)
(Korhogo/Ferke ; 2015 ≒ 300,000)
(Bouake ; 2015 ≒ 800,000)
(Man ; 2015 ≒ 250,000)

(2) Water Consumption per Capita

・Urban water ; Present ≧60 l/capita→2015 = 100 l/capita
・Urban water ; Present ≦60 l/capita→2015= 65 l/capita
・Rural water ; (Present 10～15 l/capita)→2015 = 25 l/capita

(Agricultural Water)

(1) Data source : Agricultural Master Plan(1992～2015) prepared by MINAGRA

(2) Cropped total area ; 1995＝7,248,000ha →2015 =11,504,000ha

(3) Cropped Area of major crops

Table S.11.2 -1 Cropped Area of Major Crops (1,000 ha)

Crops name	1995	2015	Remark
Paddy	592	1,373	・***Water consumption：*** ***1,000ha ≒ 1m³/s*** ・*Yield of irrigation paddy rice = 4.78 t/ha×1.72(crop cycle) =8.212t/ha* ・*Standard paddy rice price ≒ 250 FCFA/kg*
Maize	669	1,228	
Cocoa	1,723	1,723	
Coffee	1,250	2,250	
Cotton	242	880	
Yam	265	347	
Cassava	36	546	
Plantain Banana	1,203	1,455	
Sugarcane	21	42	
Ground nut	136	288	

2.1.2 Domestic Water Demand Classified by Sub-Prefecture and City/Town in 2015

The domestic water demand classified by sub-prefecture and city/town in 2015 are as shown in Table S.11.2-2.

2.1.3 Agricultural Water Demand in 2015 (1/5 Year)

The agricultural water demand in 2015 classified by the control points is as shown in Table S.11.2-3.

Table S.11.2-2 **Domestic Water Demand Classified by Sub-Prefecture in 2015**

Water Demand in 2015 (1)

Code	Control e Points	Sub-Prefectures	Population Data		2015 Population		Water Supply	Per C. Deman		2015 Demand			2015 Production Demand		
			Sharing (%)	Center Town	urban	Rural	Coverage	Rural Population (l/c/d)	Urban Population (l/c/d)	Urban Demand (x1000 m3/an)	Rural Demand (x1000m3)	Total (x1000m3)	Urban Demand (x1000 m3/an)	Rural Demand (x1000m3)	Total (x1000m)
I-C1	GAHOULOU				399.942	483.392	100	100	25	11.013,41	3.248,67	14.262,08	12.957	3.249	16.206
		Sassandra	45	1	119357	119467	100	100	25	4.356,53	1.090,14	5.446,67	5.125	1.090	6.215
		Gueyo	30		0	21734	100	65	25	0,00	128,91	128,91	0	129	129
		Soubre	75		0	178193	100	65	25	0,00	1.056,91	1.056,91	0	1.057	1.057
		Guiberoua	5		0	3235	100	65	25	0,00	19,19	19,19	0	19	19
		Gagnoa	5		0	2629	100	65	25	0,00	15,59	15,59	0	16	16
		Meagui	40	1	280585	158134	100	65	25	6.656,88	937,93	7.594,81	7.832	938	8.770
I-C2	SOUBRE				288.575	243.881	100	65	25	10.532,99	1.446,52	11.979,51	12.392	1.447	13.839
		Meagui	5		0	19767	100	65	25	0,00	117,24	117,24	0	117	117
		Soubre	25	1	288575	59398	100	100	25	10.532,99	542,01	11.075,00	12.392	542	12.934
		Buyo	50		0	135243	100	65	25	0,00	802,16	802,16	0	802	802
		Grand Zattry	20		0	23216	100	65	25	0,00	137,70	137,70	0	138	138
		Issia	3		0	2273	100	65	25	0,00	13,48	13,48	0	13	13
		Tai	5		0	3984	100	65	25	0,00	23,63	23,63	0	24	24
I-C3	BUYO Dam				636.494	562.003	100	65	25	15.100,82	3.333,38	18.434,20	17.766	3.333	21.099
		Guiglo	75	1	113442	95511	100	65	25	2.691,41	566,50	3.257,91	3.166	567	3.733
		Tai	10		0	7968	100	65	25	0,00	47,26	47,26	0	47	47
		Buyo	10	1	130486	27049	100	65	25	3.095,78	160,43	3.256,21	3.642	160	3.802
		Issia	7		0	5305	100	65	25	0,00	31,47	31,47	0	31	31
		Iboguhe	50	1	18276	18987	100	65	25	433,60	112,62	546,22	510	113	623
		Zoukougbeu	50	1	64398	60542	100	65	25	1.527,84	359,09	1.886,93	1.797	359	2.156
		Dania	20		0	24205	100	65	25	0,00	143,57	143,57	0	144	144
		Kouibly	45	1	39534	2073	100	65	25	937,94	12,30	950,24	1.103	12	1.115
		Dieouzon	100	1	40370	75133	100	65	25	957,78	445,63	1.403,41	1.127	446	1.573
		Bangolo	90	1	16724	255	100	65	25	396,78	1,51	398,29	467	2	469
		Guehiebly	100	1	16929	20217	100	65	25	401,64	119,91	521,55	473	120	593
		Bagohouo	100	1	23389	43241	100	65	25	554,90	256,47	811,38	653	256	909
		Duekoue	100	1	106125	111847	100	65	25	2.517,82	663,39	3.181,21	2.962	663	3.625
		Guezon	100	1	32962	29559	100	65	25	782,02	175,32	957,35	920	175	1.095
		Gbapleu	100	1	33859	40111	100	65	25	803,31	237,91	1.041,21	945	238	1.183
I-C4	PIEBLY				229.732	101.096	100	65	25	5.450,39	599,63	6.050,02	6.412	600	7.012
		Kouibly	50		0	2303	100	65	25	0,00	13,66	13,66	0	14	14
		Facobly	80	1	46160	1566	100	65	25	1.095,15	9,29	1.104,43	1.288	9	1.297
		Man	20		0	1257	100	65	25	0,00	7,46	7,46	0	7	7
		Gbonne	100	1	21267	1466	100	65	25	504,56	8,70	513,26	594	9	603
		Biankouma	70	1	104566	9062	100	65	25	2.480,83	53,75	2.534,58	2.919	54	2.973
		Sipilou	5		0	222	100	65	25	0,00	1,32	1,32	0	1	1
		Ouaninou	5		0	4	100	65	25	0,00	0,02	0,02	0	0	0
		Foungbesso	80	1	19608	640	100	65	25	465,20	3,80	469,00	547	4	551
		Touba	40		0	597	100	65	25	0,00	3,54	3,54	0	4	4
		Guinteguela	90	1	5653	669	100	65	25	134,12	3,97	138,09	158	4	162
		Worofla	60		0	1314	100	65	25	0,00	7,79	7,79	0	8	8
		Djibrosso	10		0	21	100	65	25	0,00	0,13	0,13	0	0	0
		Sifie	100	1	16229	3138	100	65	25	385,03	18,61	403,65	453	19	472
		Seguela	3		0	60	100	65	25	0,00	0,36	0,36	0	0	0
		Seitifla	40		0	33974	100	65	25	0,00	201,51	201,51	0	202	202
		Dania	20		0	24205	100	65	25	0,00	143,57	143,57	0	144	144
		Semien	100	1	16249	20598	100	65	25	385,51	122,17	507,68	454	122	576
I-C5	DABALA				188.502	18.497	100	65	25	4.472,21	109,71	4.581,92	5.261	110	5.371
		Guinteguela	10		0	74	100	65	25	0,00	0,44	0,44	0	0	0
		Touba	60	1	52327	895	100	65	25	1.241,46	5,31	1.246,77	1.461	5	1.466
		Koro	100	1	21627	10256	100	65	25	513,10	60,83	573,93	604	61	665
		Borotou	100	1	10886	1542	100	65	25	258,27	9,15	267,42	304	9	313
		Booko	100	1	21593	854	100	65	25	512,29	5,07	517,36	603	5	608
		Bako	90	1	31355	50	100	65	25	743,90	0,30	744,19	875	0	875
		Odienne	5		0	138	100	65	25	0,00	0,82	0,82	0	1	1
		Djoulatiedougou	70		0	518	100	65	25	0,00	3,07	3,07	0	3	3
		Koonan	50	1	18431	4008	100	65	25	437,28	23,77	461,05	514	24	538
		Ouaninou	50	1	32283	38	100	65	25	765,91	0,23	766,14	901	0	901
		DJIBROSSO	60		0	124	100	65	25	0,00	0,74	0,74	0	1	1
I-C6	DAKPADOU				957.586	455.996	100	65	25	22.718,73	2.704,63	25.423,35	26.728	2.705	29.433
		Sassandra	10		0	26548	100	65	25	0,00	157,46	157,46	0	157	157
		Gueyo	70	1	48829	50712	100	65	25	1.158,47	300,79	1.459,25	1.363	301	1.664
		Lakota	10		0	3209	100	65	25	0,00	19,03	19,03	0	19	19
		Gagnoa	95	1	211232	49952	100	65	25	5.011,48	296,28	5.307,76	5.896	296	6.192
		Ouragahio	90	1	110030	51548	100	65	25	2.610,46	305,74	2.916,21	3.071	306	3.377
		DIEGONEFLA	10		0	3627	100	65	25	0,00	21,51	21,51	0	22	22
		GUIBEROUA	85	1	288575	201952	100	65	25	6.846,44	1.197,83	8.044,27	8.055	1.198	9.253
		SAIOUA	50		0	37088	100	65	25	0,00	219,98	219,98	0	220	220
		SINFRA	25	1	258783	10623	100	65	25	6.139,63	63,01	6.202,64	7.223	63	7.286
		BONON	20		0	18908	100	65	25	0,00	112,15	112,15	0	112	112
		GADOUAN	5	1	40137	1829	100	65	25	952,25	10,85	963,10	1.120	11	1.131
I-C7	LOBOVILIE				976.845	788.736	100	65	25	23.175,65	4.678,19	27.853,84	27.265	4.678	31.943
		Daloa	100	1	338935	59831	100	65	25	8.041,23	354,87	8.396,11	9.460	355	9.815
		Buyo	10		0	27049	100	65	25	0,00	160,43	160,43	0	160	160
		Grand Zattry	80	1	57759	92863	100	65	25	1.370,33	550,79	1.921,13	1.612	551	2.163
		Issia	90	1	127914	68201	100	65	25	3.034,76	404,52	3.439,28	3.570	405	3.975
		Iboguhe	50		0	18987	100	65	25	0,00	112,62	112,62	0	113	113

Water Demand in 2015

Code	Control Points	Sub-Prefectures	Population Data		2015 Population		Water Supply	Per C. Demand		2015 Demand			2015 Production Demand		
			Sharing (%)	Center Town	urban	Rural	Coverage	Rural Population (l/c/d)	Urban Population (l/c/d)	Urban Demand (x1000 m3/an)	Rural Demand (x1000m3)	Total (x1000m3)	Urban Demand (x1000 m3/an)	Rural Demand (x1000m3)	Total (x1000m3)
		Zoukougbeu	50		0	60542	100	65	25	0,00	359,09	359,09	0	359	359
		Boguedia	100	1	17664	9818	100	65	25	419,08	58,23	477,31	493	58	551
		Saioua	50	1	59689	37088	100	65	25	1.416,12	219,98	1.636,10	1.666	220	1.886
		Gadouan	95	1	40137	34758	100	65	25	952,25	206,16	1.158,41	1.120	206	1.326
		Bediala	50		0	25486	100	65	25	0,00	151,16	151,16	0	151	151
		Zuenoula	20		0	5024	100	65	25	0,00	29,80	29,80	0	30	30
		Vavoua	85	1	179665	116644	100	65	25	4.262,55	691,85	4.954,40	5.015	692	5.707
		Seguela	7		0	141	100	65	25	0,00	0,84	0,84	0	1	1
		Bonon	15		0	14181	100	65	25	0,00	84,11	84,11	0	84	84
		Seitifla	60	1	61478	50960	100	65	25	1.458,57	302,26	1.760,82	1.716	302	2.018
		Dania	60	1	50195	72616	100	65	25	1.190,88	430,70	1.621,58	1.401	431	1.832
		Zahibo	100	1	7512	31124	100	65	25	178,22	184,60	362,83	210	185	395
		Gboguhe	100	1	35897	63423	100	65	25	851,66	376,18	1.227,83	1.002	376	1.378
I-C8	KAHIN				497.593	50.613	100	65	25	11.805,39	300,20	12.105,59	13.889	300	14.189
		Zou	35	1	30331	18583	100	65	25	719,60	110,22	829,82	847	110	957
		Logouale	100	1	49660	5414	100	65	25	1.178,18	32,11	1.210,30	1.386	32	1.418
		Sangouine	90	1	41951	14767	100	65	25	995,29	87,59	1.082,87	1.171	88	1.259
		Mahapleu	20	1	66529	1632	100	65	25	1.578,40	9,68	1.588,08	1.857	10	1.867
		Biankouma	20		0	2589	100	65	25	0,00	15,36	15,36	0	15	15
		Sipilou	5		0	222	100	65	25	0,00	1,32	1,32	0	1	1
		Man	80	1	252448	5030	100	65	25	5.989,33	29,83	6.019,16	7.046	30	7.076
		Facobly	20		0	391	100	65	25	0,00	2,32	2,32	0	2	2
		Totrodrou	100	1	8108	0	100	65	25	192,36	0,00	192,36	226	0	226
		Nidrou	100	1	14911	1158	100	65	25	353,76	6,87	360,63	416	7	423
		Zeo	95	1	33655	597	100	65	25	798,47	3,54	802,01	939	4	943
		Kouibly	5		0	230	100	65	25	0,00	1,36	1,36	0	1	1
I-C9	BADALA				31.693	10.837	100	65	25	751,92	64,28	816,19	885	64	949
		Koonan	50		0	4008	100	65	25	0,00	23,77	23,77	0	24	24
		Foungbesso	20		0	160	100	65	25	0,00	0,95	0,95	0	1	1
		Sipilou	90	1	31693	3997	100	65	25	751,92	23,71	775,62	885	24	909
		Biankouma	5		0	647	100	65	25	0,00	3,84	3,84	0	4	4
		Danane	20		0	1991	100	65	25	0,00	11,81	11,81	0	12	12
		Ouaninou	45		0	34	100	65	25	0,00	0,20	0,20	0	0	0
I-C10	DIOULATIEDOUGOU				18.493	1.355	100	65	25	438,75	8,04	446,78	516	8	524
		Dioulatiedougou	30		0	222	100	65	25	0,00	1,32	1,32	0	1	1
		Seguelon	65	1	18493	951	100	65	25	438,75	5,64	444,39	516	6	522
		Madinani	20		0	182	100	65	25	0,00	1,08	1,08	0	1	1
II-C1	Nzida				90926	144359	100	65	25	2.157,22	856,23	3.013,45	2.538	856	3.394
		GRAND LAHOU	80	1	90926	84838	100	65	25	2.157,22	503,20	2.660,41	2.538	503	3.041
		DABOU	25		0	7215	100	65	25	0,00	42,79	42,79	0	43	43
		TIASSALE	40		0	27538	100	65	25	0,00	163,34	163,34	0	163	163
		DIVO	15		0	14299	100	65	25	0,00	84,81	84,81	0	85	85
		HIRE	20		0	5879	100	65	25	0,00	34,87	34,87	0	35	35
		TAABO	10		0	312	100	65	25	0,00	1,85	1,85	0	2	2
		SIKENSI	40		0	4278	100	65	25	0,00	25,37	25,37	0	25	25
II-C2	TIASSALE				142.877	30.118	100	65	25	3.389,76	178,64	3.568,39	3.988	179	4.167
		TIASSALE	20	1	142877	13769	100	65	25	3.389,76	81,67	3.471,42	3.988	82	4.070
		TAABO	30		0	937	100	65	25	0,00	5,56	5,56	0	6	6
		DIVO	10		0	9533	100	65	25	0,00	56,54	56,54	0	57	57
		HIRE	20		0	5879	100	65	25	0,00	34,87	34,87	0	35	35
II-C3	TAABO Dam				512.909	143.989	100	65	25	16.368,96	854,04	17.222,99	19.258	854	20.112
		TAABO	20	1	29254	624	100	65	25	694,05	3,70	697,75	817	4	821
		HIRE	10	1	62248	2939	100	65	25	1.476,83	17,43	1.494,27	1.737	17	1.754
		TOUMODI	5		0	17	100	65	25	0,00	0,10	0,10	0	0	0
		DJEKANOU	25		0	1165	100	65	25	0,00	6,91	6,91	0	7	7
		KOKOUMBO	60		0	1441	100	65	25	0,00	8,55	8,55	0	9	9
		YAMOUSSOUKRO	70	1	328782	14226	100	100	25	12.000,54	129,81	12.130,36	14.118	130	14.248
		BOUAFLE	45		0	32603	100	65	25	0,00	193,38	193,38	0	193	193
		BOUAKE	15		0	526	100	65	25	0,00	3,12	3,12	0	3	3
		SINFRA	75		0	31868	100	65	25	0,00	189,02	189,02	0	189	189
		OUME	95	1	92625	43783	100	65	25	2.197,53	259,69	2.457,22	2.585	260	2.845
		OURAGAHIO	10		0	5728	100	65	25	0,00	33,97	33,97	0	34	34
		DIEGONEFLA	25		0	9069	100	65	25	0,00	53,79	53,79	0	54	54
II-C4	KOSSOU Dam				437.436	78.398	100	65	25	10.378,17	465,00	10.843,17	12.210	465	12.675
		DIABO	60	1	13499	2218	100	65	25	320,26	13,16	333,42	377	13	390
		BOUAFLE	30		0	21736	100	65	25	0,00	128,92	128,92	0	129	129
		GOHITAFLA	85	1	57474	7882	100	65	25	1.363,57	46,75	1.410,32	1.604	47	1.651
		KOUNAHIRI	100	1	22876	4264	100	65	25	542,73	25,29	568,02	639	25	664
		KONGASSO	5		0	222	100	65	25	0,00	1,32	1,32	0	1	1
		MANKONO	5		0	659	100	65	25	0,00	3,91	3,91	0	4	4
		TIENINGBOUE	45	1	46422	11213	100	65	25	1.101,36	66,51	1.167,87	1.296	67	1.363
		BODOKRO	85	1	53935	14058	100	65	25	1.279,61	83,38	1.362,99	1.505	83	1.588
		BOTRO	85	1	32785	2059	100	65	25	777,82	12,21	790,04	915	12	927
		BEOUMI	100	1	84340	4577	100	65	25	2.000,97	27,15	2.028,11	2.354	27	2.381
		Kondrobo	100	1	14748	3050	100	65	25	349,90	18,09	367,99	412	18	430
		ANDO KEKRENO	100	1	14008	312	100	65	25	332,34	1,85	334,19	391	2	393
		TOUMODI-SAKAS	100	1	17582	193	100	65	25	417,13	1,15	418,28	491	1	492
		LANGUIBONOU	100	1	24599	1884	100	65	25	583,61	11,17	594,79	687	11	698

Water Demand in 2015

Code	Control Points	Sub-Prefectures	Population Data		2015 Population		Water Supply	Per C. Demand		2015 Demand			2015 Production Demand		
			Sharing (%)	Center Town	urban	Rural	Coverage	Rural Population (l/c/d)	Urban Population (l/c/d)	Urban Demand (x1000 m3/an)	Rural Demand (x1000m3)	Total (x1000m3)	Urban Demand (x1000 m3/an)	Rural Demand (x1000m3)	Total (x1000m3)
		BOUAKE	5		0	175	100	65	25	0,00	1,04	1,04	0	1	1
		SAKASSOU	80	1	55168	307	100	65	25	1.308,86	1,82	1.310,68	1.540	2	1.542
		TIEBISSOU	20		0	1557	100	65	25	0,00	9,24	9,24	0	9	9
		YAMOUSSOUKRO	10		0	2032	100	65	25	0,00	12,05	12,05	0	12	12
II-C5	BADA				33.056	113.369	100	65	25	784,25	672,42	1.456,67	923	672	1.595
		TIENINGBOUE	40		0	9967	100	65	25	0,00	59,12	59,12	0	59	59
		MARANDALLAH	65		0	30461	100	65	25	0,00	180,67	180,67	0	181	181
		DIKODOGOU	62		0	48175	100	65	25	0,00	285,74	285,74	0	286	286
		NAPIELEDOUGOU	10		0	154	100	65	25	0,00	0,91	0,91	0	1	1
		TORTIYA	70	1	33056	7743	100	65	25	784,25	45,93	830,18	923	46	969
		NIAKARAMADOU	30		0	1836	100	65	25	0,00	10,89	10,89	0	11	11
		FRONAN	60		0	9614	100	65	25	0,00	57,02	57,02	0	57	57
		KATIOLA	35		0	2575	100	65	25	0,00	15,27	15,27	0	15	15
		BOTRO	15		0	363	100	65	25	0,00	2,15	2,15	0	2	2
		BODOKRO	15		0	2481	100	65	25	0,00	14,72	14,72	0	15	15
II-C6	TORTIYA				472.460	58.142	100	65	25	11.209,11	344,86	11.553,97	13.187	345	13.532
		TORTIYA	30		0	3318	100	65	25	0,00	19,68	19,68	0	20	20
		NIAKARAMADOU	20		0	1224	100	65	25	0,00	7,26	7,26	0	7	7
		TAFIERE	60	1	43134	5270	100	65	25	1.023,35	31,26	1.054,61	1.204	31	1.235
		KOUMBALA	35	1	12864	2773	100	65	25	305,20	16,45	321,65	359	16	375
		FERKESSEDOUGO	50	1	59773	10251	100	65	25	1.418,11	60,80	1.478,92	1.668	61	1.729
		OUANGOLODOUO	15		0	8778	100	65	25	0,00	52,07	52,07	0	52	52
		DIAWALA	35	1	14992	12039	100	65	25	355,69	71,41	427,09	418	71	489
		KORHOGO	30	1	225539	1401	100	65	25	5.350,91	8,31	5.359,22	6.295	8	6.303
		SINEMATIALI	100	1	36558	3613	100	65	25	867,34	21,43	888,77	1.020	21	1.041
		KARAKORO	100	1	10641	296	100	65	25	252,46	1,76	254,21	297	2	299
		KOMBORODOUGO	100	1	7948	1365	100	65	25	188,57	8,10	196,66	222	8	230
		NAPIELEDOUGOU	90	1	14272	1383	100	65	25	338,60	8,20	346,81	398	8	406
		GUIEMBE	90	1	10127	0	100	65	25	240,26	0,00	240,26	283	0	283
		DIKODOGOU	8	1	19498	6216	100	65	25	462,59	36,87	499,46	544	37	581
		TIORONIARADOU	95	1	17114	215	100	65	25	406,03	1,28	407,31	478	1	479
II-C7	TAWARA Amont				85.803	30.195	100	65	25	2.035,68	179,09	2.214,77	2.395	179	2.574
		DIAWALA	25		0	8600	100	65	25	0,00	51,01	51,01	0	51	51
		NIELLE	15		0	1449	100	65	25	0,00	8,59	8,59	0	9	9
		MBENGUE	80	1	38068	5639	100	65	25	903,16	33,45	936,61	1.063	33	1.096
		KORHOGO	70		0	3268	100	65	25	0,00	19,38	19,38	0	19	19
		NIOFOIN	95	1	27060	627	100	65	25	642,00	3,72	645,72	755	4	759
		KASSERE	50	1	20675	9267	100	65	25	490,51	54,97	545,48	577	55	632
		BOUNDIALI	10		0	925	100	65	25	0,00	5,49	5,49	0	5	5
		TIORONIARADOU	5		0	11	100	65	25	0,00	0,07	0,07	0	0	0
		SIRASSO	5		0	409	100	65	25	0,00	2,43	2,43	0	2	2
II-C8	ZIENOA				409.021	56.354	100	65	25	9.704,02	334,25	10.038,27	11.416	334	11.750
		TIASSALE	40		0	27538	100	65	25	0,00	163,34	163,34	0	163	163
		TAABO	40		0	1249	100	65	25	0,00	7,41	7,41	0	7	7
		KPOUEBO	100	1	21030	1215	100	65	25	498,94	7,21	506,14	587	7	594
		TOUMODI	95	1	70213	319	100	65	25	1.665,80	1,89	1.667,70	1.960	2	1.962
		DJEKANOU	75	1	24327	3494	100	65	25	577,16	20,72	597,88	679	21	700
		KOKOUMBO	40	1	29585	960	100	65	25	701,90	5,69	707,60	826	6	832
		ANGODA	100	1	13877	16	100	65	25	329,23	0,10	329,33	387	0	387
		YAMOUSSOUKRO	20		0	4065	100	65	25	0,00	24,11	24,11	0	24	24
		ATTIEGOUAKRO	100	1	43595	38	100	65	25	1.034,29	0,23	1.034,52	1.217	0	1.217
		TIEBISSOU	80	1	102342	6229	100	65	25	2.428,06	36,95	2.465,01	2.857	37	2.894
		DIDIEVI	85	1	47320	193	100	65	25	1.122,67	1,15	1.123,81	1.321	1	1.322
		TIE N'DIEKRO	60	1	18078	357	100	65	25	428,90	2,12	431,02	505	2	507
		DIMBOKRO	70		0	1424	100	65	25	0,00	8,45	8,45	0	8	8
		TIEMELEKRO	95	1	25344	8097	100	65	25	601,29	48,03	649,31	707	48	755
		ANOUMABLA	40	1	13310	1160	100	65	25	315,78	6,88	322,66	372	7	379
II-C9	DIMBOKRO				283.272	31.502	100	65	25	6.720,63	186,85	6.907,47	7.907	187	8.094
		DIMBOKRO	30	1	99778	610	100	65	25	2.367,23	3,62	2.370,85	2.785	4	2.789
		BOCANDA	100	1	74026	7180	100	65	25	1.756,27	42,59	1.798,85	2.066	43	2.109
		KOUASSI KOUASS	90	1	17134	1806	100	65	25	406,50	10,71	417,22	478	11	489
		MBAHIAKRO	50		0	3424	100	65	25	0,00	20,31	20,31	0	20	20
		BONGUERA	30		0	477	100	65	25	0,00	2,83	2,83	0	3	3
		PRIKRO	25	1	43573	1316	100	65	25	1.033,77	7,81	1.041,58	1.216	8	1.224
		KOFFI AMONKRO	15	1	13053	232	100	65	25	309,68	1,38	311,06	364	1	365
		ETTROKRO	3		0	270	100	65	25	0,00	1,60	1,60	0	2	2
		OUELLE	100	1	35708	3992	100	65	25	847,17	23,68	870,85	997	24	1.021
		DAOUKRO	25		0	3894	100	65	25	0,00	23,10	23,10	0	23	23
		BONGOUANOU	50		0	4175	100	65	25	0,00	24,76	24,76	0	25	25
		MBATTO	30		0	3666	100	65	25	0,00	21,74	21,74	0	22	22
		TIEMELEKRO	5		0	426	100	65	25	0,00	2,53	2,53	0	3	3
		DIDIEVI	15		0	34	100	65	25	0,00	0,20	0,20	0	0	0
II-C10	M'BAHIAKRO				1.017.970	25.981	100	65	25	24.151,34	154,10	24.305,44	28.413	154	28.567
		MBAHIAKRO	50	1	37781	3424	100	65	25	896,35	20,31	916,66	1.055	20	1.075
		BONGUERA	70	1	15951	1113	100	65	25	378,44	6,60	385,04	445	7	452
		BASSAWA	25		0	61	100	65	25	0,00	0,36	0,36	0	0	0
		DABAKALA	50		0	2802	100	65	25	0,00	16,62	16,62	0	17	17
		SATAMA-SOKOU	100	1	10470	643	100	65	25	248,40	3,81	252,22	292	4	296

Water Demand in 2015

Code	Control Points	Sub-Prefectures	Population Data: Sharing (%)	Population Data: Center Town	2015 Population: urban	2015 Population: Rural	Water Supply Coverage	Per C. Demand: Rural Population (l/c/d)	Per C. Demand: Urban Population (l/c/d)	2015 Demand: Urban Demand (x1000 m3/an)	2015 Demand: Rural Demand (x1000m3)	2015 Demand: Total (x1000m3)	2015 Production Demand: Urban Demand (x1000 m3/an)	2015 Production Demand: Rural Demand (x1000m3)	2015 Production Demand: Total (x1000m3)
		SATAMA-SOKOR	100	1	9455	1489	100	65	25	224,32	8,83	233,15	264	9	273
		BROBO	100	1	29477	1359	100	65	25	699,34	8,06	707,40	823	8	831
		TIE N'DIEKRO	40		0	238	100	65	25	0,00	1,41	1,41	0	1	1
		BOUAKE	80	1	803107	2805	100	65	25	19.053,71	16,64	19.070,35	22.416	17	22.433
		DIABO	40	1	13499	1479	100	65	25	320,26	8,77	329,04	377	9	386
		KATIOLA	65	1	66705	4783	100	65	25	1.582,58	28,37	1.610,95	1.862	28	1.890
		TIMBE	100	1	8784	397	100	65	25	208,40	2,36	210,76	245	2	247
		FRONAN	10	1	22741	1602	100	65	25	539,53	9,50	549,03	635	10	645
		BONIEREDOUGO	50		0	3260	100	65	25	0,00	19,34	19,34	0	19	19
		PRIKRO	10		0	526	100	65	25	0,00	3,12	3,12	0	3	3
II-C11	Rte KATIOLA-DABAKALA				93.015	48.425	100	65	25	2.206,78	287,22	2.494,00	2.596	287	2.883
		FRONAN	30		0	4807	100	65	25	0,00	28,51	28,51	0	29	29
		NIAKARAMADOU	50	1	48573	3061	100	65	25	1.152,39	18,16	1.170,55	1.356	18	1.374
		KOUMBALA	20		0	1585	100	65	25	0,00	9,40	9,40	0	9	9
		KONG	15		0	27777	100	65	25	0,00	164,75	164,75	0	165	165
		FOUMBOLO	65	1	15155	4421	100	65	25	359,55	26,22	385,77	423	26	449
		BONIEREDOUGO	50	1	29287	3260	100	65	25	694,83	19,34	714,17	817	19	836
		TAFIERE	40		0	3514	100	65	25	0,00	20,84	20,84	0	21	21
II-C12	BOUAFLE				320.625	113.514	100	65	25	7.606,83	673,28	8.280,11	8.949	673	9.622
		BONON	65	1	69615	61452	100	65	25	1.651,62	364,49	2.016,10	1.943	364	2.307
		BOUAFLE	25	1	169072	18113	100	65	25	4.011,23	107,43	4.118,67	4.719	107	4.826
		ZUENOULA	30		0	7536	100	65	25	0,00	44,70	44,70	0	45	45
		GOHITAFLA	10		0	927	100	65	25	0,00	5,50	5,50	0	5	5
		BEDIALA	50	1	81938	25486	100	65	25	1.943,98	151,16	2.095,14	2.287	151	2.438
II-C13	ZUENOULA				239.726	98.019	100	65	25	5.687,50	581,38	6.268,87	6.691	581	7.272
		ZUENOULA	50	1	131752	12560	100	65	25	3.125,82	74,50	3.200,31	3.677	74	3.751
		VAVOUA	15		0	20584	100	65	25	0,00	122,09	122,09	0	122	122
		MASSALA	75		0	5948	100	65	25	0,00	35,28	35,28	0	35	35
		MANKONO	85	1	67771	11208	100	65	25	1.607,87	66,48	1.674,34	1.892	66	1.958
		SARHALA	50		0	22892	100	65	25	0,00	135,78	135,78	0	136	136
		MARANDALLAH	35	1	22306	16402	100	65	25	529,21	97,28	626,49	623	97	720
		TIENINGBOUE	15		0	3738	100	65	25	0,00	22,17	22,17	0	22	22
		KONGASSO	95	1	17897	4223	100	65	25	424,61	25,05	449,65	500	25	525
		GOHITAFLA	5		0	464	100	65	25	0,00	2,75	2,75	0	3	3
II-C14	MANKONO				102.782	41.590	100	65	25	2.438,50	246,68	2.685,18	2.869	247	3.116
		DUALLA	70		0	1605	100	65	25	0,00	9,52	9,52	0	10	10
		KANI	70	1	28163	1814	100	65	25	668,17	10,76	678,93	786	11	797
		MORONDO	50	1	22134	35	100	65	25	525,13	0,21	525,34	618	0	618
		SEGUELON	10		0	146	100	65	25	0,00	0,87	0,87	0	1	1
		MADINANI	5		0	46	100	65	25	0,00	0,27	0,27	0	0	0
		BOUNDIALI	15		0	1387	100	65	25	0,00	8,23	8,23	0	8	8
		DIANRA	90		0	12346	100	65	25	0,00	73,23	73,23	0	73	73
		SARHALA	50	1	52485	22892	100	65	25	1.245,21	135,78	1.380,99	1.465	136	1.601
		MANKONO	10		0	1319	100	65	25	0,00	7,82	7,82	0	8	8
II-C15	KOUROUKORO				183.769	5.895	100	65	25	4.359,92	34,97	4.394,89	5.129	35	5.164
		MASSALA	25	1	21213	1983	100	65	25	503,28	11,76	515,04	592	12	604
		SEGUELA	80	1	139260	1610	100	65	25	3.303,94	9,55	3.313,49	3.887	10	3.897
		WOROFLA	40	1	15735	876	100	65	25	373,31	5,20	378,51	439	5	444
		MORONDO	40		0	28	100	65	25	0,00	0,17	0,17	0	0	0
		KANI	25		0	648	100	65	25	0,00	3,84	3,84	0	4	4
		DJIBROSSO	30		0	62	100	65	25	0,00	0,37	0,37	0	0	0
		Dualla	30	1	7561	688	100	65	25	179,39	4,08	183,47	211	4	215
II-C16	BORON				87.250	33.847	100	65	25	2.070,01	200,76	2.270,76	2.435	201	2.636
		DIKODOGOU	30		0	23311	100	65	25	0,00	138,26	138,26	0	138	138
		SIRASSO	95	1	30415	7777	100	65	25	721,60	46,13	767,72	849	46	895
		BOUNDIALI	15		0	1387	100	65	25	0,00	8,23	8,23	0	8	8
		DIANRA	10	1	56835	1372	100	65	25	1.348,41	8,14	1.356,55	1.586	8	1.594
III-C1	Grand-Bassam				282.744	44.895	100	65	25	6.708,10	266,28	6.974,38	7.892	266	8.158
		GRAND-BASSAM	95	1	86917	2143	100	65	25	2.062,11	12,71	2.074,82	2.426	13	2.439
		ALEPE	50	1	134752	21388	100	65	25	3.196,99	126,86	3.323,85	3.761	127	3.888
		BETTIE	60	1	61075	12832	100	65	25	1.449,00	76,11	1.525,11	1.705	76	1.781
		YAKASSE ATTOB	40		0	8532	100	65	25	0,00	50,61	50,61	0	51	51
III-C2	ABRADINOU				378.841	150.144	100	65	25	8.988,00	890,54	9.878,55	10.574	891	11.465
		YAKASSE ATTOB	15		0	3199	100	65	25	0,00	18,97	18,97	0	19	19
		ADZOPE	10		0	210	100	65	25	0,00	1,25	1,25	0	1	1
		AKOUPE	50		0	12734	100	65	25	0,00	75,53	75,53	0	76	76
		ARRAH	65		0	6681	100	65	25	0,00	39,63	39,63	0	40	40
		DAOUKRO	75	1	81072	11683	100	65	25	1.923,43	69,30	1.992,73	2.263	69	2.332
		ETTROKRO	92	1	16198	8277	100	65	25	384,30	49,09	433,39	452	49	501
		KOUN-FAO	20		0	639	100	65	25	0,00	3,79	3,79	0	4	4
		TANKESSE	10		0	668	100	65	25	0,00	3,96	3,96	0	4	4
		AGNIBILEKRO	60		0	14570	100	65	25	0,00	86,42	86,42	0	86	86
		ABENGOUROU	95	1	237840	84745	100	65	25	5.642,75	502,64	6.145,40	6.639	503	7.142
		NIABLE	100	1	43731	5669	100	65	25	1.037,52	33,62	1.071,14	1.221	34	1.255
		BETTIE	5		0	1069	100	65	25	0,00	6,34	6,34	0	6	6
III-C3	AKAKOMOEKRO				260.037	23.688	100	65	25	6.169,38	140,50	6.309,88	7.258	140	7.398
		ETTROKRO	5		0	450	100	65	25	0,00	2,67	2,67	0	3	3
		KOFFI AMONKRO	85		0	1315	100	65	25	0,00	7,80	7,80	0	8	8

Water Demand in 2015

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		PRIKRO	65		0	3420	100	65	25	0,00	20,29	20,29	0	20	20
		BASSAWA	75	1	15273	182	100	65	25	362,35	1,08	363,43	426	1	427
		DABAKALA	30	1	62470	1681	100	65	25	1.482,10	9,97	1.492,07	1.744	10	1.754
		KOUASSI-DATEK	100	1	32878	2065	100	65	25	780,03	12,25	792,28	918	12	930
		SANDEGUE	100	1	58802	9091	100	65	25	1.395,08	53,92	1.449,00	1.641	54	1.695
		SAPLI	20	1	52823	3959	100	65	25	1.253,23	23,48	1.276,71	1.474	23	1.497
		Taoudi	100	1	37791	1525	100	65	25	896,59	9,05	905,64	1.055	9	1.064
III-C4	GRANSE				107.267	154.324	100	65	25	2.544,91	915,33	3.460,24	2.994	915	3.909
		KONG	75	1	32836	138886	100	65	25	779,03	823,77	1.602,80	917	824	1.741
		NASSIAN	20	1	40857	1638	100	65	25	969,33	9,72	979,05	1.140	10	1.150
		TEHINI	85	1	33574	10299	100	65	25	796,54	61,09	857,63	937	61	998
		DABAKALA	20		0	1121	100	65	25	0,00	6,65	6,65	0	7	7
		FOUMBOLO	35		0	2380	100	65	25	0,00	14,12	14,12	0	14	14
III-C5	KAFOLON				77.368	104.750	100	65	25	1.835,56	621,30	2.456,85	2.159	621	2.780
		NIELLE	85	1	32971	8209	100	65	25	782,24	48,69	830,93	920	49	969
		Kong	10		0	18518	100	65	25	0,00	109,84	109,84	0	110	110
		KOUMBALA	45		0	3566	100	65	25	0,00	21,15	21,15	0	21	21
		FERKESSEDOUG	50		0	10251	100	65	25	0,00	60,80	60,80	0	61	61
		OUANGOLODOU	85	1	44397	49742	100	65	25	1.053,32	295,03	1.348,35	1.239	295	1.534
		DIAWALA	40		0	13759	100	65	25	0,00	81,61	81,61	0	82	82
		MBENGUE	10		0	705	100	65	25	0,00	4,18	4,18	0	4	4
III-C6	N'DAKRO				515.597	36.437	100	65	25	12.232,54	216,12	12.448,66	14.391	216	14.607
		KOUN-FAO	80	1	38756	2554	100	65	25	919,49	15,15	934,63	1.082	15	1.097
		TANDA	80	1	91607	3301	100	65	25	2.173,38	19,58	2.192,96	2.557	20	2.577
		GOUMERE	100	1	20835	992	100	65	25	494,31	5,88	500,19	582	6	588
		TABAGNE	30	1	22596	193	100	65	25	536,09	1,15	537,24	631	1	632
		BONDOUKOU	100	1	67947	3486	100	65	25	1.612,04	20,68	1.632,72	1.897	21	1.918
		ASSUEFRY	100	1	29779	3733	100	65	25	706,51	22,14	728,65	831	22	853
		TRANSUA	100	1	49518	6450	100	65	25	1.174,82	38,26	1.213,07	1.382	38	1.420
		TANKESSE	90	1	63378	6014	100	65	25	1.503,64	35,67	1.539,31	1.769	36	1.805
		AGNIBILEKRO	40	1	131181	9714	100	65	25	3.112,27	57,62	3.169,89	3.661	58	3.719
IV-C1	TATE				173.559	410.263	100	65	25	4.117,69	2.433,37	6.551,06	4.844	2.433	7.277
		Grabo	90	1	56151	32636	100	65	25	1.332,18	193,57	1.525,75	1.567	194	1.761
		Tai	85	1	46921	67724	100	65	25	1.113,20	401,69	1.514,89	1.310	402	1.712
		Blolequin	70	1	61924	85980	100	65	25	1.469,15	509,97	1.979,12	1.728	510	2.238
		Bakoubly	100	1	8563	5	100	65	25	203,16	0,03	203,19	239	0	239
		Pehe	80		0	4839	100	65	25	0,00	28,70	28,70	0	29	29
		Buyo	30		0	81146	100	65	25	0,00	481,30	481,30	0	481	481
		Meagui	30		0	118601	100	65	25	0,00	703,45	703,45	0	703	703
		San Pedro	5		0	19332	100	65	25	0,00	114,66	114,66	0	115	115
IV-C2	TOULEPLEU				17.782	40.178	100	65	25	421,88	238,31	660,18	496	238	734
		PEHE	20	1	17782	1210	100	65	25	421,88	7,18	429,06	496	7	503
		BIN-HOUYE	50		0	156	100	65	25	0,00	0,93	0,93	0	1	1
		ZOUAN-HOUNIEN	30		0	1271	100	65	25	0,00	7,54	7,54	0	8	8
		DANANE	30		0	2986	100	65	25	0,00	17,71	17,71	0	18	18
		MAHAPLEU	80		0	6526	100	65	25	0,00	38,71	38,71	0	39	39
		SANGOUINE	10		0	1641	100	65	25	0,00	9,73	9,73	0	10	10
		ZOU	15		0	7964	100	65	25	0,00	47,24	47,24	0	47	47
		BLOLEQUIN	15		0	18424	100	65	25	0,00	109,28	109,28	0	109	109
VI-C1	PAPARA				61.483	5.791	100	65	25	1.458,68	34,35	1.493,03	1.716	34	1.750
		TENGRELA	40	1	52082	1456	100	65	25	1.235,65	8,64	1.244,28	1.454	9	1.463
		KANAKONO	100	1	9401	4245	100	65	25	223,04	25,18	248,22	262	25	287
		KOUTO	10		0	90	100	65	25	0,00	0,53	0,53	0	1	1
VI-C2	KOUTO Pont				157.015	17.266	100	65	25	3.725,18	102,41	3.827,59	4.383	102	4.485
		Kouto	65	1	34077	582	100	65	25	808,48	3,45	811,93	951	3	954
		M'Bengue	8		0	564	100	65	25	0,00	3,35	3,35	0	3	3
		Kassere	50		0	9267	100	65	25	0,00	54,97	54,97	0	55	55
		Gbon	30	1	22433	217	100	65	25	532,22	1,29	533,51	626	1	627
		Kolia	45	1	34786	632	100	65	25	825,30	3,75	829,05	971	4	975
		Boundiali	60	1	65719	5548	100	65	25	1.559,18	32,91	1.592,09	1.834	33	1.867
		Madinani	50		0	456	100	65	25	0,00	2,71	2,71	0	3	3
VI-C3	DEBETE				0	2.412	100	65	25	0,00	14,31	14,31	0	14	14
		TENGRELA	25		0	910	100	65	25	0,00	5,40	5,40	0	5	5
		KOUTO	25		0	224	100	65	25	0,00	1,33	1,33	0	1	1
		GBON	70		0	506	100	65	25	0,00	3,00	3,00	0	3	3
		KOLIA	55		0	772	100	65	25	0,00	4,58	4,58	0	5	5
VI-C4	DJIRILA				132.406	5.357	100	65	25	3.141,33	31,77	3.173,11	3.696	32	3.728
		MINIGNAN	15		0	25	100	65	25	0,00	0,15	0,15	0	0	0
		Samatiguila	100	1	5634	1329	100	65	25	133,67	7,88	141,55	157	8	165
		Kaniasso	100	1	11129	119	100	65	25	264,04	0,71	264,74	311	1	312
		Tieme	100	1	9355	2018	100	65	25	221,95	11,97	233,92	261	12	273
		Odienne	50	1	106288	1382	100	65	25	2.521,68	8,20	2.529,88	2.967	8	2.975
		Tienko	15		0	25	100	65	25	0,00	0,15	0,15	0	0	0
		Goulia	20		0	368	100	65	25	0,00	2,18	2,18	0	2	2
		Madinami	10		0	91	100	65	25	0,00	0,54	0,54	0	1	1
VI-C5	IRADOUGOU				0	967	100	65	25	0,00	5,74	5,74	0	6	6
		SEYDOUGOU	25		0	0	100	65	25	0,00	0,00	0,00	0	0	0
		ODIENNE	35		0	967	100	65	25	0,00	5,74	5,74	0	6	6

Water Demand in 2015

Code	Control e Points	Sub-Prefectures	Population Data		2015 Population		Water Supply	Per C. Demand		2015 Demand			2015 Production Demand		
			Sharing (%)	Center Town	urban	Rural	Coverage	Rural Population (l/c/d)	Urban Population (l/c/d)	Urban Demand (x1000 m3/an)	Rural Demand (x1000m3)	Total (x1000m3)	Urban Demand (x1000 m3/an)	Rural Demand (x1000m3)	Total (x1000m3)
VII-C1	KONTODOU				0	6.755	100	65	25	0,00	40,07	40,07	0	40	40
		BOUNA	20		0	6755	100	65	25	0,00	40,07	40,07	0	40	40
VII-C2	VONKORO				136.090	5.195	100	65	25	3.228,74	30,81	3.259,55	3.799	31	3.830
		BOUNA	10	1	136090	3377	100	65	25	3.228,74	20,03	3.248,77	3.799	20	3.819
		Daropo	100	1	0	0	100	65	25	0,00	0,00	0,00	0	0	0
		Tehini	15		0	1818	100	65	25	0,00	10,78	10,78	0	11	11
VIII-1	Assnie-Mafia				217619	82764	100	65	25	5.163,01	490,89	5.653,91	6.074	491	6.565
		ASSINI-MAFIA	60	1	16630	1190	100	65	25	394,55	7,06	401,61	464	7	471
		ETUEBOUE	100	1	16099	14497	100	65	25	381,95	85,99	467,93	449	86	535
		Adiake	95	1	52859	14963	100	65	25	1.254,08	88,75	1.342,83	1.475	89	1.564
		ABOISSO	45		0	13040	100	65	25	0,00	77,34	77,34	0	77	77
		TIAPOUM	70	1	54567	12097	100	65	25	1.294,60	71,75	1.366,35	1.523	72	1.595
		MAFERE	40	1	77464	26977	100	65	25	1.837,83	160,01	1.997,84	2.162	160	2.322
VIII-C2	Krindjabo				103658	17922	100	65	25	2.459,29	106,30	2.565,59	2.893	106	2.999
		ABOISSO	55	1	103658	15938	100	65	25	2.459,29	94,53	2.553,82	2.893	95	2.988
		AYAME	5		0	927	100	65	25	0,00	5,50	5,50	0	5	5
		BONOUA	5		0	1057	100	65	25	0,00	6,27	6,27	0	6	6
VIII-C3	AYAME Dam-No.2				15.691	42.560	100	65	25	372,27	252,43	624,70	438	252	690
		AYAME	70	1	15691	12975	100	65	25	372,27	76,96	449,23	438	77	515
		BIANOUAN	60		0	29585	100	65	25	0,00	175,48	175,48	0	175	175
VIII-C4	BIAN				27.981	19.723	100	65	25	663,85	116,98	780,83	781	117	898
		BIANOUAN	40	1	27981	19723	100	65	25	663,85	116,98	780,83	781	117	898
IX-C1	Adjin				24.476	3.859	100	65	25	580,69	22,89	603,58	683	23	706
		ANOUMABLA	40		0	1160	100	65	25	0,00	6,88	6,88	0	7	7
		BINGERVILLE	15		0	1028	100	65	25	0,00	6,10	6,10	0	6	6
		AZAGUIE	25	1	24476	1671	100	65	25	580,69	9,91	590,60	683	10	693
IX-C2	IRHO				166.351	33.424	100	65	25	3.946,68	198,25	4.144,92	4.643	198	4.841
		AYAME	10		0	1854	100	65	25	0,00	11,00	11,00	0	11	11
		ALEPE	45		0	19249	100	65	25	0,00	114,17	114,17	0	114	114
		AZAGUIE	60		0	4010	100	65	25	0,00	23,78	23,78	0	24	24
		AGBOVILLE	10		0	4163	100	65	25	0,00	24,69	24,69	0	25	25
		BECEDI BRIGNA	100	1	24322	2314	100	65	25	577,04	13,73	590,76	679	14	693
		AGOU	100	1	27798	1043	100	65	25	659,51	6,19	665,69	776	6	782
		ADZOPE	30	1	80658	631	100	65	25	1.913,61	3,74	1.917,35	2.251	4	2.255
		ASSIKOI	50	1	33573	160	100	65	25	796,52	0,95	797,47	937	1	938
IX-C3	LOBOAKOUDZIN				44.070	10.500	100	65	25	1.045,56	62,28	1.107,84	1.230	62	1.292
		ALEPE	5		0	2139	100	65	25	0,00	12,69	12,69	0	13	13
		ASSIKOI	50		0	160	100	65	25	0,00	0,95	0,95	0	1	1
		ADZOPE	35		0	736	100	65	25	0,00	4,37	4,37	0	4	4
		YAKASSE ATTOB	35	1	44070	7465	100	65	25	1.045,56	44,28	1.089,84	1.230	44	1.274
IX-C4	KOSSIHOUEN				0	42.464	100	65	25	0,00	251,87	251,87	0	252	252
		AYAME	15		0	2780	100	65	25	0,00	16,49	16,49	0	16	16
		AGBOVILLE	65		0	27057	100	65	25	0,00	160,48	160,48	0	160	160
		RUBINO	45		0	9485	100	65	25	0,00	56,26	56,26	0	56	56
		SIKENSI	20		0	2139	100	65	25	0,00	12,69	12,69	0	13	13
		AZAGUIE	15		0	1003	100	65	25	0,00	5,95	5,95	0	6	6
IX-C5	AGBOVILLE				530.556	69.748	100	65	25	12.587,44	413,69	13.001,13	14.809	414	15.223
		AGBOVILLE	25	1	193700	10407	100	65	25	4.595,53	61,73	4.657,26	5.407	62	5.469
		RUBINO	55	1	40402	11593	100	65	25	958,54	68,76	1.027,30	1.128	69	1.197
		ANOUMABLA	20		0	580	100	65	25	0,00	3,44	3,44	0	3	3
		MBATTO	65	1	42928	7942	100	65	25	1.018,47	47,11	1.065,57	1.198	47	1.245
		BONGOUANOU	50	1	97896	4175	100	65	25	2.322,58	24,76	2.347,35	2.732	25	2.757
		ARRAH	35	1	64528	3598	100	65	25	1.530,93	21,34	1.552,27	1.801	21	1.822
		AKOUPE	50	1	70529	12734	100	65	25	1.673,30	75,53	1.748,83	1.969	76	2.045
		AFFERY	100	1	20573	18193	100	65	25	488,09	107,91	596,00	574	108	682
		ADZOPE	25		0	526	100	65	25	0,00	3,12	3,12	0	3	3
IX-C6	IRA				0	8.658	100	65	25	0,00	51,35	51,35	0	51	51
		DABOU	30		0	8658	100	65	25	0,00	51,35	51,35	0	51	51
X-C1	Adahi Dougeu				619.435	169.710	100	65	25	14.696,10	1.006,59	15.702,69	17.290	1.007	18.297
		GUITRY	50	1	92704	83351	100	65	25	2.199,40	494,38	2.693,78	2.588	494	3.082
		DIVO	25	1	270965	23831	100	65	25	6.428,65	141,35	6.569,99	7.563	141	7.704
		HIRE	40		0	11758	100	65	25	0,00	69,74	69,74	0	70	70
		DIEGONEFLA	65	1	79922	23578	100	65	25	1.896,15	139,85	2.036,00	2.231	140	2.371
		ZIKISSO	100	1	32906	12754	100	65	25	780,70	75,65	856,34	918	76	994
		LAKOTA	45	1	142938	14438	100	65	25	3.391,20	85,64	3.476,84	3.990	86	4.076
X-C2	GRAND-LAHOU				0	89.896	100	65	25	0,00	533,20	533,20	0	533	533
		GUITRY	20		0	33340	100	65	25	0,00	197,75	197,75	0	198	198
		GRAND LAHOU	7		0	7423	100	65	25	0,00	44,03	44,03	0	44	44
		DIVO	50		0	47663	100	65	25	0,00	282,70	282,70	0	283	283
		HIRE	5		0	1470	100	65	25	0,00	8,72	8,72	0	9	9
X-C3	DAHIRI				0	46.038	100	65	25	0,00	273,06	273,06	0	273	273
		FRESCO	35		0	28266	100	65	25	0,00	167,65	167,65	0	168	168
		GUITRY	2		0	3334	100	65	25	0,00	19,78	19,78	0	20	20
		LAKOTA	45		0	14438	100	65	25	0,00	85,64	85,64	0	86	86
X-C4	FRESCO				0	81.363	100	65	25	0,00	482,58	482,58	0	483	483
		FRESCO	35		0	28266	100	65	25	0,00	167,65	167,65	0	168	168
		SASSANDRA	20		0	53097	100	65	25	0,00	314,93	314,93	0	315	315

Water Demand in 2015

Code	Control Points	Sub-Prefectures	Population Data: Sharing (%)	Population Data: Center Town	2015 Population: urban	2015 Population: Rural	Water Supply Coverage	Per Capita Demand: Rural Population (l/c/d)	Per Capita Demand: Urban Population (l/c/d)	2015 Demand: Urban Demand (x1000 m3/an)	2015 Demand: Rural Demand (x1000m3)	2015 Demand: Total (x1000m3)	2015 Production Demand: Urban Demand (x1000 m3/an)	2015 Production Demand: Rural Demand (x1000m3)	2015 Production Demand: Total (x1000m3)
XI-C1	SAN PEDRO				568.890	364.439	100	65	25	13.496,92	2.161,58	15.658,49	15.879	2.162	18.041
		San Pedro	65	1	568890	251310	100	65	25	13.496,92	1.490,58	14.987,50	15.879	1.491	17.370
		Grand Bereby	15		0	14295	100	65	25	0,00	84,79	84,79	0	85	85
		Meagui	25		0	98834	100	65	25	0,00	586,21	586,21	0	586	586
XI-C2	Grand Bereby				111.046	35.169	100	65	25	2.634,57	208,60	2.843,16	3.099	209	3.308
		GRAND BEREBY	35	1	111046	33356	100	65	25	2.634,57	197,84	2.832,41	3.099	198	3.297
		GRABO	5		0	1813	100	65	25	0,00	10,75	10,75	0	11	11
XI-C3	WEOULO				0	1.813	100	65	25	0,00	10,75	10,75	0	11	11
		GRAND BEREBY	10		0	0	100	65	25	0,00	0,00	0,00	0	0	0
		GRABO	5		0	1813	100	65	25	0,00	10,75	10,75	0	11	11
					0	0	100	65	25	0,00	0,00	0,00	0	0	0
	Abidjan				5.656.724	0	100	100	25	206.470,43	0,00	206.470,43	242.906	0	242.906
		ABOBO	100	1	1448135	0	100	100	25	52.856,93	0,00	52.856,93	62.185	0	62.185
		ADJAME	100	1	452942	0	100	100	25	16.532,38	0,00	16.532,38	19.450	0	19.450
		ATTECOUBE	100	1	373191	0	100	100	25	13.621,47	0,00	13.621,47	16.025	0	16.025
		COCODY	100	1	457837	0	100	100	25	16.711,05	0,00	16.711,05	19.660	0	19.660
		KOUMASSI	100	1	903128	0	100	100	25	32.964,17	0,00	32.964,17	38.781	0	38.781
		MARCORY	100	1	339963	0	100	100	25	12.408,65	0,00	12.408,65	14.598	0	14.598
		TREICHVILLE	100	1	203340	0	100	100	25	7.421,91	0,00	7.421,91	8.732	0	8.732
		PLATEAU	100	1	15153	0	100	100	25	553,09	0,00	553,09	651	0	651
		PORTBOUET	100	1	248610	0	100	100	25	9.074,27	0,00	9.074,27	10.676	0	10.676
		YOPOUGON	100	1	1214425	0	100	100	25	44.326,51	0,00	44.326,51	52.149	0	52.149
			21362	218	########	5.898.575		Demand		535.417,70	35.485,04	570.902,74	629.903	35.485	665.388
					########			Prodection		629.903,17	35.469,64	665.372,81			

Table S.11.2-3 Agricultural Water Demand in 2015 (1/5 Year)

River Basin	Surface Water Demand (MCM/year)				G.Water
Sassandra River	Irrigation	Aquaculture	Livestock	Total	Vegetables
I-A0	2.320	2.960	0.016	5.296	0.260
I-A1	37.980	51.130	0.203	89.313	4.720
I-A2	20.630	26.620	0.080	47.330	2.460
I-A3	90.170	96.760	0.249	187.179	7.860
I-A4	96.750	102.230	0.307	199.287	9.350
I-A5	128.940	41.650	0.465	171.055	5.580
I-A6	37.300	81.970	0.512	119.782	7.390
I-A7	71.810	89.630	0.615	162.055	24.900
I-A8	81.990	79.300	0.140	161.430	6.470
I-A9	31.180	32.930	0.078	64.188	1.960
I-A10	11.910	4.460	0.189	16.559	1.050
Total	610.980	609.640	2.854	1,223.474	72.000
Bandama River	Irrigation	Aquaculture	Livestock	Total	Vegetables
II-A0	0.000	0.000	0.004	0.004	0.070
II-A1	7.400	2.110	0.218	9.728	5.040
II-A2	5.130	3.380	0.071	8.581	1.120
II-A3	174.370	71.220	0.485	246.075	11.840
II-A4	110.980	29.550	0.839	141.369	12.740
II-A5	175.000	30.740	1.353	207.093	6.040
II-A6	392.800	63.960	4.165	460.925	8.740
II-A7	282.600	77.350	3.862	363.812	7.880
II-A8	214.370	28.100	1.025	243.495	16.310
II-A9	25.980	45.540	0.579	72.099	8.360
II-A10	78.300	13.570	1.071	92.941	13.830
II-A11	45.180	8.930	1.179	55.289	4.140
II-A12	15.070	30.040	0.296	45.406	5.650
II-A13	37.920	26.160	0.287	64.367	4.560
II-A14	67.350	19.340	0.686	87.376	4.860
II-A15	25.380	10.660	0.178	36.218	1.990
II-A16	158.040	45.620	2.041	205.701	4.730
Total	1,815.870	506.270	18.339	2,340.479	117.900

River Basin	Surface Water Demand (MCM/year)				G.Water
Comoe River	Irrigation	Aquaculture	Livestock	Total	Vegetables
III-A1	8.860	3.800	0.517	13.177	13.990
III-A2	14.700	29.580	0.553	44.833	6.650
III-A3	132.640	10.660	0.984	144.284	7.770
III-A4	139.010	12.890	4.347	156.247	9.200
III-A5	105.760	5.950	2.560	114.270	3.550
III-A6	17.230	6.300	0.510	24.040	6.280
Total	418.200	69.180	9.471	496.851	47.440
Cavally River	Irrigation	Aquaculture	Livestock	Total	Vegetables
IV-A0	3.550	4.650	0.021	8.221	0.490
IV-A1	63.800	73.940	0.196	137.936	5.810
IV-A2	49.050	45.940	0.081	95.071	3.660
Total	116.400	124.530	0.298	241.228	9.960
Cetos River	Irrigation	Aquaculture	Livestock	Total	Vegetables
V-A0	47.290	44.640	0.074	92.004	3.450
Total	47.290	44.640	0.074	92.004	3.450
Bani-Nige Rive	Irrigation	Aquaculture	Livestock	Total	Vegetables
VI-A01	15.060	1.980	0.482	17.522	0.530
VI-A02	23.340	8.930	0.364	32.634	2.040
VI-A1	54.280	8.930	1.467	64.677	1.770
VI-A2	142.160	20.830	2.336	165.326	4.400
VI-A3	75.980	12.400	1.537	89.917	2.960
VI-A4	21.010	7.930	0.331	29.271	1.840
VI-A5	7.460	2.980	0.117	10.557	0.660
Total	339.290	63.980	6.634	409.904	14.200
Kolodio River	Irrigation	Aquaculture	Livestock	Total	Vegetables
VII-A01	7.460	1.980	0.387	9.827	4.470
VII-A02	0.000	0.000	0.010	0.010	0.070
VII-A03	2.330	1.980	0.341	4.651	1.310
VII-A1	1.160	0.990	0.185	2.335	0.720
VII-A2	0.820	0.990	0.130	1.940	0.530
Total	11.770	5.940	1.053	18.763	7.100

River Basin	Surface Water Demand (MCM/year)				G.Water
Bia River	Irrigation	Aquaculture	Livestock	Total	Vegetables
VIII-A01	1.950	1.270	0.047	3.267	0.950
VIII-A02	0.750	0.420	0.034	1.204	0.950
VIII-A1	3.200	2.540	0.083	5.823	1.790
VIII-A2	1.320	0.850	0.031	2.201	0.720
VIII-A3	3.800	2.960	0.090	6.850	1.700
VIII-A4	0.380	0.420	0.009	0.809	0.190
Total	11.400	8.460	0.294	20.154	6.300
Agneby Basin	Irrigation	Aquaculture	Livestock	Total	Vegetables
IX-A0	22.050	2.540	0.769	25.359	21.920
IX-A1	5.750	0.420	0.110	6.280	3.040
IX-A2	10.920	4.230	0.266	15.416	6.440
IX-A3	1.330	2.110	0.087	3.527	1.630
IX-A4	27.730	7.180	0.202	35.112	4.070
IX-A5	17.430	24.080	0.229	41.739	3.670
IX-A6	1.930	0.420	0.125	2.475	3.600
Total	87.140	40.980	1.788	129.908	44.370
Boubo Basin	Irrigation	Aquaculture	Livestock	Total	Vegetables
X-A01	1.270	8.030	0.056	9.356	1.320
X-A02	2.630	4.230	0.023	6.883	0.420
X-A1	1.940	13.520	0.083	15.543	2.050
X-A2	6.510	35.920	0.217	42.647	4.370
X-A3	2.020	13.940	0.098	16.058	1.810
X-A4	4.480	8.870	0.052	13.402	1.000
Total	18.850	84.510	0.529	103.889	10.970
San Pedro Basir	Irrigation	Aquaculture	Livestock	Total	Vegetables
XI-A01	8.200	10.140	0.058	18.398	1.580
XI-A02	3.000	3.800	0.020	6.820	0.580
XI-A1	15.310	19.010	0.098	34.418	3.020
XI-A2	4.920	5.920	0.033	10.873	1.000
XI-A3	2.320	2.540	0.014	4.874	0.400
Total	33.750	41.410	0.223	75.383	6.580

River Basin	Surface Water Demand (MCM/year)				G.Water
Whole Country	Irrigation	Aquaculture	Livestock	Total	Vegetables
	3,510.940	1,599.540	41.557	5,152.037	340.270

River Basin	Surface Water Demand (MCM/year)				G.Water
River Basin	Irrigation	Aquaculture	Livestock	Total	Vegetables
I	610.980	609.640	2.854	1,223.474	72.000
II	1,815.870	506.270	18.339	2,340.479	117.900
III	418.200	69.180	9.471	496.851	47.440
IV	116.400	124.530	0.298	241.228	9.960
V	47.290	44.640	0.074	92.004	3.450

River Basin	Surface Water Demand (MCM/year)				G.Water
Bia River	Irrigation	Aquaculture	Livestock	Total	Vegetables
VI	339.290	63.980	6.634	409.904	14.200
VII	11.770	5.940	1.053	18.763	7.100
VIII	11.400	8.460	0.294	20.154	6.300
IX	87.140	40.980	1.788	129.908	44.370
X	18.850	84.510	0.529	103.889	10.970
XI	33.750	41.410	0.223	75.383	6.580

(Note) 1) Unit Demand: Cattle 25 lit/head/day, Sheep and Goat: 5 lit/head/day, Pig: 7.25 lit/head/day (5 lit/head/day for Traditional pig 85%, 20 lit/head/day for Modern pig 15%), Poultry: 0.1 lit/head/day

2) *: 30 lit/head/day taking increase of cattle number due to grasing beyond international boundary in dry season. (Cattle number is estimated to increase by 40% in dry season. 25lit/head/day x 1.20 = 30 lit/head/day)

3) Water losses are not considered in above table because livestock themselves access to water due to free grasing system mostly.

2.2 Development Discharge and Reservoir Capacity

2.2.1 For Major Dams (Residual Mass Curves)

The relation between development discharge and reservoir capacity for the following major dams which have carrying-over reservoir capacity are studied by residual mass curve. The result are as shown in Figure S.11.2-1 / 2/ 3/ 4/5(1)&(2).

(1) Figure S.11.2-1 Nidieliesso Dam (Comoe River)

(2) Figure S.11.2-2 Agboville Dam (Agneby River)

(3) Figure S.11.2-3 Boufle Dam (Marahoue River)

(4) Figure S.11.2-4 Aboisso Dam (Bia River)

(5) Figure S.11.2-5(1) Louga dam (Sassandra River)

(6) Figure S.11.2-5(2) Louga dam (Sassandra River)

2.2.2 For Other Dams (Relation of Necessary Reservoir Capacity to Development Discharge)

The relation between development discharge and reservoir capacity for other dams which have been operating on reservoir capacities with one year cycle are studied by water balance calculation based on monthly specific discharge at control points in 1983. The result are as shown in Figure S.11.2-6(1)～(9).

The development discharge at proposed sites could be calculated by following formula using Figure S.11.2-6(1)～(9).

$Q_{1/10}$ = Adjustment factor $\times Q_{1983}$

$Q_{1/10}$ = Development discharge for return period 1/10 years
Q_{1983} = Development discharge in 1983,could be calculated by Figure S.11.2.6 (1)～(9)

Figure S.11.2-1 Mass Curve at Planned Ndieliesso Dam (The Comoe River)

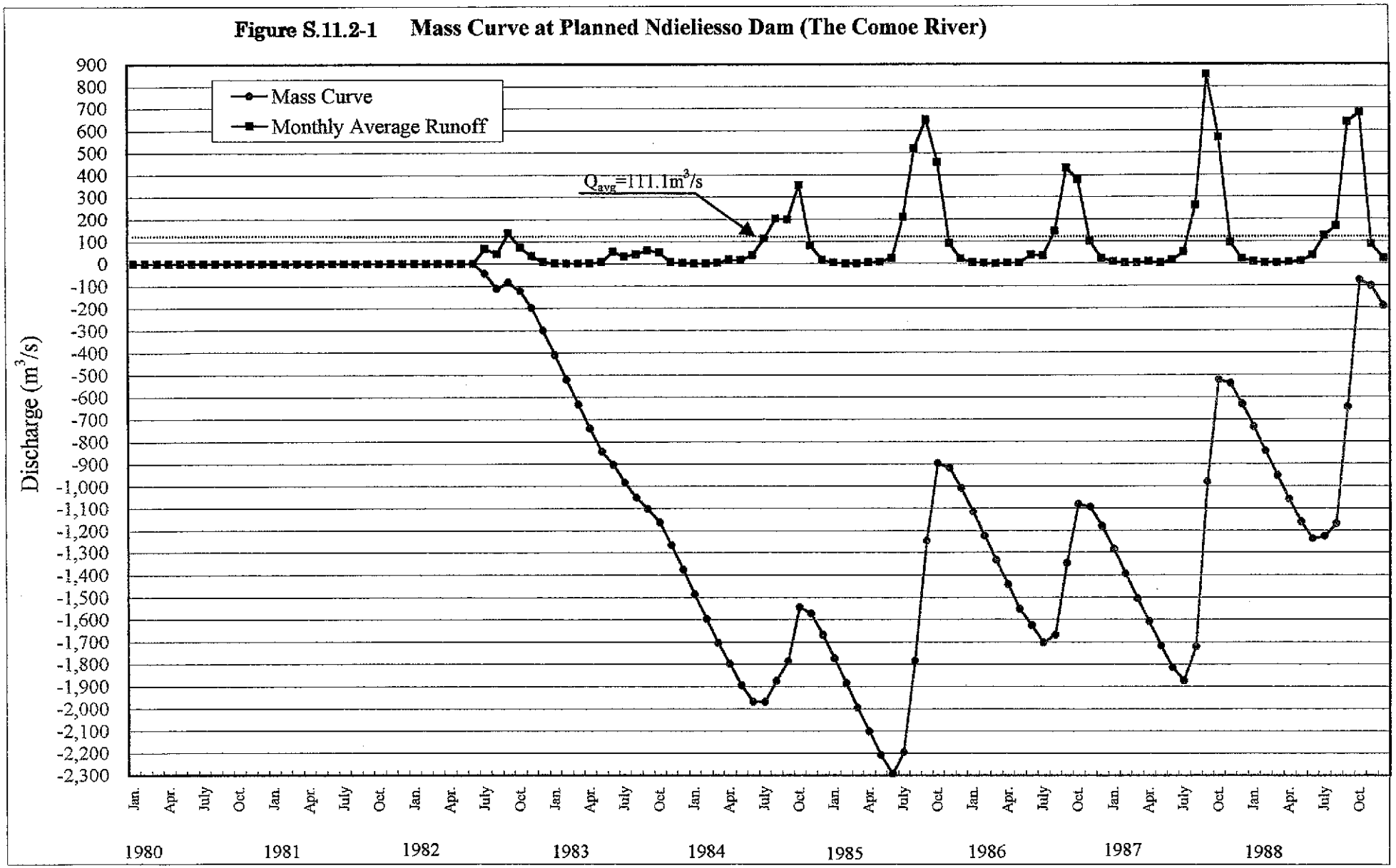


Figure S.11.2-2 **Mass Curve at the Planned Agboville Dam (The Agneby River)**

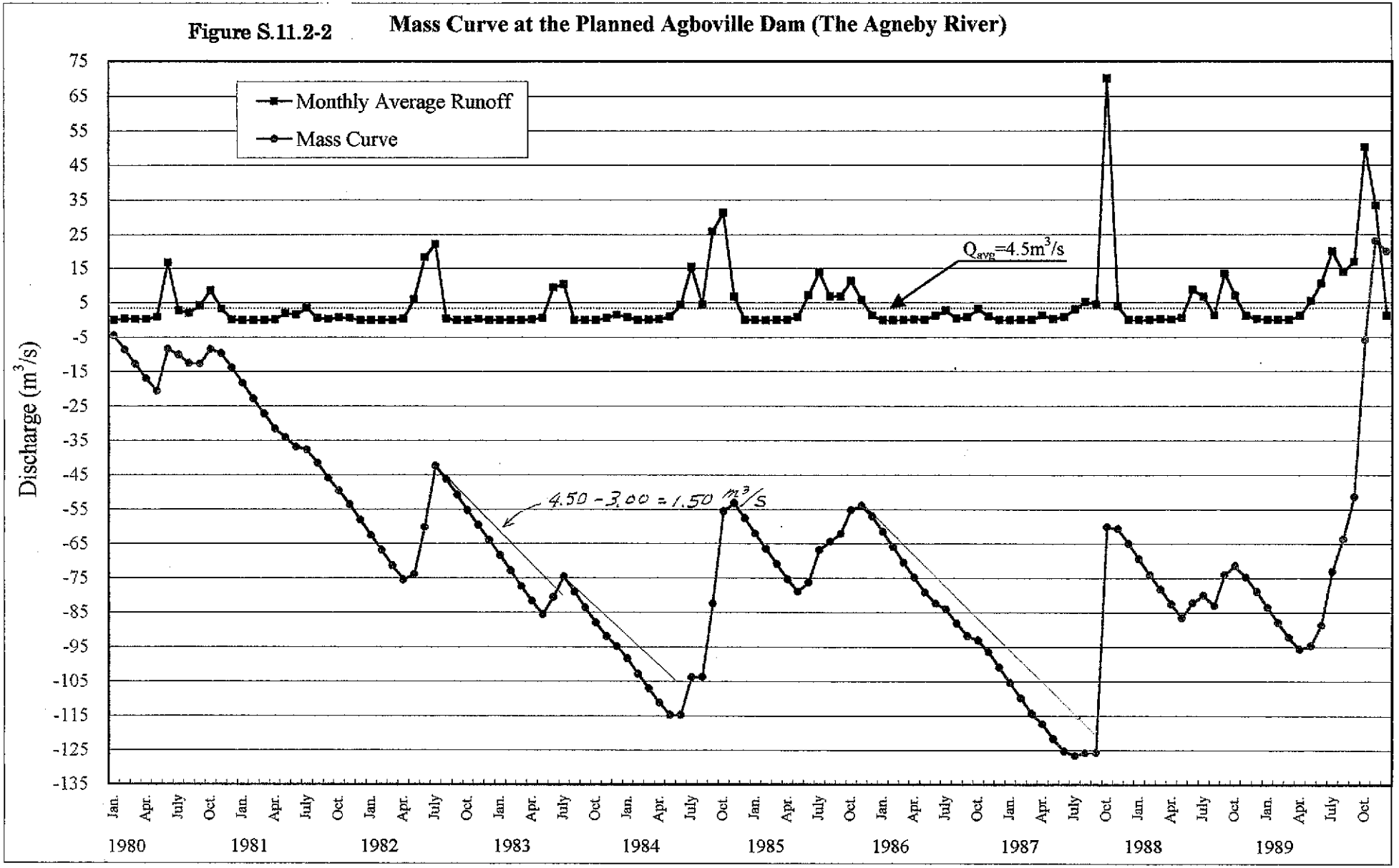


Figure S.11.2-3 **Mass Curve at Planned Bouafle Dam Site (The MarahoueRiver)**

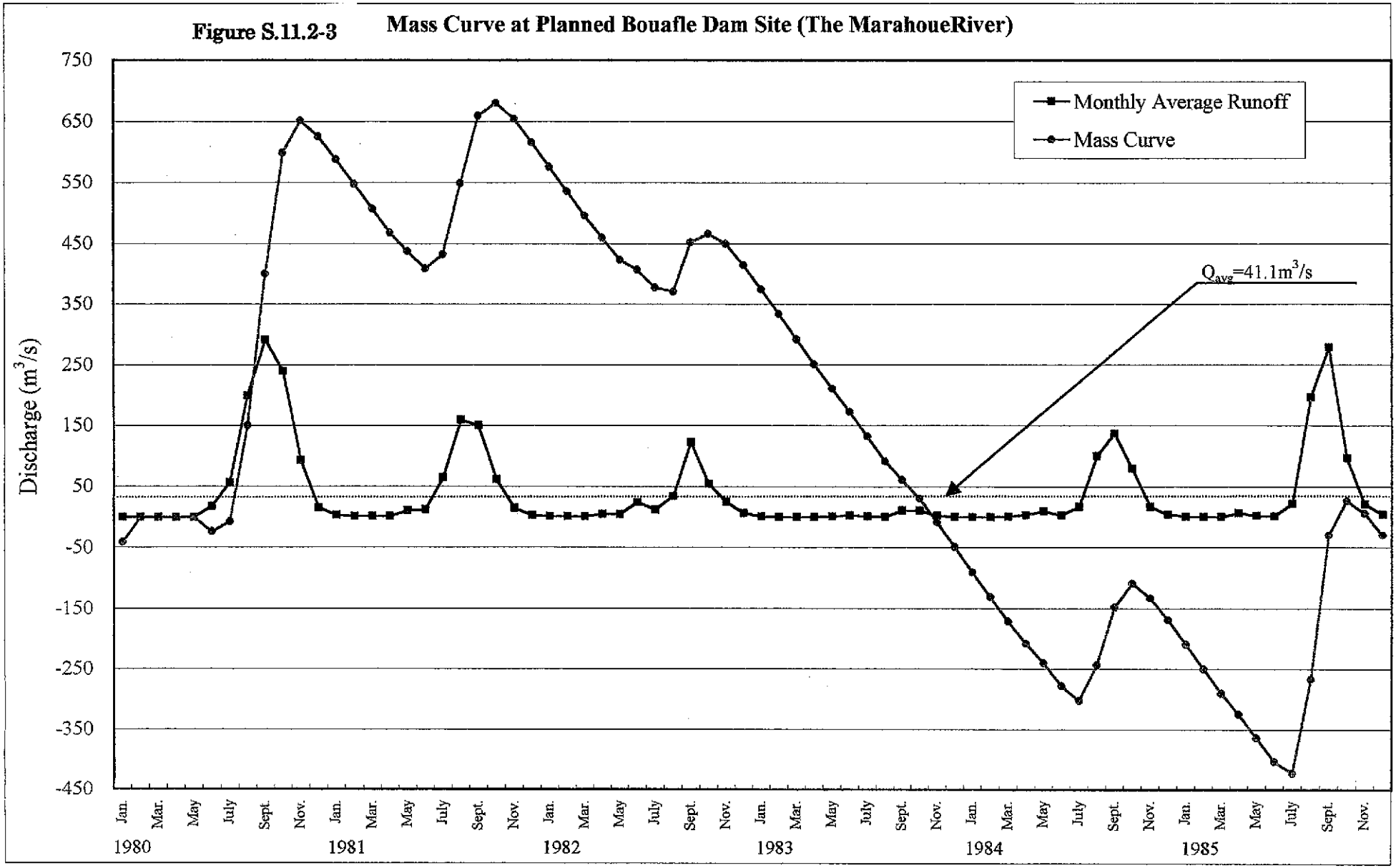


Figure S.11.2-4 Mass Curve at Planned Aboisso Dam Site (The Bia River)

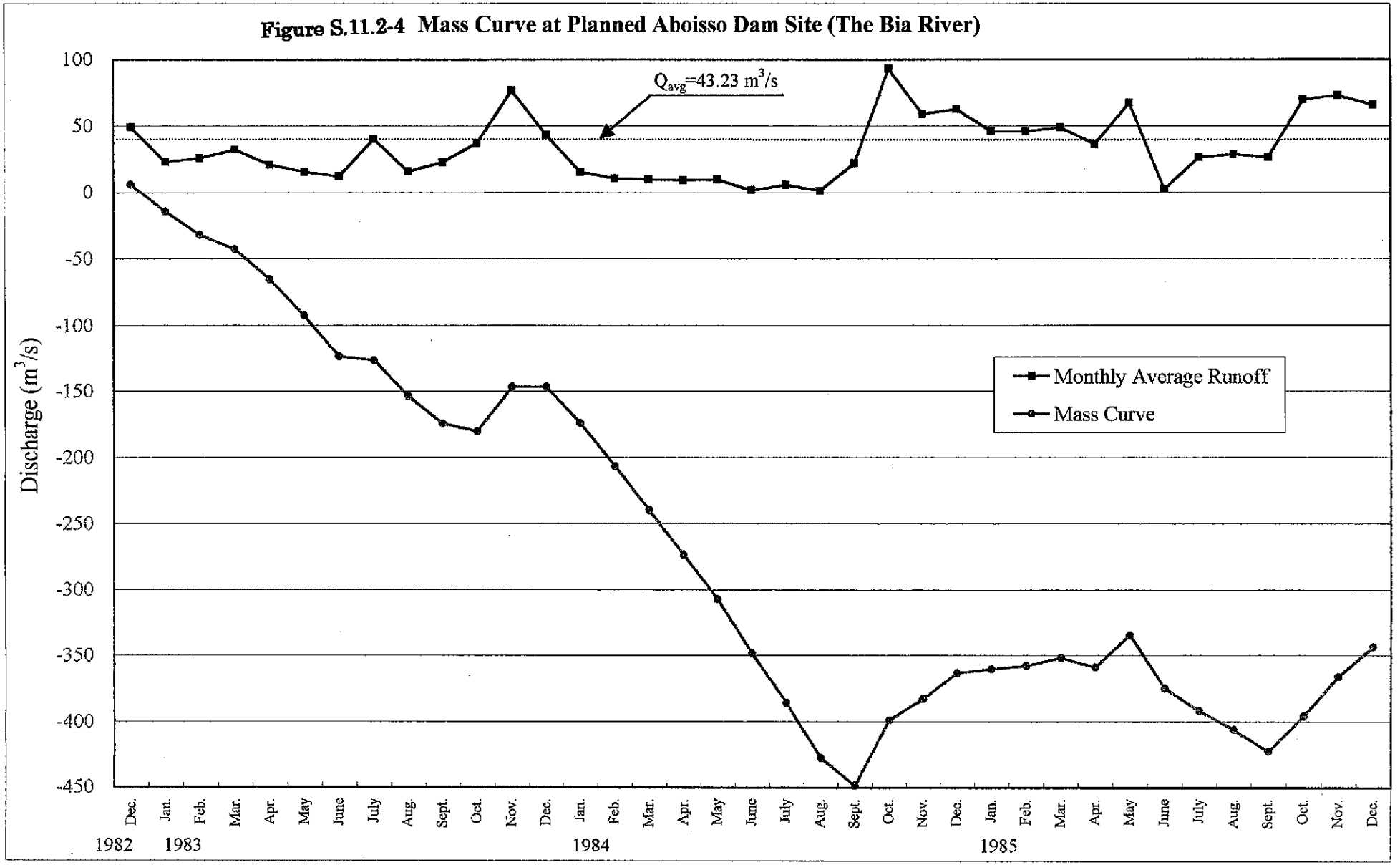


Figure S.11.2-5(1) Mass Curve at Planned Louga Dam Site (The Sassandra River)

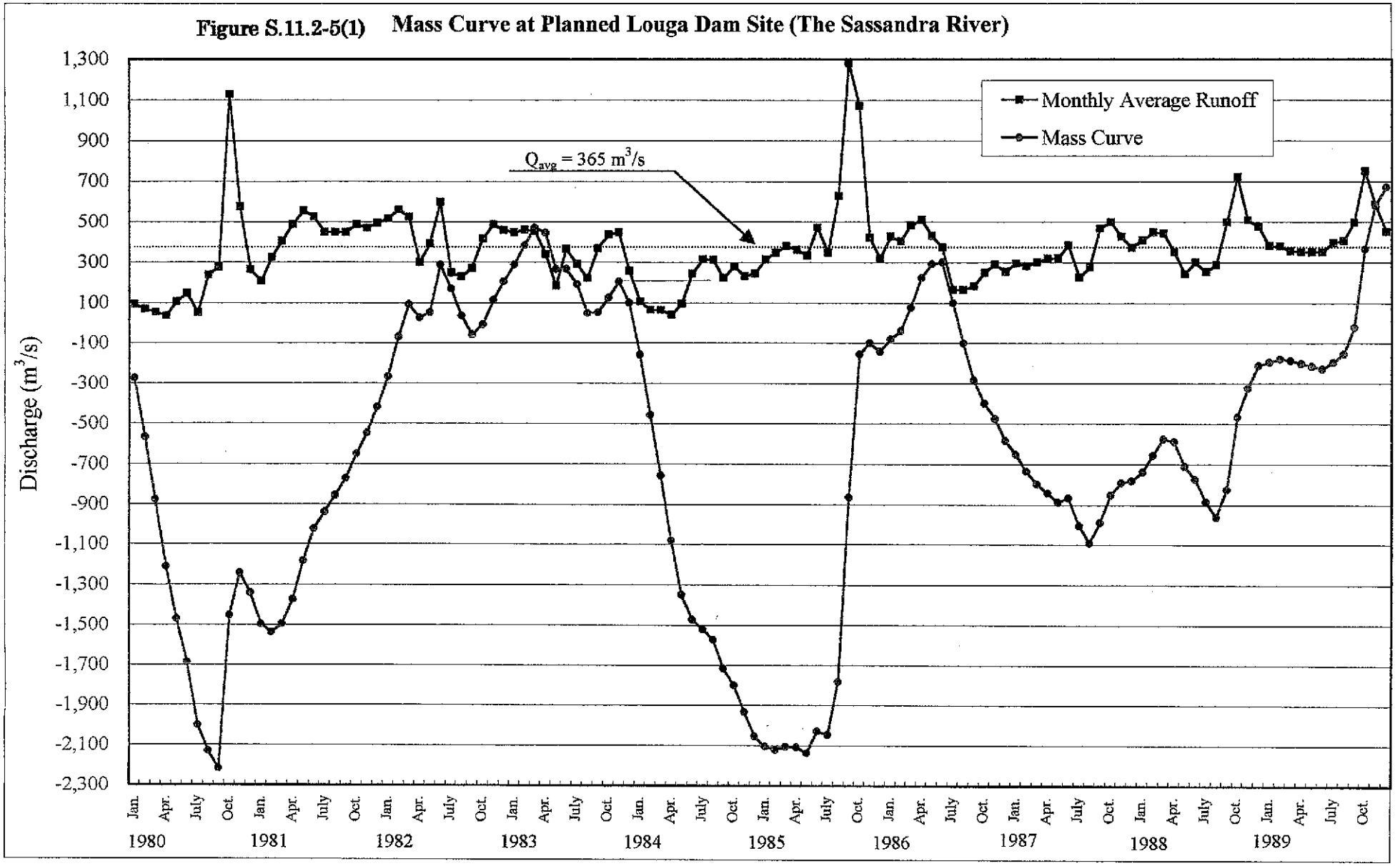


Figure S.11.2-5(2) Mass Curve at Planned Louga Dam Site in 1984 (The Sassandra River)

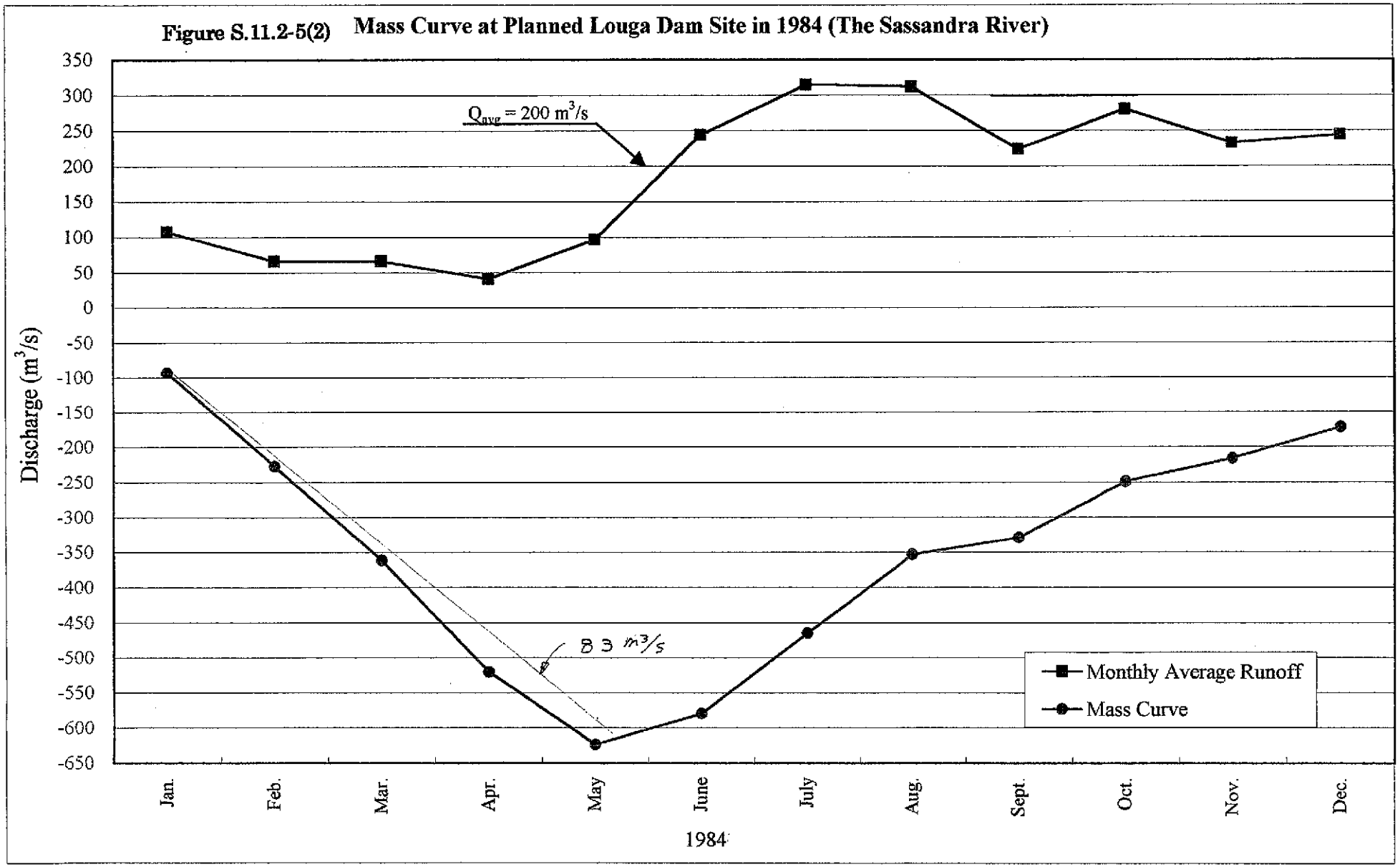
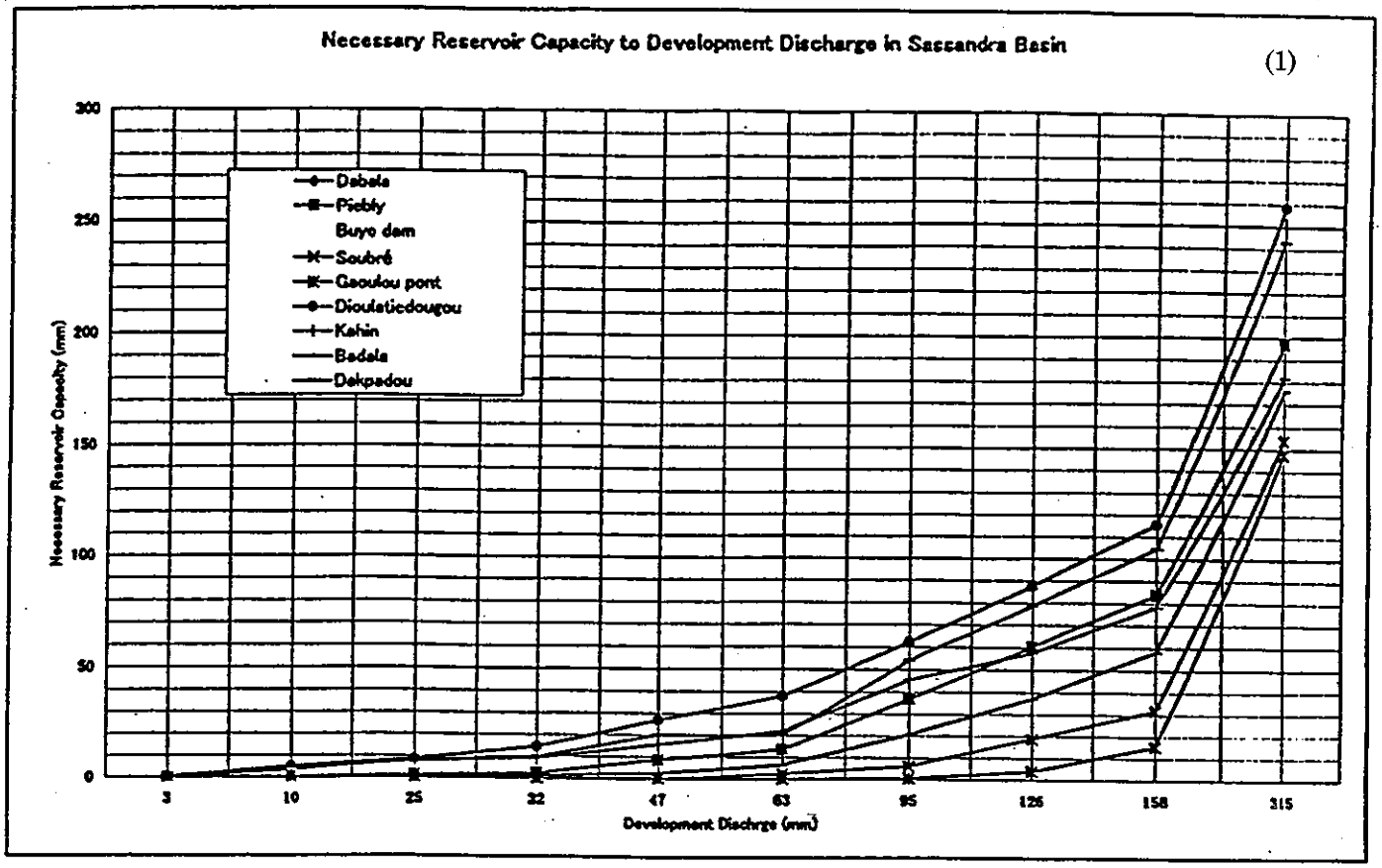


Figure S.11.2-6



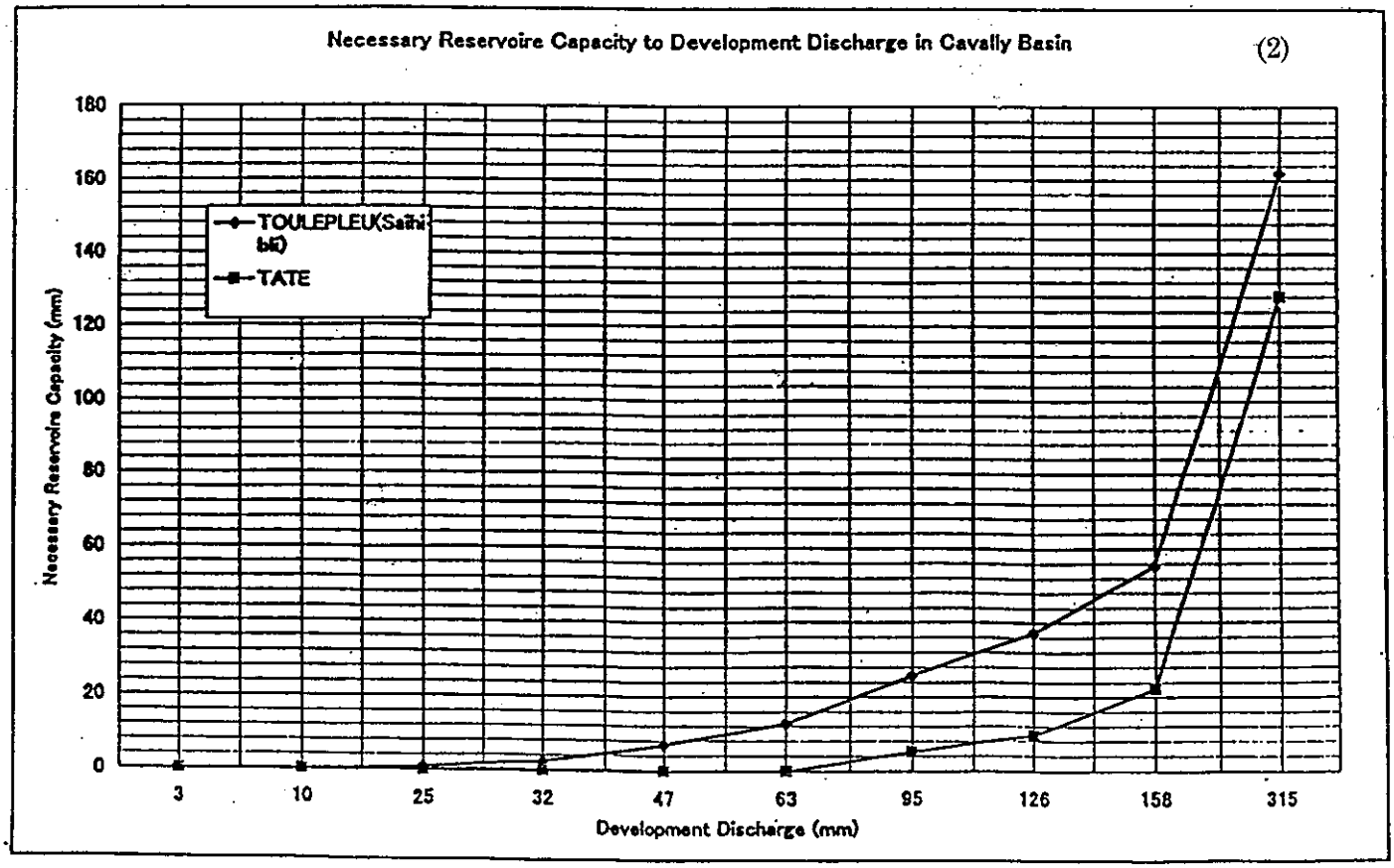
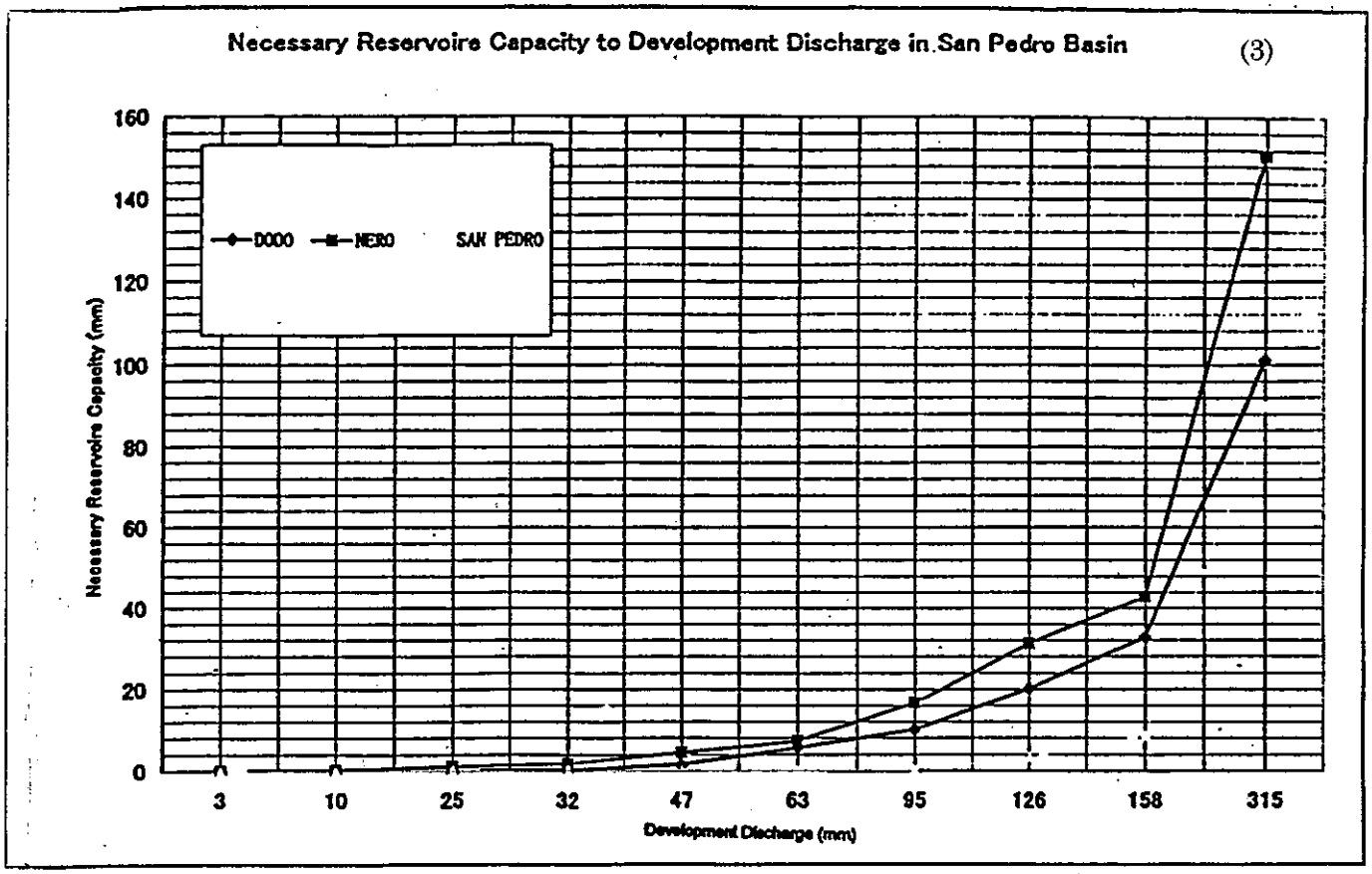


Figure S.11.2-6



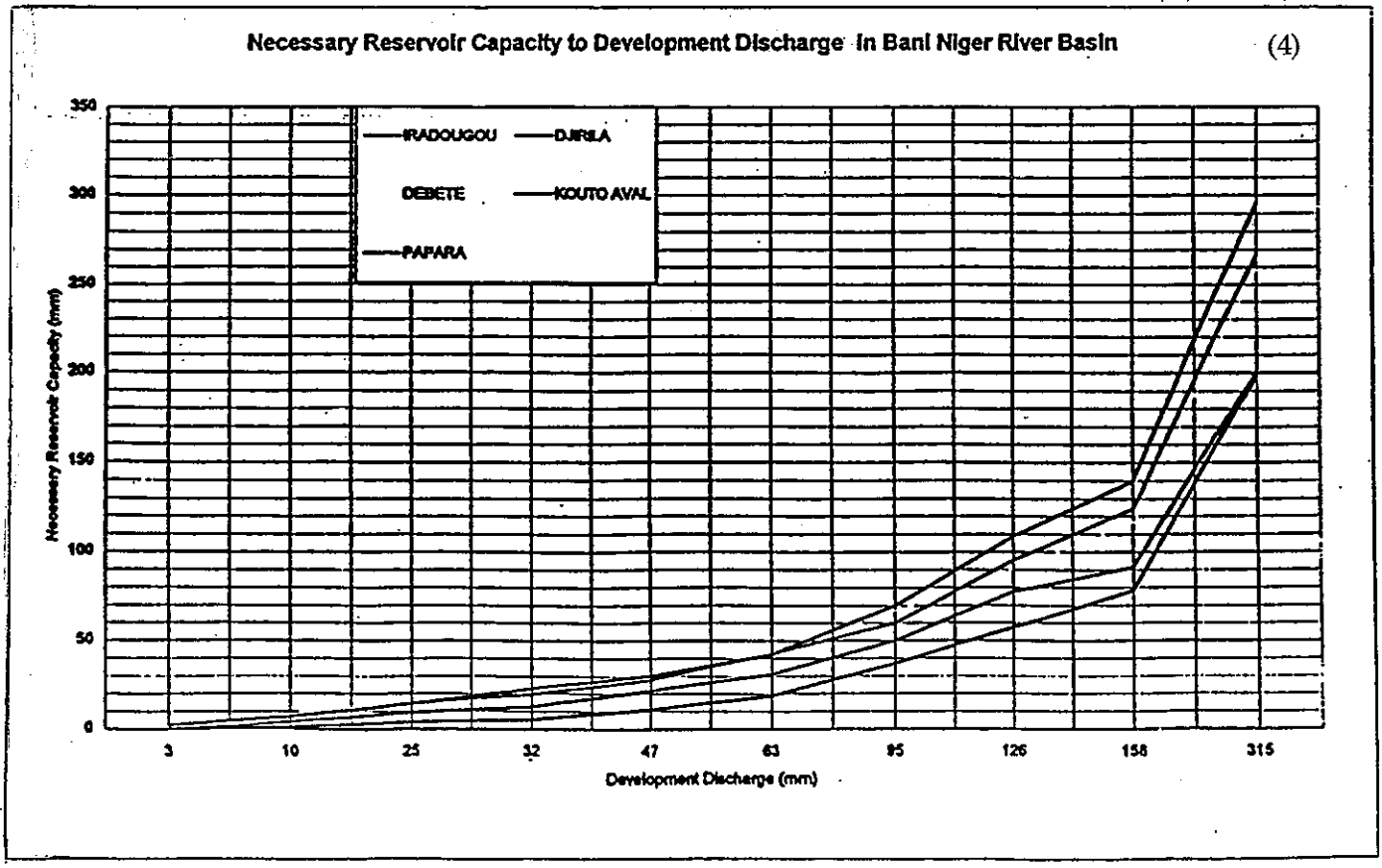
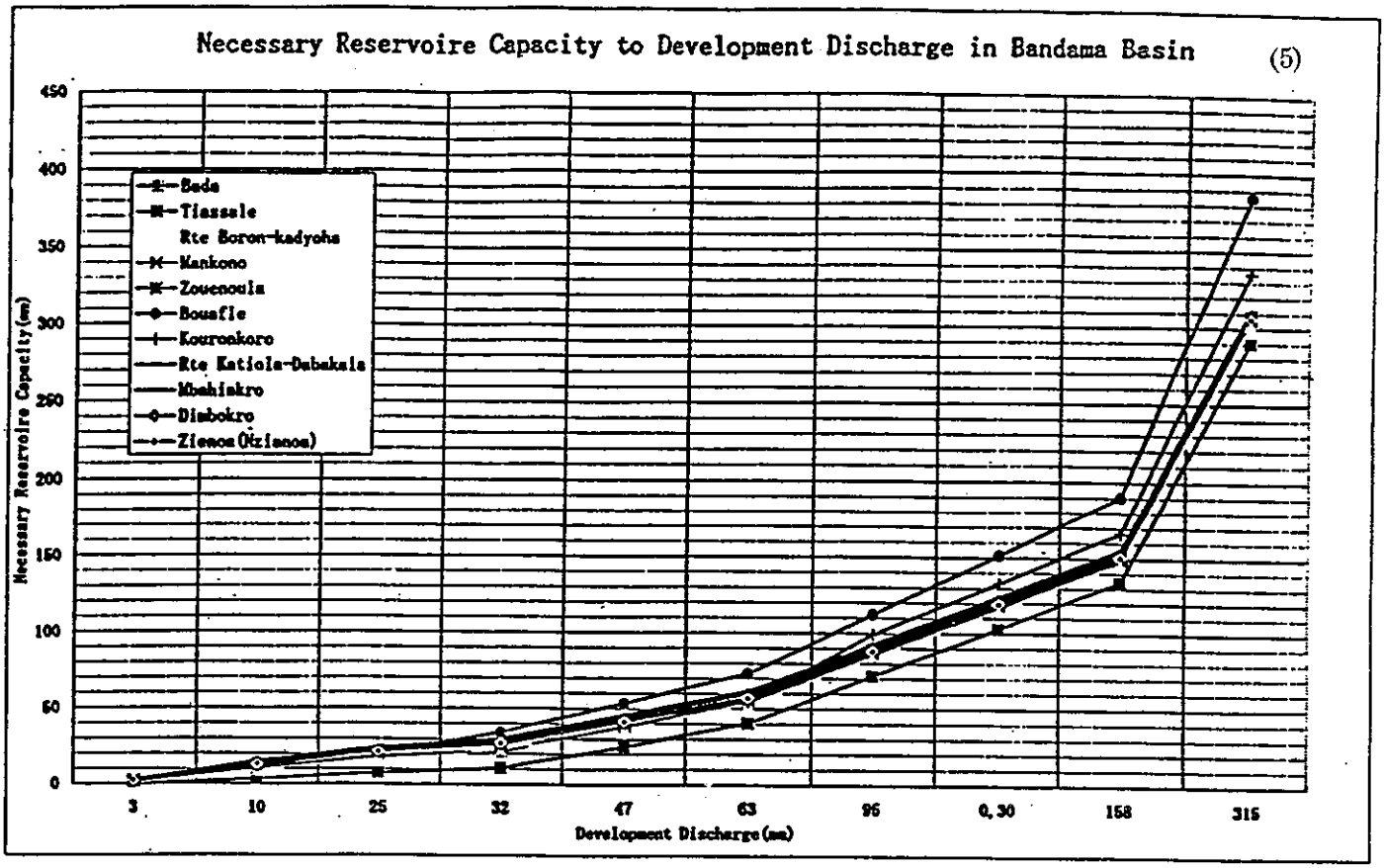


Figure S.11.2-6



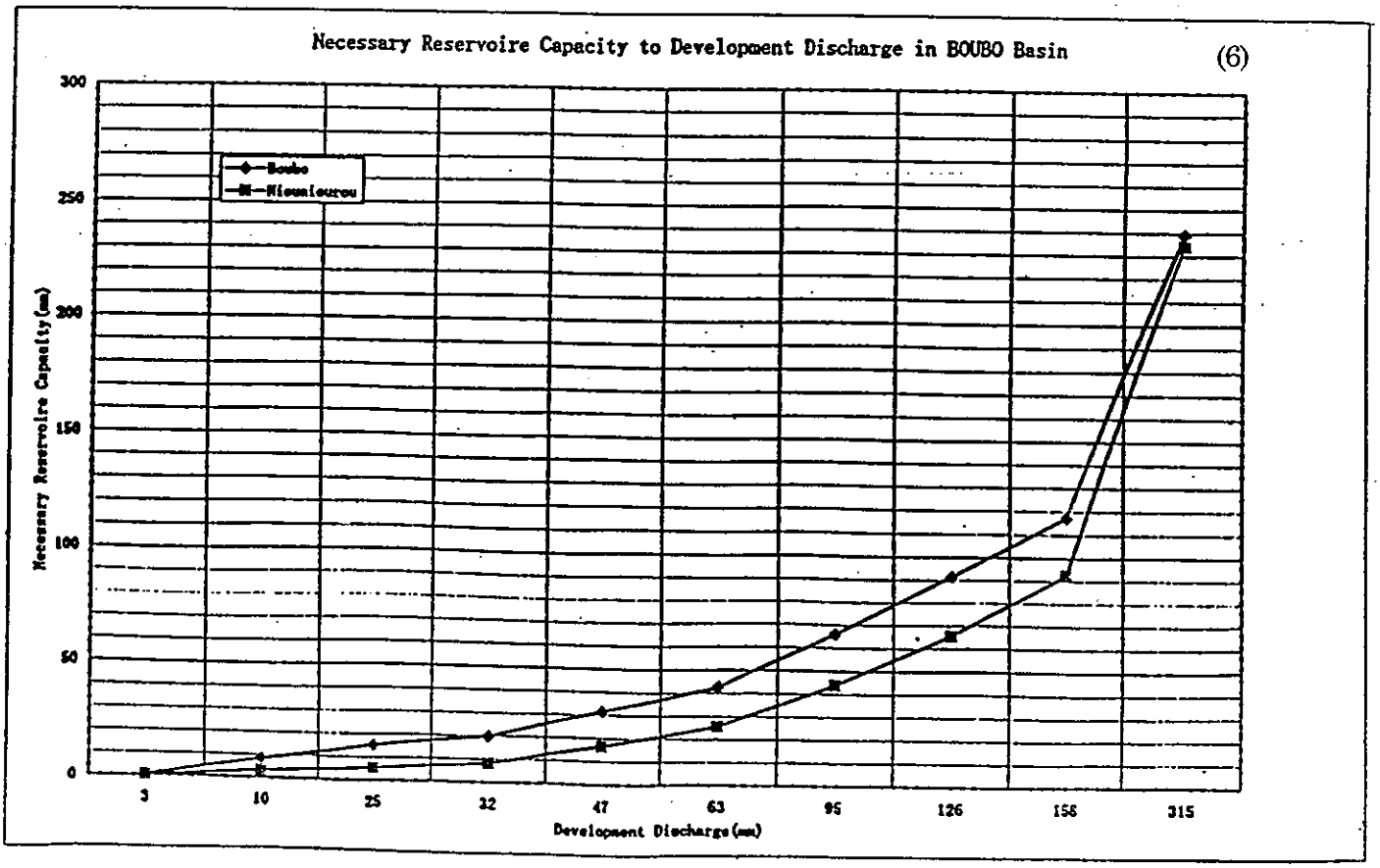
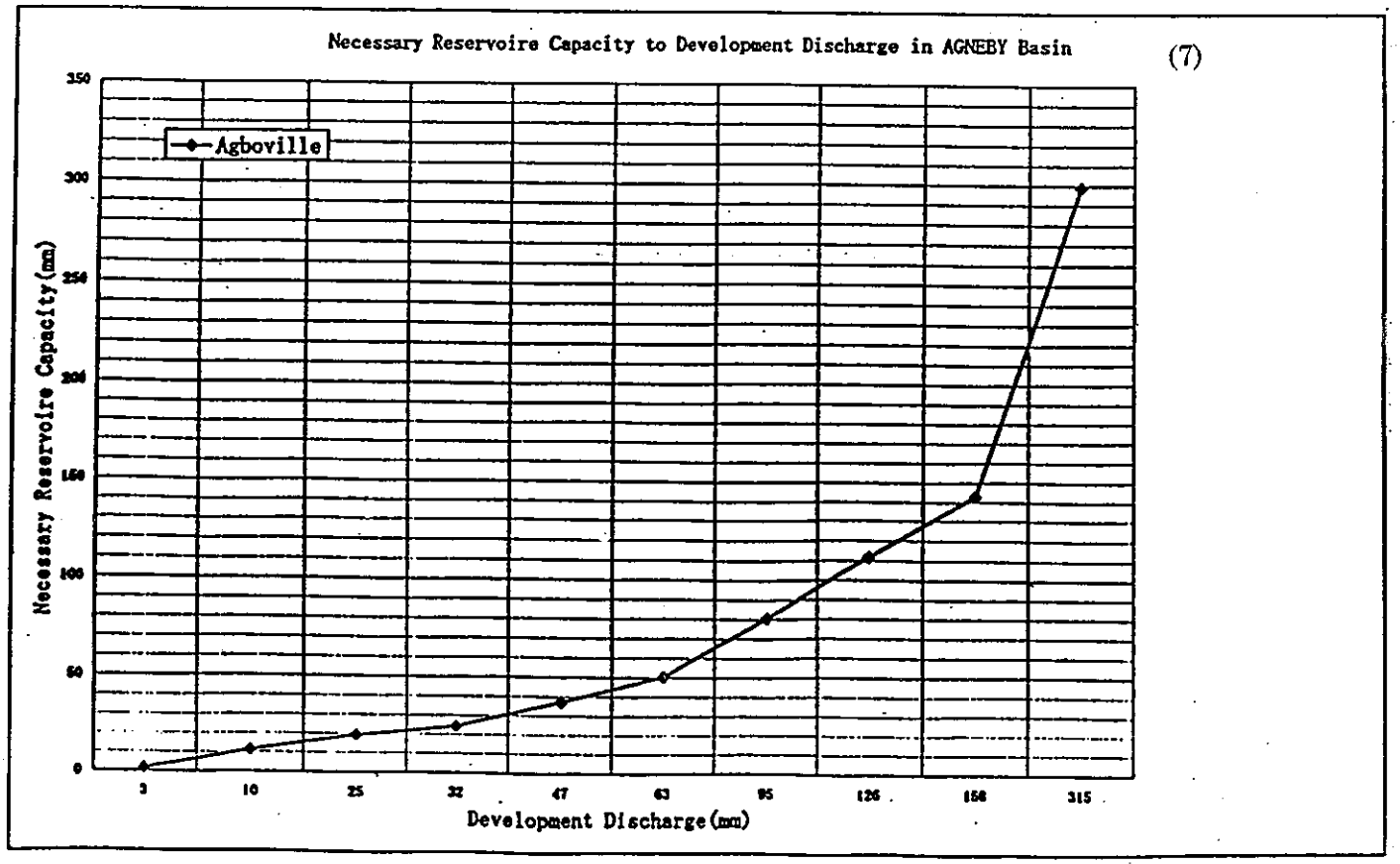


Figure S.11.2-6



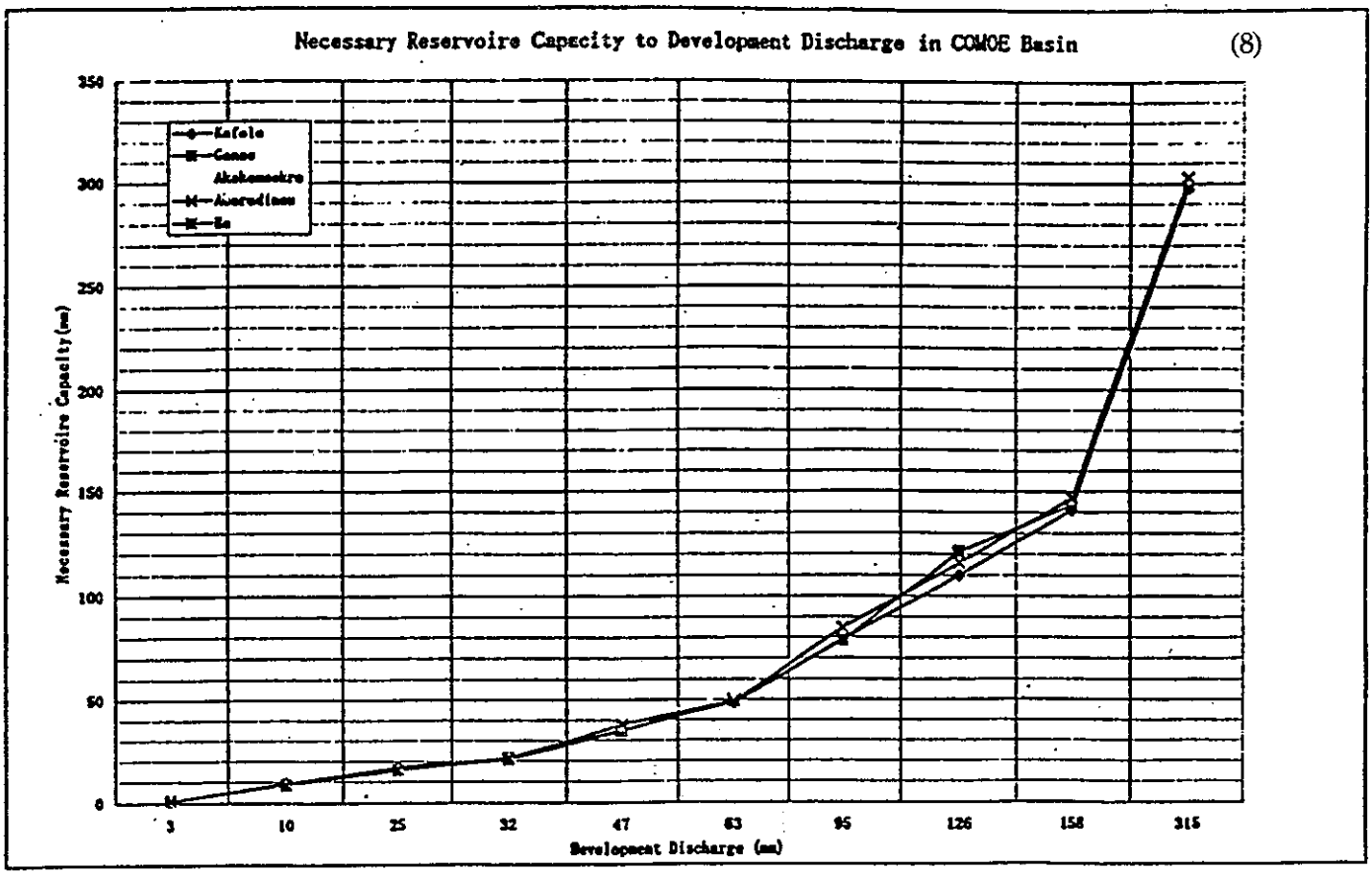
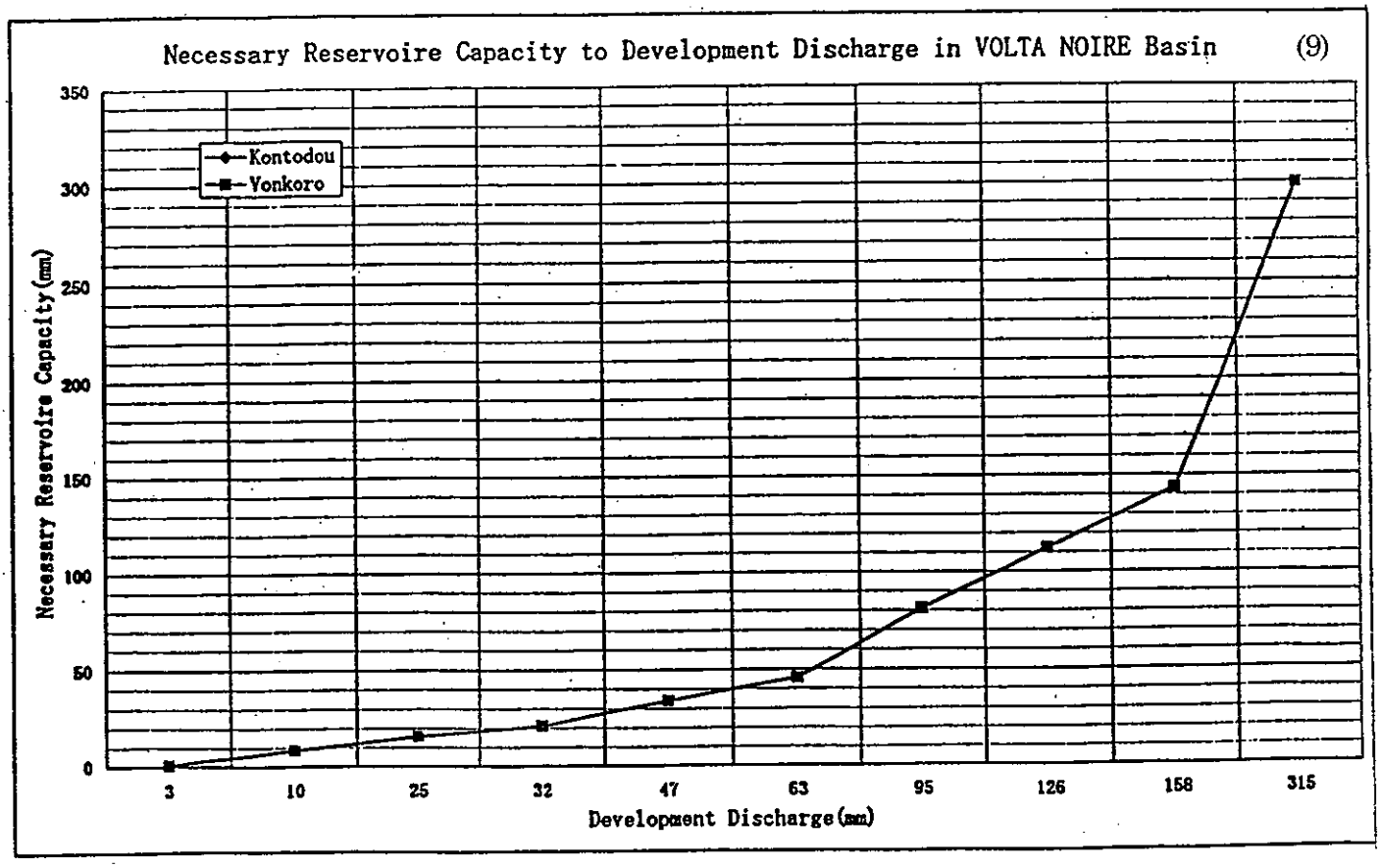


Figure S.11.2-6



CHAPTER 3 SELECTION CRITERIA FOR WATER RESOURCES DEVELOPMENT PROJECT

The selection criteria for the priority projects will be set up as follows;

3.1 Common Criteria

① No serious problem for the topographical and geological conditions at the proposed project site.

② Proper evaluation for potential water resources, water demand and water balance in the proposed project.

③ No serious impact to environmental conditions in the project area.

④ Project proofing the technical and economical feasibility as well as the necessity and viability.

⑤ Project with a large contribution to regional and national economy.

⑥ Project to be able to be implemented with people participation in the project area.

⑦ Project with sufficient consent by the public relation activity.

3.2 Sectoral Criteria

(1) Irrigated Agricultural Project

① Project with proper plan for land use and cropping pattern

② Project with irrigation requirement estimated accurately

③ Project with the high agricultural market for products

③ Project including the proper plan for O/M organization and farmer's irrigation association

(2) Domestic and Industrial Water Supply Project

① Project area with low rate of propagation for water supply and being suffered from water pollution

② Project with proper estimation for service population and unit water consumption

③ Project to be able to guarantee the water quantity and quality for the service population

④ Project setting up the operation and maintenance organization and manner for the water works

⑤ Project estimating and proposing water charge to be collected

(3) Hydropower Project

① Project site to be able to obtain the sufficient reservoir capacity to control the reservoir inflow; i.e. the sufficient storage rate (reservoir capacity/inflow) as possible as carrying over several years and the high head for power generation.

② Project to be able to produce the power energy with reasonable price as compared with the price of alternative power energy.

③ Project low cost per KW and kwh.

④ Project to be reasonable power demand and supply balance

CHAPTER 4 COST ESTIMATE

4.1 Cost Estimate for the Whole Projects

The cost estimate of the whole priority projects are shown in Table S.11.4-1.

4.2 Cost Estimate for the Major Three Projects

The cost estimate for the major three projects are as shown in Table S.11.4-2/3/4.

CHAPTER 5 BENEFIT FOR THE MAJOR THREE PROJECTS

The benefit for the major three projects are as shown in Table S.11.5-1.

Table S.11.4-1 **Cost Estimate for the Whole Priority Projects** Unit: Million FCFA

Projects Name	Foreign cost	Local cost	Total cost	Remark
River Management				
① Criteria and Manual on River Works	2,560	140	2,700	Three parts Survey / Planning / Design
② Manual on Water Right Establishment	1,710	90	1,800	
③ Hydro-Meteorological Network Arrangement and Establishmer	5,220	1,300	6,520	
③ Preparation of the River Ledger	1,050	410	1,460	
Grant Aid Projects				
① Agneby River Integrated Development Project	8,510	320	8,830	Flood control/ Abidjan water With Agboville multipurpose dam
② Dounou River Integrated Development Project	3,330	170	3,500	Q=0.7m^3/s For irrigation and Small hydro=34KW
③ Integrated Rural Development in the San Pedro	6,440	330	6,770	L=31 km canal For paddy rice 575 ha
④ Karougou-Womo Dam for Irrigation	1,970	105	2,075	
⑤ Expantion Irrigation Project at Tiassale	3,800	200	4,000	
⑥ Aboiso Hydropower Development Project	11,400	600	12,000	
Development Projects				
① Marahoue River Integrated Development Project	50,990	310	51,300	Hydropwer/ Bouafle water/ Irrigation For Kossou dam recovery plan
② Comoe River Integrated Development Project	268,600	10,500	279,100	Hydropower/ Abidjan water/ Irrigation With Ndelisse multipurpose dam
③ Middle Valley on NZI River	57,910	3,050	60,960	For paddy 4,638 ha
④ Development Rice Irrigation in the Centre/ centre Nord	31,900	1,656	33,556	For paddy rice 2,151 ha
⑤ Marabadiassa, Katiolla Sugarecane Project	44,460	2,340	46,800	Rihabilitation 3,000 ha
⑥ Serebou, M'buhiakro Sugercane Project	74,100	3,900	78,000	Rihabilitation 5,000 ha
⑦ Man Domestic Water Supply				Storage facility only
⑧ Bouake Domestic Water Supply				Storage facility only
⑨ Abidajn Domestic Water Supply Intake and Waterway Facilities	67,970	4,040	72,010	Urgent matter for Abidjan water
⑩ Soubre Hydropower Development Project	74,100	3,900	78,000	P=27 MW / 218 GWH
⑪ Louga Hydropower Development Project	100,890	5,310	106,200	P=30 MW / 239 GWH

Table S.11.4-2 Cost Estimate of Comoe River Integrated Development Project

Item		Unit	Quantity	Unit Price Yen	Amount (10^3Yen)	Remark
Dam	(Main Dam)	m^3	10,300,000	2,000	20,600,000	Fill type dams
	(Re-Regulating Dam	m3	600,000	3,000	1,800	
	(Grouting)	number	1,500	※ 1,405,80	1,330	※ 142m*90$*110yen
Intake	(Q=333 m^3/s)	set	1		1,060	
Penstock	(Q=333 m^3/s)	set	1		1,018	
Spillway		set	1		1,000	
Power station		set	1		9,300	
Sub-Total					35,048,000	
Expense (Above total×33%)						
Miscecelenous Work(5%)					1,752,000	
Contigency(10%)					3,504,000	
Engineering Fee(13%)					4,464,000	Including D/D
Administration Fee(5%)					1,752,000	
Total					46,520,000	≒279,100 MFCFA
Foreign Currency					44,768,000	≒268,600 M.FCFA(96%
Domestic Currency					1,752,000	≒10,500 M.FCFA(4%)

Table S.11.4-3 Cost Estimate of Agneby River Integrated Development Project

Item		Unit	Quantity	Unit Pric Yen	Amount (10^3Yen)	Remark
Dam	(Main Dam)	m^3	260,000	3,000	780,000	H×L=20m×250m
	(Base treatment; =Curtain grouting)	set	1		80,000	C.A.=4,600km^2 Reserver Capacity=30 MCM Including spillway
Intake	(Q=1.5 m^3/s)	set	1		60,000	Irrigation=1,500 ha
Small Hydroelectric Power Station	(Pmax=160 KW)	set	1		130,000	Head=13.5m Qmax=1.5m Ann.Energy Prod.=1,340MWH
Sub-Total					1,050,000	
Expense (Above total×40%)						
Miscecelenous Work(5%)					53,000	
Contigency(10%)					105,000	
B/D & D/D & Tender (10%)					105,000	
Engineering Fee(10%)					105,000	
Administration Fee(5%)					53,000	
Total					1,471,000	≒8,830 MillionFCFA
Foreign Currency					1,418,000	≒8,510 MillionFCFA(96
Domestic Currency					53,000	≒320 MillionFCFA(4%)

Table S.11.4-4 Cost Estimate of Marahoue River Integrated Diversion Water development (Down-Stream P)

Item	Unit	Quantity	Unit Pri Yen	Amount (10^6Yen)	Remark
Dam (Main Dam)	m^3	2,300,000	2,000	4,600	H×L=25m×3,700m
(Base treatment; =Curtain grouting)	set	1		1,000	C.A.=18,000km^2 Reserver Capacity= 00 MCM
Spillway (Q=1,200 m^3/s)	set	1		300	
Waterway (Q=34 m^3/s)	m	1,500		0	Including spillway work
Small Hydroelectric Power Station (Pmax=470 KW)	set	1		200	Head=28.3.0m Qmax=9.0m^3/ Ann.Energy Prod.=5,500MWH
Sub-Total				6,100	
Expense (Above total×40%)	set			2,450	
Miscecelenous Work(5%)				310	
Contigency(10%)				610	
F/S & D/D & Tender (10%)				610	
Engineering Fee(10%)				610	
Administration Fee(5%)				310	
Total				8,550	≒51,300 MillionFCFA
Foreign Currency				8,240	≒49,440 Million FCF(96%)
Domestic Cuurency				310	≒1,860Million FCFA(4%)

9 WATER RESOURCES MANAGEMENT

9 WATER RESOURCES MANAGEMENT

Table of Contents

CHAPTER1 River Surface Water Deficiency in Dry Season

- Necessity of Reservoir-Dams-

It seems that annual potential of water resources in the country such as rainfall, surface water and groundwater relatively large in accordance with JICA evaluation result for their observation data and can cover sufficiently the existing and future water demands. However, rainfall and surface water in dry season are very scarce and as a result in the water deficient problem for the water uses in the dry season has been occurred and will be more serious. Scarce runoff conditions in the dry season for major rivers of the Sassandra, Bandama, Comoe, etc are shown in Table S.10.1-1.

Table S.10.1-1 Scarce Runoff Condition at Dry Season

River and Station	Catchment Area (km^2)	Runoff (MCM)			Runoff Yield (mm)		
		Wet	Dry	Total	Wet	Dry	Total
1. Sassandra River							
Dabala Sta.	16,600	3,296	311	3,607	199	19	218
Bafing Badala Sta.	5,930	1,573	234	1,807	265	40	305
Piebly Sta.	32,600	5,907	583	6,498	181	18	199
2. Bandama River							
Tawara Sta.	5,375	461	5	466	86	1	87
Tortiya Sta.	14,500	1,243	43	1,286	86	3	89
Bada Sta.	24,050	1,737	64	1,801	72	3	75
3. Marahoue Basin							
Mankono Sta.	6,700	581	9	590	87	1	88
Zuenoula Sta.	17,314	1,200	34	1,234	69	2	71
Bouafle Sta	19,800	1,440	55	1,495	73	3	76
4. N'zi River							
Dabakala Sta.	6,620	331	10	341	50	2	52
M'Bahiakro Sta.	15,700	789	31	820	50	2	52
Dimbokro Sta.	24,100	1,221	53	1,274	51	2	53
Ziamoa Sta.	35,000	1,438	79	1,517	41	2	43
5. Comoe River							
Dafolo Sta.	21,200	1,836	25	1,861	87	1	88
Ganse Sta.	43,700	3,201	54	3,255	73	1	74
Akakomoekro	57,000	2,523	85	2,608	44	2	46

As is clear in the above table, the dry season runoff in all rivers is less than 10% of the annual runoff and is very small. The dry season runoff yield in the Bandama, Marahoue, N'zi and Comoe river is extremely small as shown in 1 to 3mm, which could not support any domestic and irrigation water demand at all. It is essentially necessary accordingly to provide the reservoir dams to store the wet season runoff and use it in the dry season to eliminate the water deficit in the dry season. A number of reservoir dams will be required at the Savanna area being located at the north region, where many rivers have no runoff in the dry season, but a number of irrigation projects are proposed.

CHAPTER2 Watershed Management

2.1 Necessity of Watershed Management

The watershed management shall be implemented to preserve the watershed sustainability and to maintain or increase the fostering capacity of water resources in the river basin.

Rainfall is the sole source of the water resources and it is impossible to manage the rainfall by the might of man-kind, although it can be observed and evaluated. The quantity and quality of the water resources are largely changed depending on not only rainfall intensity and duration but also the water shed conditions.

Although the western mountain areas at the middle and lower basins of the Cavally and Sassandra river are presenting a high annual rainfall of 1,600 to 2,000mm and covered with dense forest area which could foster sufficiently rain water with high intensity, the other river basins are mostly formed with the flat plateau and farm areas being covered with less vegetation and water consumption in rainfed farm area. A part of forest and farm lands has been devastated by slush-burn farming, tree cutting, soil erosion and land sliding and can't foster the water resources.

The watershed management accordingly shall be carried out so as to be able to mitigate the rainfall with high intensity in the wet season and improve the poor runoff yield in the dry season.

2.2. Land Use Management

Land use at small sub-basins shall be studied applying the Satellite Image analysis method in order to evaluate the topographical and vegetation conditions in the watershed. Forest area is classified into dense forest, thin forest, Savanna, devastated area, etc, farm area into tree crops, paddy, field crops, grass land, etc and other area into wetland, bear land, lake and swamp, urban and village, etc. All areas of the above categories of land use shall be measured by the Satellite Image analysis. In accordance with the above land use study, the fostering capacity of the watershed in the small sub-basins could be evaluated.

The result of land use analysis is to be registered in GIS, which will be reviewed at about 5 years interval to evaluate the land use variation if possible. The following watershed management could be made by analyzes of the land use.

- Monitor, evaluation and control the slush-burn cultivation area and tree cutting area in the forestry area.

- Monitor and evaluation of the existing reserved forest and national park areas.

・Monitor, evaluation and control the expanding farm land consisting of actual cultivation area, fallow area, village area, etc.

・Identification of devastated land and land erosion.

・Identification of increasing reservoir area and decreasing water area in rivers by water resources development.

・Identification of increasing area for town, city, industry, etc.

2.3 Preservation Program for Watershed Management

In accordance with JICA study result, the following watershed management program shall be set up and implemented:

・Reinforcement for management manner for the existing reserved forest and national park

・Acceleration of reforestation program at devastated forest area and land consolidation program for wasted farm and grasslands.

・Control of production forest taking into account the replanting plan of trees.

・Provision of the fire fighting activities for forest fire.

CHAPTER3 Irrigation Water Management

3.1 Agricultural Land and Major Crops

Total agricultural farmland is estimated at about 7,248,430 ha in 1995 and at 11,540,200 ha in target year 2015 which is average growth rate per year of 2.34% and about 1.6 times of 1995 year as Table S.10.3-1.

Table S.10.3-1 Cropped Area and Production in 1995 and Target Year 2015

Crops	Year 1995			Growth	Year 2015		
	Cropped Area (ha)	Production (t)	Ratio of Area (%)	Ratio of Area (%/year)	Cropped Area (ha)	Production (t)	Ratio of Area (%)
Food Crops							
Paddy	592,000	868,430	8.2%	4.3%	1,373,000	3,353,560	11.9%
Rained Paddy	570,000	7.9%	7.9%	4.1%	1,263,000	2,450,230	11.0%
Irrigated Paddy	22,000	0.3%	0.3%	8.4%	110,000	903,330	1.0%
Maize	669,100	552,040	9.2%	3.1%	1,227,800	1,013,000	10.7%
S.F.M.	136,400	90,980	1.9%	1.5%	182,900	122,000	1.6%
Yam	264,900	2,868,850	3.7%	1.4%	347,090	3,759,000	3.0%
Cassava	316,200	1,608,220	4.4%	2.8%	546,160	2,778,000	4.7%
Ground nut	136,200	143,040	1.9%	3.8%	287,550	302,000	2.5%
Plantain	1,203,000	1,335,320	16.6%	1.0%	1,454,960	1,615,000	12.6%
Banana							
Taro	376,900	352,050	5.2%	0	376,900	352,050	3.3%
Vegetables	27,000	540,000	0.4%	6.6%	96,830	1,937,000	0.8%
Total	3,721,700		51.3%	2.3%	5,893,190		
Perennial Crops							
Cocoa	1,723,400	915,670	23.8%	0	1,723,400	915,670	15.0%
Coffee	1,250,000	236,660	17.2%	3.0%	2,250,070	426,000	19.6%
Oil Palm	150,700	274,900	2.1%	0	150,700	274,900	1.3%
Coconut	53,140	23,020	0.7%	0	53,140	23,020	0.5%
Rubber	64,680	69,320	0.9%	9.9%	425,470	456,000	3.7%
Total	3,241,920		44.7%	1.8%	4,602,780		
Industrial Crops							
Sugarcane	21,310	140,410	0.3%	3.5%	42,350	279,040	0.4%
Cotton	242,400	233,320	3.3%	6.7%	880,000	847,000	7.6%
Sweet Banana	5,600	232,000	0.1%	2.8%	9,650	400,000	0.1%
Pineapple	15,500	210,020	0.2%	8.3%	76,230	1,033,000	0.7%
Total	284,810		3.9%	6.5%	1,008,230		8.8%
Grand Total	7,248,430		100.0%	2.34%	11,504,200	≒ 1.6times-increasing	100.0%

(Source) Statistic Agricole, MINAGRA 1982-1995, and FAO Yearbook 1998 (Vol.52)

- Yield of irrigation paddy rice = 4.78t/ha*1.72(crop cycle)=8.212 t/ha(4.78t/ha: PNR 2005 Target yield see Table 2.2-12)
- Rice price = 250 FCFA/kg

3.2 Agricultural Population and Farming Size

Agricultural population is estimated at 7,004,000 and agricultural households are 1,132,000 in 1998. Total farmland in the country is 7,248,430ha as of 1995, so that average farming size of one agricultural household is estimated at about 6.4 ha.

3.3 Per capita Consumption and Staple Food

Staple food of Côte d'Ivoire depends on cereal and starchy crops. The per capita staple food consumption is composed of 109kg of cereals and 240kg of starchy crops. Rice is main crop of cereals, and yam and cassava are main starchy crops. Import meat and fish share 88% and 67% of consumption respectively.

3.4 Irrigation Area in 1995

Table S.10.3-2 Estimations of Irrigated Area in Côte d'Ivoire in 1995

Irrigated Crops	Irrigated Area (ha)	Area Composition (%)	Remarks
Paddy Rice	22,000	42.0%	Crop intensity = 125%
Sugarcane	21,310	40.6%	
Banana	5,600	10.7%	
Pineapple	3,500	6.7%	22.6% of total pineapple area (15,500ha).
Total	52,410	100.0%	

(Note) estimated based on Irrigation Inventory Survey 1999 and PNR and DCGTx information

3.5 Irrigation Water Use Management

The water use management for irrigation is the most important one because the irrigation requires the large water use quantity as compared with the other water use and includes many kinds of water losses on the process of the water use. It is recommendable to carry out the proper irrigation water use management by the following manner.

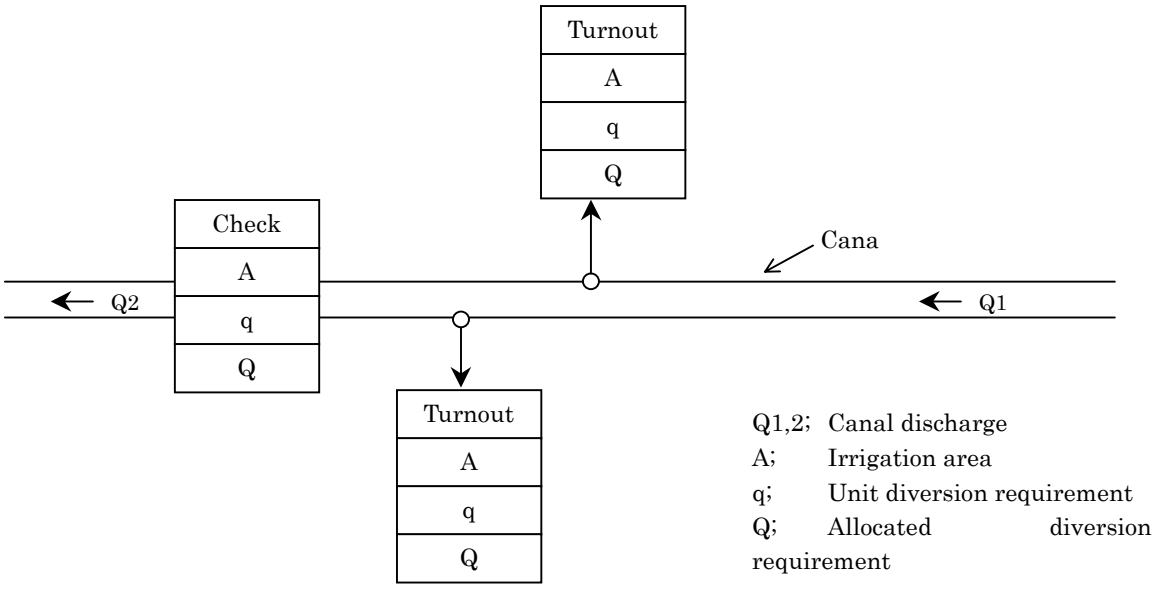
3.5.1 Water Diversion Management in Irrigation Canal

Irrigation water released from reservoirs and weirs is generally distributed and diverted by canals to farm area. If the proper management for the water distribution and diversion through canal system could not be carried out, the large water losses will take place during irrigation season. The following water diversion management shall be carefully implemented.

(1) Preparation of Canal Flow Diagram

The existing diversion discharge capacity at turnouts and checks in the canal is designed based on the irrigation water demand in the detailed design stage. However, this capacity is the maximum discharge one, during irrigation season and actual capacity at the water operation in the canal shall be changed by irrigation schedule on 10 day basis depending on the cultivation area, cropping pattern, unit irrigation requirement, irrigation method, canal losses.

Accordingly the operation and maintenance (O/M) office in the project management shall firstly prepare the flow diagram of the canal system as shown in the following figure. The diagram consists of main, secondary and tertiary canals and shows the position of turnouts and checks in the canal.



Notes (1) A is actual irrigation area which will be changed every irrigation season by the proposed area of irrigation association.
(2) q is unit irrigation requirement (ℓ/sec/ha) which is changed on 10 days basis and cropping pattern and estimated by O/M office
(3) Q is diversion discharge on 10 days basis at turnouts and estimated by A/q
(4) Q1 and Q2 is the canal discharge to be controlled by checks and estimated by accumulation of Q.

The O/M office shall prepare the computer program to estimate the diversion discharge correctly and quickly at the turnouts and checks based on the above flow diagram.

(2) Estimation of Diversion Discharge at O/M Office

The O/M office will estimate the diversion discharge on 10 days basis at one month before next irrigation season and indicate to the irrigation association by the following procedures and manners.

- Irrigation association shall be established at each turnout level which is generally consisting of 50 to 100 farmers and covering the irrigation area of 100 to 300ha.
- I.A submits firstly the proposed irrigation area including cropping pattern at least one month before the next irrigation season to the o/M office for his approval.
- O/M office estimates the diversion discharge at each turnout and check as well as the water use quantity in whole irrigation canal system during irrigation season, while O/M office checks the available water in the reservoir and rivers to be able to cover the water use quantity through the next irrigation season.
- If available water is not sufficient in the dry year or other reasons, the proposed area by I.A will be reduced based on the available water and indicated to I.A from O/M office. In case of sufficient available water, the proposed area by I.A is of course approved by O/M office.
- O/M office shall evaluate the unit diversion requirement (ℓ/sec/ha) at the end of irrigation season based on the monitoring result of diversion water during irrigation season such as water deficit or excess water at each turnout. The unit irrigation requirement for next irrigation season will be adjusted by the evaluation result.

(3) Water Diversion Practice at Canal

The water diversion operation in the canal shall be carried out maintaining the constant water level at the checks and regulators and adjusting the opening degree of the turnout gates in accordance with designed diversion discharge as mentioned in the above.

Gate keepers shall adjust firstly the check gate so as to release the design discharge to the downstream canal under the constant water level in front of the gate and then adjust turnout gates so as to divert the estimated diversion discharge to farm area.

In case the water level at the checks is fluctuated during water diversion operation, the diversion discharge at turnouts or releasing discharge to the downstream canal will not be coincided with the designed one, so that gate opening degree shall be readjusted.

3.5.2 Irrigation Water Management on Farm Level

Irrigation water management on farm level is carried out by farmers establishing irrigation

association and taking into account the following items;

- Irrigation association (I.A) shall select a representative who will arrange the farmer's request for the irrigation water use and discuss the O/M office.
- Proper on farm development consisting of farm diches for irrigation water, farm road and land leveling shall be constructed by I.A. under technical guidance of the O/M office.
- Rotation irrigation system to control the irrigation water at farm ditches shall be set up in I.A. (For example rotation with once to 10 days)
- In paddy irrigation the water supply during 24 hrs including night could be applied on the farm taking into account the farm plot size, water intake notch, water supply quantity (ℓ/sec) etc.
- In upland crop irrigation, the water supply during 24hrs is difficult because irrigation is carried out by border and furrow method. Accordingly the night reservoir and farm pond to store the water supplied in night shall be provided, otherwise the might water will be wasted to drainage canal without use.
- Mechanical irrigation such as sprinkler and drip irrigation will be applied for valuable crops such as orchard and industrial crops in order to minimize the irrigation losses and irrigation labour force.
- Irrigation losses on farm level is 40% for the gravity irrigation such as basin, furrow, border but 10 to 5% for the mechanical one.
- Although the irrigation interval of 10 days is mentioned in the above, the irrigation interval may be 6-7 days for paddy and 7-15 days for upland crops depending on type of crops soil conditions and depth of root zone.

CHAPTER4 Reservoir Water Use Management

The reservoir water management is very important because the effective water use shall be carried out so as to store a rich water resources in the wet season and to use it in the dry season presenting scarce water. Although a number of large, medium and small scale reservoir dams have been constructed and operated in the country, many existing reservoir dams except hydropower dams have been operated without the proper operation rule and not used the reservoir water effectively and properly.

4. 1 Evaluation of Reservoir Operation in the Existing Hydropower

The reservoir operation result for the existing hydropower dams is studied by JICA Team .

Reservoir operation for all dams is generally well carried out except the dry year of 1983. The characteristics of reservoir operation are shown in Figure S.10.4-1,S.10.4-2, and S.10.4.-3 summarized as follows;

4.1.1 Buyo and Ayame Reservoirs

As the Buyo and Ayame reservoirs have a rich surplus water to be stored in the wet season after using for power outflow, the reservoir is recovered rapidly with the sharp water level curve in the Figure S.10.4-1.

The Buyo operation is well made every year except the dryest year of 1983 and 1984, because the reservoir capacity is provided properly taking into account the reservoir inflow and power outflow. The Ayame operation has a slightly problem in July to September in wet season, because the reservoir capacity is too small to regulate a rich inflow and the operation is made by the run of river type. Accordingly the water level in June to September is fluctuated largely.

4.1.2 Kossou Reservoir

As the Kossou reservoir has not enough reservoir inflow, the reservoir is operated so as to store the all wet season inflow. Accordingly the water level at the end of wet season (November) is considerably fluctuated depending on the reservoir inflow volume, while the power outflow in the dry season also is fluctuated because of different storage volume at the wet season. The reservoir like the Kossou could not be managed even if any operation rule is set up.

4.1.3 Taabo Reservoir

The Taabo reservoir is operated mainly by the wet season inflow of the Marahoue, tributary of the Bandama, and the dry season outflow of the Kossou dam. The active reservoir capacity of Taabo is as small as 340 MCM which can't control the above runoff and outflow sufficiently. Accordingly the reservoir water level through the year is fluctuated.

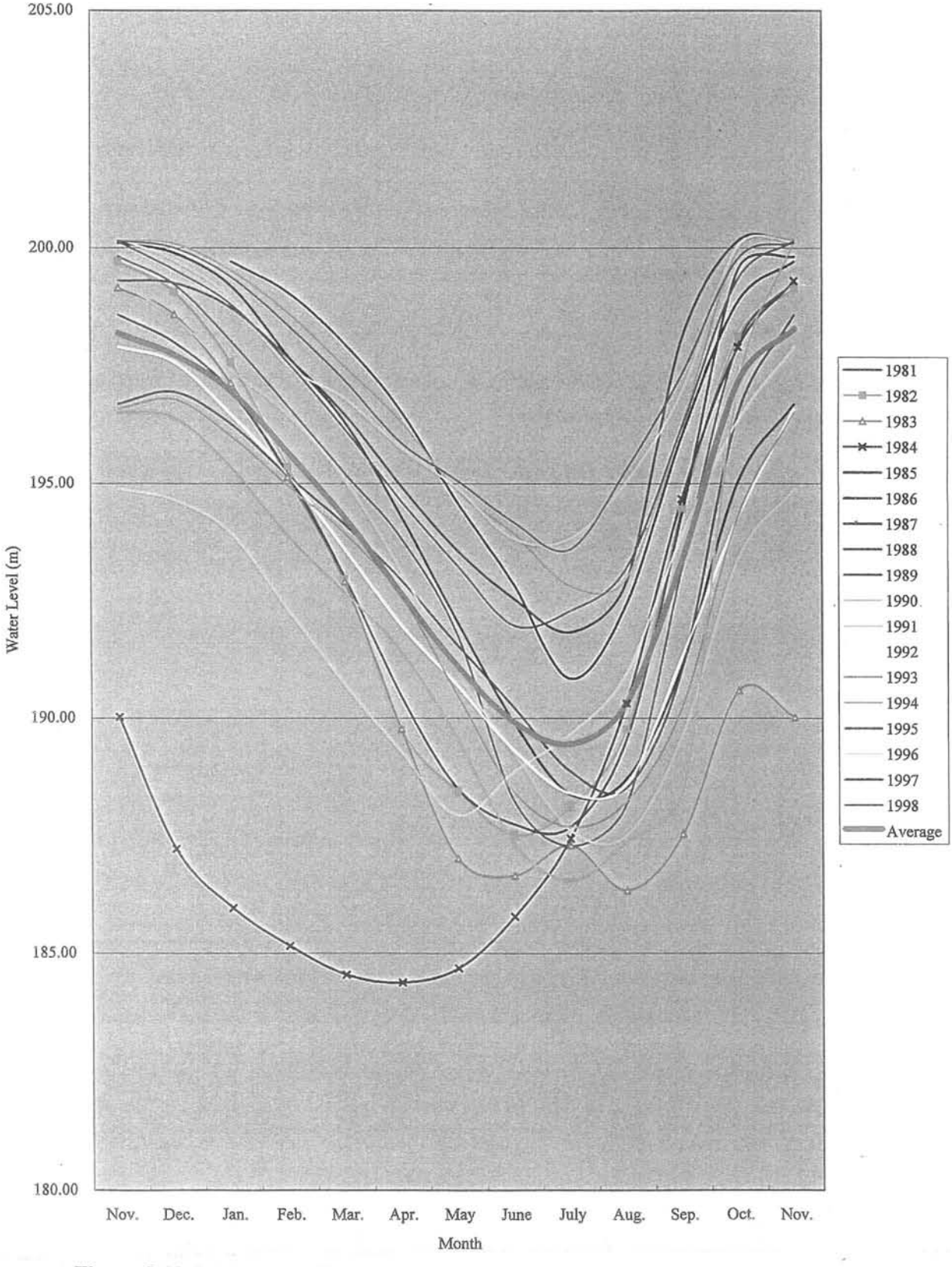


Figure S.10.4-1 Result of Buyo reservoir Operation (Water Level at the End of Month)

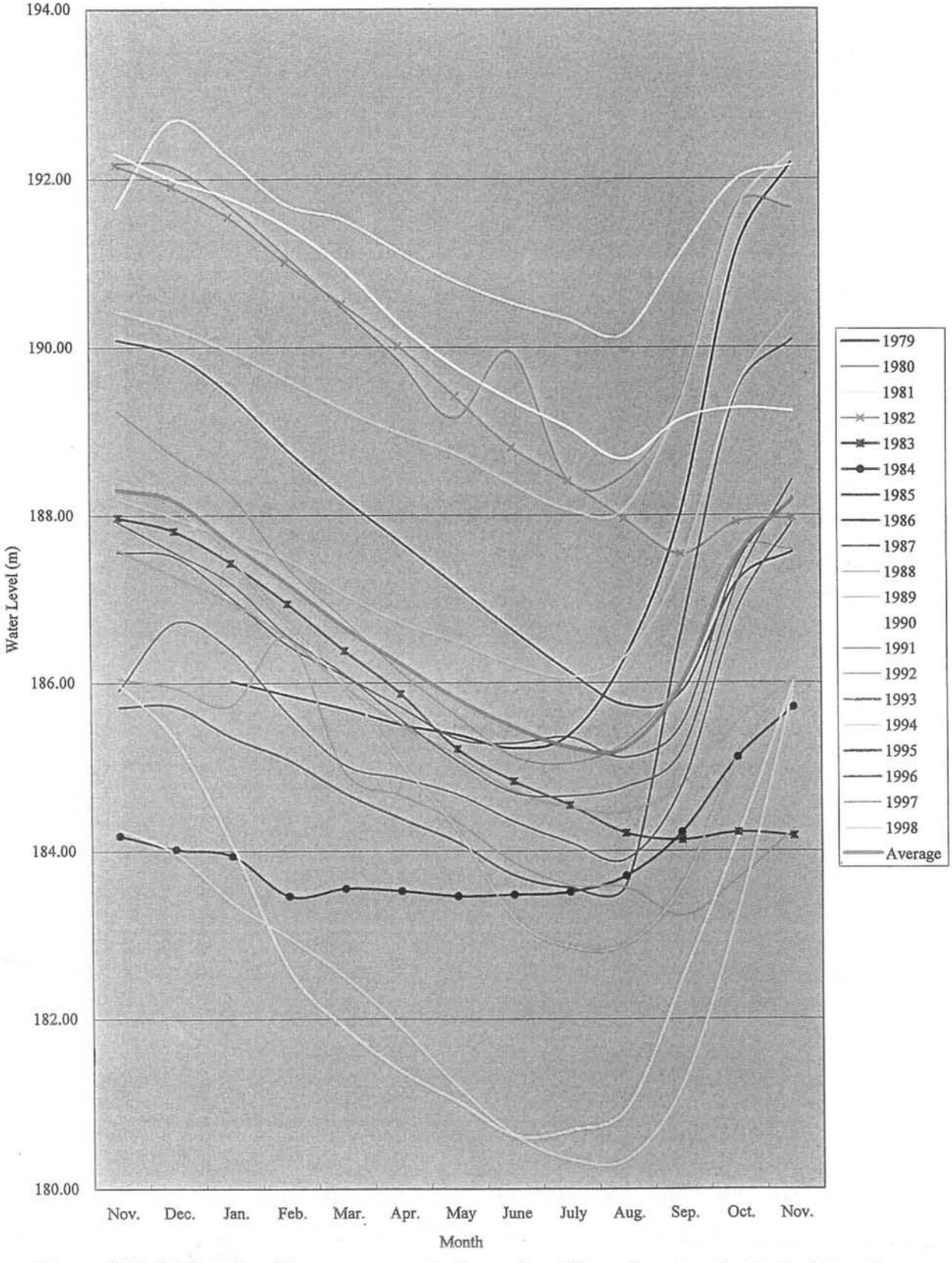


Figure S.10.4-2 Results of Ayame reservoir Operation (Water Level at the End of Month)

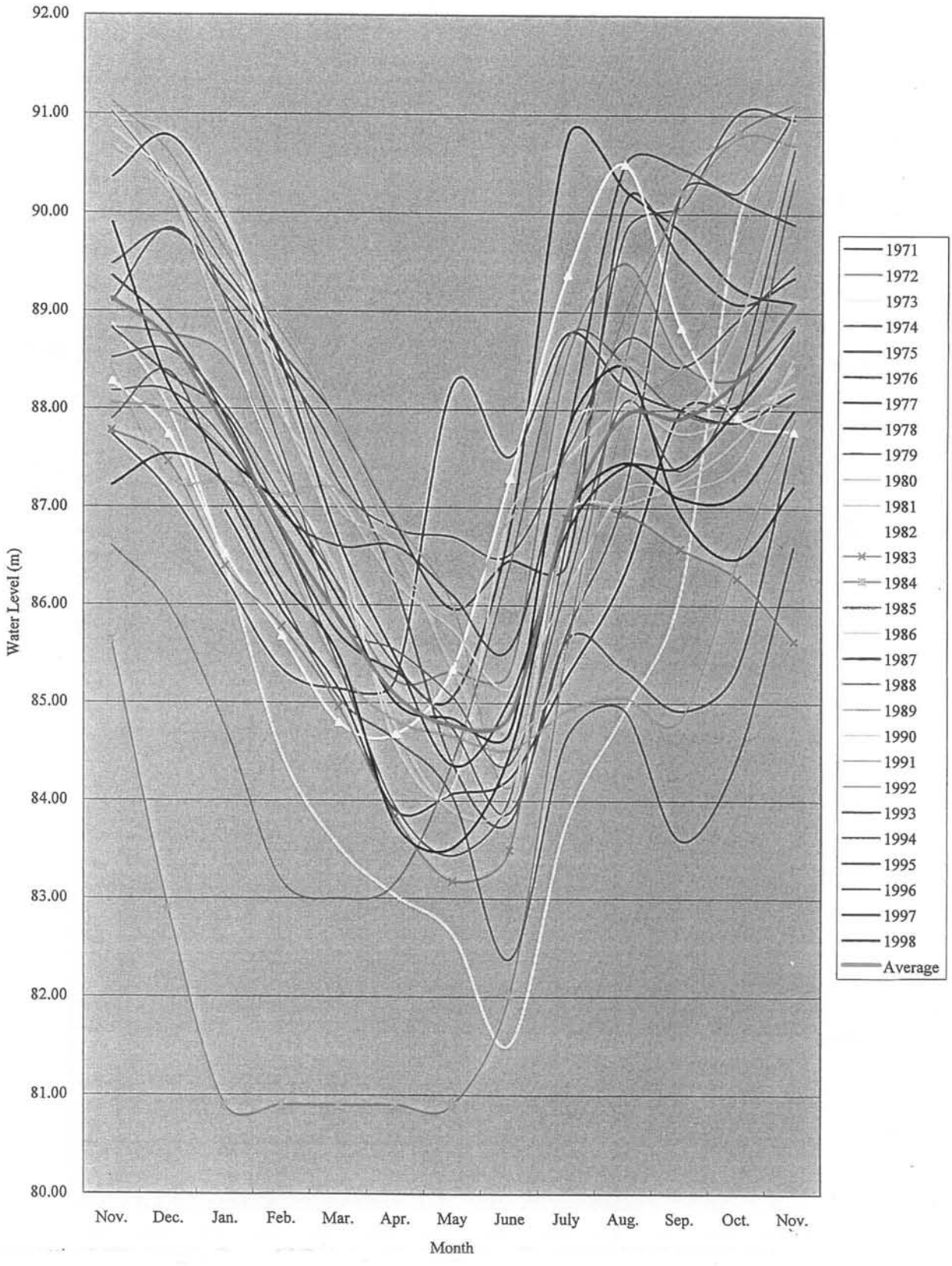


Figure S.10.4-3 Results of Kossou Reservoir Operation (Water Level at the End of Month)