Table 5.1-2 SEDIMENT DISCHARGE BY EACH SUB-BASIN

Sub-Basin Number	Name of Tributaries	Sediment Discharge (m3)	Flow Discharge (m3/s)	
			Mean	Max.
1.	Upper Chama	122,800	7.3	58.3
2.	Mucuruba, El Cardenillo, etc.	11,700	2.7	21.4
3.	La Mucuy	64,300	2.1	16.4
4.	Mucujun	5,900	4.1	32.4
5.	San Jacinto, Mucunutan, etc.	0	3.9	30.8
6.	Albarregas	0	2.6	20.8
7.	La Gavidia, etc.	58,500	2.0	15.7
8.	Upper Nuestra Senora	900,900	3.7	26.8
9.	Lower Nuestra Senora	427,000	3.4	29.7
10.	La Gonzalez	76,100	2.4	18.9
11.	La Sucia	0	1.3	10.1
12.	Arbolote,etc.	743,000	0.7	5.2
13.	La Vizcaina	315,900	1.5	12.0
14.	Maruchi, El Molino, El Anis	702,000	2.1	16.8
15.	La Joya, ets.	895,000	0.5	4.0
16.	San Pablo	1,456,700	6.8	42.7
17.	Sto. Domingo	76,100	1.9	11.8
18.	Upper Mocoties	0	6.1	38.0
19.	Lower Mocoties	0	4.4	27.3
20.	Mejias	0	3.0	18.9
21.	La Sucia, Mocacay	0	3.8	24.0

Table 5.1-3 SEDIMENT PRODUCTIVE SUB-BASINS

Sub-basin No.	Catchment Area (km2)	Denuded Area (km2)	Torrent Length* (m)	Gully		Remarks (Tributaries)
				Density (m/km2)	Mean Length (m)	
8.	303.8	4.1	1,335	7,000	400	Upper Nuestra Senora
9.	330.0	15.1	5,947	5,000	400	Lower Nuestra Senora
12.	58.8	16.0	5,000	2,500	300	Arbolote, etc.
13.	136.6	4.6	2,444	5,000	300	La Vizcaina
14.	191.5	72.5	32,384	2,500	300	Maruchi, El Molino, etc.
15.	45.4	16.9	3,961	2,500	350	La Joya, etc.
16.	270.7	17.8	13,072	4,000	350	San Pablo
Total	1,336.8	147.0	64,143	---	---	
Average	---	---	---	3,142**	325**	

Note * : Torrent length is calculated only for the denuded area.
** : The figures show the average weighed by the ratios of denuded area in each sub-basin to the total.

Table 5.1-4 DESIGN FEATURES OF CROSS SECTION BY ALTERNATIVE CASE

Unit: m

Stretch *	Riverbed Gradient	Case 1		Case 2		Case 3		
		Width	Depth	Width	Depth	Width (H.W.C.)	Width (L.W.C.)	Depth
I 0.0k-12.6k	1/1,400	1,400	1.6	600	2.7	290	210	4.7
II 12.6k-28.0k	1/880	1,400	1.4	600	2.3	240	160	4.6
III 28.0k-35.2k	1/625	1,400	1.3	600	2.1	230	150	4.5
IV 35.2k-45.6k	1/450	1,100	1.3	600	1.9	210	130	4.3
V 45.6k-48.0k	1/250	1,100	1.1	600	1.6	180	100	4.1
VI 48.0k-50.0k	1/185	1,100	1.0	600	1.5	170	90	4.0
VII 50.0k-53.4k	1/145	1,100	0.9	600	1.3	150	70	3.9

NOTE *: Measured along the design alignment.
H.W.C. = high water channel
L.W.C. = low water channel

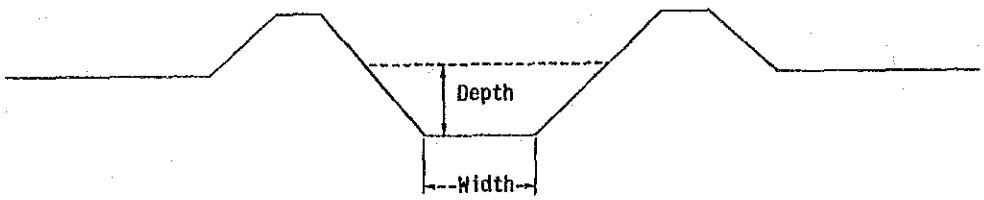


Table 5.1-5 COST COMPARISON FOR ALTERNATIVE CASES

Item	Unit of Quantity	Case 1		Case 2		Case 3	
		Quantity	Cost (Bs.million)	Quantity	Cost (Bs.million)	Quantity	Cost (Bs.million)
Land Acquisition	million m2	64.6	442	24.2	166	11.5	79
Embankment	million m3	2.55	741	4.17	871	4.63	901
Excavation	million m3	-	-	(1.08)	-	11.91 (16.83)	1,942
Revetment	1000 m3	13	19	213	305	150	215
Groin	1000 m3	70	69	164	162	65	64
Bridge	no.	1	494	1	183	1	90
Total			1,765		1,687		3,291

Table 5.1-6 COST COMPARISON BETWEEN RIVER CHANNEL IMPROVEMENT PLAN AND DIVERSION CHANNEL PLAN

Item	Unit of Quantity	Channel Improvement Plan		Diversion Channel Plan	
		Quantity	Cost (million Bs.)	Quantity	Cost (million Bs.)
Land Acquisition	million m2	24.2	166	30.4	146
Embankment	million m3	4.17	871	4.17	871
Excavation	million m3	(1.08)*		1.58 ** (5.75)*	264
Rivetment	1000 m3	213	305	213	305
Groin	1000 m3	164	162	164	162
Bridge	no.	1	183	1	183
Total			1,687		1,931

NOTE * : To be used for embankment.
**: Volume for spoil. (= Excavation Volume - Embankment Volume)

Table 5.1-7 DAILY LABOR WAGE BY CLASSIFICATION

NO.	CLASSIFICATION	UNIT	LABOR WAGE	
			F.C. (Yen)	L.C. (Bs)
1.	Foreman	day	0	675
2.	Operator	day	0	600
3.	Asst. Operator	day	0	500
4.	Driver	day	0	500
5.	Mechanic	day	0	515
6.	Electrician	day	0	515
7.	Welder	day	0	565
8.	Carpenter	day	0	515
9.	Concrete Worker	day	0	465
10.	Mason	day	0	515
11.	Steel Worker	day	0	515
12.	Rigger	day	0	565
13.	Skilled Labor	day	0	515
14.	Semi-skilled Labor	day	0	465
15.	Common Labor	day	0	450
16.	Foreman (foreign)	day	30,000	1,400

NOTE: Minimum wage up to Feb.1989 = 2,000 Bs./month
Minimum wage after Mar.1989 = 4,000 Bs./month
Workable days will be assumed at 22 days per month

Working hour Mon.to Thu.;
7:00-12:00 and 13:00-18:00(10 hrs)
Fri.;
7:00-12:00 and 13:00-16:00(8 hrs)
(48 hrs. per week)

Overtime work 35% up for night
60% up for midnight
100% up for horiday

Table 5.1-8 UNIT PRICE OF MATERIALS

NO.	DESCRIPTION	UNIT	PRICE (Bs)
1.	Portland Cement	ton	1,180.0
2.	Reinforcing Bar	ton	9,450.0
3.	Channel Steel	ton	11,800.0
4.	Steel Angle	ton	11,800.0
5.	Cobble & Rubble	ton	240.0
6.	River Run (screened)	ton	300.0
7.	Concrete Aggregate	ton	400.0
8.	Water-reducing Agent	kg	46.2
9.	Annealed Iron Wire	kg	9.3
10.	Nail	kg	25.0
11.	Seed	kg	1.2
12.	Fertilizer	kg	8.5
13.	Form Oil	lit.	24.6
14.	Metal Form, 300x1500	no.	531.0
15.	Metal Form, 200x1500	no.	531.0
16.	Timber	m3	9,300.0
17.	Bolt and Nut	kg	43.6
18.	Clump	no.	38.8
19.	Clip	no.	6.5
20.	Concrete Pipe, 1m dia.	m	1,840.0
21.	PVC Pipe, 50mm	m	33.0
22.	Light Oil	lit.	0.7
23.	Gasoline	lit.	2.5
24.	Lubricant	lit.	25.9
25.	Steel frame	ton	13,000.0
26.	Pipe Support, 48.6mm	m	56.5
27.	Anchor Bolt, 22mm	no.	39.3

Table 5.1-9 BREAKDOWN OF MASTER PLAN CONSTRUCTION COST FOR BASIN-WIDE PROJECT

Unit: Bs

WORK ITEM	UNIT	UNIT COST	QUANTITY	COST
I. DIRECT COST				
A. Sediment Control Works				
(1) Preparatory Works (10% of (2) to (17))	l.s.			92,183,280
(2) Sabo Dam C-1, Rubblestone Concrete	m3	2,390	62,500	149,375,000
(3) Sabo Dam C-2, Rubblestone Concrete	m3	2,310	40,500	93,555,000
(4) Sabo Dam C-3, Steel Frame	m3	2,590	17,100	44,289,000
(5) Sabo Dam C-4, Steel Frame	m3	2,660	27,000	71,820,000
(6) Sabo Dam C-5, Steel Frame	m3	2,640	14,600	38,544,000
(7) Sabo Dam C-6, Steel Frame	m3	2,590	25,100	65,009,000
(8) Sabo Dam C-7, Steel Frame	m3	2,600	22,000	57,200,000
(9) Sabo Dam C-8, Steel Frame	m3	2,590	17,100	44,289,000
(10) Sabo Dam C-9, Steel Frame	m3	2,590	27,200	70,448,000
(11) Sabo Dam N-1, Rubblestone Concrete	m3	2,070	65,000	134,550,000
(12) Continuous Dam, Mucusos	nos.	903,000	3	2,709,000
(13) Continuous Dam, Mucusas	nos.	1,364,000	10	13,640,000
(14) Continuous Dam, Mucusuru	nos.	1,640,000	5	8,200,000
(15) Continuous Dam, Other Sites	nos.	574,000	92	52,808,000
(16) Retaining Wall (Wet Masonry)	nos.	22,500	1,400	31,500,000
(17) Miscellaneous Works(5% of (2) to (16))	l.s.			43,896,800
Sub-Total				1,014,016,080
B. Flood Control Works				
(1) Preparatory Works (10% of (2) to (10))				150,593,900
(2) Land Clearing	ha	37,000	2,300	85,100,000
(3) Excavation of Riverbed	m3	-	-	-
(4) Dike Embankment	m3	167	3,993,000	666,831,000
(5) Sodding	ha	240,000	181	43,440,000
(6) Gravel Pavement	m3	560	64,100	35,896,000
(7) Revetment	m	15,200	30,800	468,160,000
(8) Groin	nos.	45,600	1,370	62,472,000
(9) Ground-sill	no.	22,040,000	1	22,040,000
(10) Puerto Chama Bridge Extension	m2	20,000	6,100	122,000,000
Sub-Total				1,656,532,900
Total of I.				2,670,548,980
II. Land Acquisition				
(1) Platano	Ha	100,000	558	55,800,000
(2) Pasture	Ha	30,000	1,742	52,260,000
Total of II.				108,060,000
III. Administration Cost (5% of I & II)	L.S.			138,930,449
IV. Engineering Service (10% of I)	L.S.			267,054,898
V. Physical Contingency(10% of I,II,III & IV)	L.S.			318,459,433
Grand Total				3,503,053,760

Note : (1) 1 US$ = 40 Bs. = 130 Yen
(2) Cost of excavation of riverbed of Item I.B.(3) is included in cost of dike embankment because materials excavated are used for dike.

Table 5.2-1 BREAKDOWN OF MASTER PLAN CONSTRUCTION COST FOR LOCAL PROJECT

Unit: Bs

WORK ITEM	UNIT	UNIT COST	QUANTITY	COST
I. DIRECT COST				
A. Sediment Control Works				
(1) Preparatory Works (10% of (2) to (4))	l.s.			1,753,490
(2) Check Dam	nos.	60,800	88	5,350,400
(3) Retaining Wall	m	8,230	750	6,172,500
(4) Revetment	m	8,350	720	6,012,000
Total				19,288,390
B. Flood Control Works				
(1) Preparatory Works (10% of (2) to (4))	l.s.			1,683,880
(2) Improvement of Albarregas River	m3	4,630	660	3,055,800
(3) Improvement of Q'da Milla	l.s.	13,000,000	1	13,000,000
(4) Improvement of Q'da La Portuguesa	m3	174	4,500	783,000
Total				18,522,680
Total of I.				37,811,070
II. Administration Cost (5% of I.)				1,890,554
III. Engineering Service (10% of I.)				3,781,107
IV. Physical Contingency (10% of I,II & III)				4,348,273
Grand Total				47,831,004

Note: 1 US$ = 40 Bs. = 130 Yen

Table 5.4-1 ESTIMATED FLOOD DAMAGE RATES OF PLANTAIN IN LOWER REACHES

FLOOD DURATION (day)	INUNDATION DEPTH (cm)										
	20	18	16	14	12	10	8	6	4	2	0
3.0	1.000	0.900	0.800	0.700	0.600	0.500	0.400	0.300	0.200	0.100	0.000
2.8	0.933	0.840	0.747	0.653	0.560	0.467	0.373	0.280	0.187	0.093	0.000
2.6	0.867	0.780	0.693	0.607	0.520	0.433	0.347	0.260	0.173	0.087	0.000
2.4	0.800	0.720	0.640	0.560	0.480	0.400	0.320	0.240	0.160	0.080	0.000
2.2	0.733	0.660	0.587	0.513	0.440	0.367	0.293	0.220	0.147	0.073	0.000
2.0	0.667	0.600	0.533	0.467	0.400	0.333	0.267	0.200	0.133	0.067	0.000
1.8	0.600	0.540	0.480	0.420	0.360	0.300	0.240	0.180	0.120	0.060	0.000
1.6	0.533	0.480	0.427	0.373	0.320	0.267	0.213	0.160	0.107	0.053	0.000
1.4	0.467	0.420	0.373	0.327	0.280	0.233	0.187	0.140	0.093	0.047	0.000
1.2	0.400	0.360	0.320	0.280	0.240	0.200	0.160	0.120	0.080	0.040	0.000
1.0	0.333	0.300	0.267	0.233	0.200	0.167	0.133	0.100	0.067	0.033	0.000
0.8	0.267	0.240	0.213	0.187	0.160	0.133	0.107	0.080	0.053	0.027	0.000
0.6	0.200	0.180	0.160	0.140	0.120	0.100	0.080	0.060	0.040	0.020	0.000
0.4	0.133	0.120	0.107	0.093	0.080	0.067	0.053	0.040	0.027	0.013	0.000
0.2	0.067	0.060	0.053	0.047	0.040	0.033	0.027	0.020	0.013	0.007	0.000
0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 5.4-2 FORECAST OF CULTIVATED LAND IN THE LOWER REACHES

STRETCH NO.	SIDE	TOTAL AREA (km2)	MAXIMUM CULTIVATED LAND	CULTIVATED LAND (km2) 1968	(%)	1981	(%)	ANNUAL GROWTH (km2/yr.)	FORECAST * (km2) 1988	2000	2010	2020
Stretch 1	Right	18.4	14.9	1.4	8%	3.8	21%	0.185	5.10	7.32	9.17	11.02
	Left	20.6	17.1	--	--	4.5	22%	0.346	6.92	11.07	14.53	17.10
Stretch 2	Right	25.0	22.0	7.5	30%	8.4	34%	0.069	8.88	9.71	10.40	11.09
	Left	12.8	9.8	0.7	5%	3.9	30%	0.246	5.62	8.57	9.80	9.80
Stretch 3	Right	8.8	6.3	0.8	9%	6.3	75%	0.446	6.30	6.30	6.30	6.30
	Left	7.5	5.0	--	--	3.8	51%	0.292	5.00	5.00	5.00	5.00
Stretch 4	Right	14.9	11.2	4.0	27%	7.5	50%	0.269	9.38	11.20	11.20	11.20
	Left	16.3	12.6	7.4	45%	10.5	64%	0.238	12.17	12.60	12.60	12.60
Stretch 5	Right	39.7	36.4	20.9	53%	28.1	71%	0.554	31.98	36.40	36.40	36.40
	Left	17.0	13.7	--	--	2.0	12%	0.154	3.08	4.93	6.47	8.01
T o t a l		181.0	149.0	42.7	24%	78.8	44%	2.799	94.4	113.1	121.9	128.5

NOTE * : Until the near future (2000), the cultivated land may be covered by plantain plantation but in the far future in the year 2010 or 2020, agricultural products with a higher productivity (50,000 Bs./yr.) than plantains, such as pepper, are possibly cultivated in the lower reaches, and flood damage calculation in these years considers that the cultivated land shares a pepper plantation area by 5%.

Table 5.4-3 ESTIMATE OF TRAFFIC DAMAGE BY PROBABLE ROAD DISASTERS

No.	Place	Detour Way (Y/N)	Inter-ruption (hr.)	Traffic Volume (Vehicles)				Traffic Damage (1000 Bs.)			
				1988	2000	2010	2020	1988	2000	2010	2020
1	El Pedregal	No	24	3,760	5,930	7,950	9,970	910	1,440	1,930	2,420
2	La Muchchache	No	48	3,760	5,930	7,950	9,970	3,660	5,770	7,740	9,710
3	Cacute	No	24	3,760	5,930	7,950	9,970	910	1,440	1,930	2,420
4	Tampacel	No	24	3,760	5,930	7,950	9,970	910	1,440	1,930	2,420
5	Tabay	No	3	3,760	5,930	7,950	9,970	10	20	30	30
6	El Salado	No	24	3,760	5,930	7,950	9,970	910	1,440	1,930	2,420
7	Mesa de La Virgen (1)	No	3	3,760	5,930	7,950	9,970	10	20	30	30
8	Mesa de La Virgen (2)	No	3	3,760	5,930	7,950	9,970	10	20	30	30
9	Merida	No	0	3,760	5,930	7,950	9,970	0	0	0	0
10	Qd. Los Higuerones	Yes	12	9,410	14,840	19,890	24,940	380	600	800	1,010
11	Conf. of Chama & N.S	Yes	12	9,410	14,840	19,890	24,940	380	600	800	1,010
12	Qd. Los Limos	No	48	9,960	15,730	21,110	26,490	9,700	15,320	20,560	25,810
13	Qd. Maciqual	No	48	9,960	15,730	21,110	26,490	9,700	15,320	20,560	25,810
14	Arraques	No	48	9,960	15,730	21,110	26,490	9,700	15,320	20,560	25,810
15	Qd. La Jaya	No	48	9,960	15,730	21,110	26,490	9,700	15,320	20,560	25,810
16	Qd. El Diablo	Yes *	3	9,770	15,660	21,250	26,840	30	50	80	100
17	La Honda	Yes *	3	9,770	15,660	21,250	26,840	30	50	80	100
18	La Palmita	Yes *	3	9,770	15,660	21,250	26,840	30	50	80	100
19	La Providencia	Yes *	3	9,770	15,660	21,250	26,840	30	50	80	100
20	Carabanchel	Yes *	3	3,620	5,820	7,720	9,620	10	20	20	30
21	Qd. Romero	Yes *	3	3,620	5,820	7,720	9,620	10	20	20	30
22	Qd. Cubalibre	Yes *	3	3,620	5,820	7,720	9,620	10	20	20	30
23	----	Yes *	3	3,620	5,820	7,720	9,620	10	20	20	30
24	Qd. Tabacal	Yes *	3	3,620	5,820	7,720	9,620	10	20	20	30
25	Qd. Silencio	Yes *	3	3,620	5,820	7,720	9,620	10	20	20	30
26	----	Yes *	3	3,620	5,820	7,720	9,620	10	20	20	30
27	Qd. Caciquito	Yes *	3	3,620	5,820	7,720	9,620	10	20	20	30
28	Qd. Penon II	Yes *	3	3,620	5,820	7,720	9,620	10	20	20	30
						Total		47,100	74,450	99,890	125,410
						Damage Per Place		1,682	2,659	3,568	4,479

NOTE *: Due to a short interruption time, vehicles are assumed not to take a detour route.

Conditions on damage calculation are :
Operation cost (cars) = 0.70 Bs/km for detour route (speed = 30 km/hr) and 0.68 Bs/km for highway (speed = 60 km/hr).
Operation cost (truck)= 2.10 Bs/km for detour route (speed = 10 km/hr) and 1.61 Bs/km for highway (speed = 60 km/hr).
Loss of productivity = 15 Bs/hr*person (2 persons/vehicle)
Detouring distance = 47 km

Table 5.4-4 CONDITIONS FOR FLOOD DAMAGE CALCULATION

FLOOD OR RAINFALL IN RETURN PERIOD	LOWER REACHES										UPPER/MIDDLE REACHES	
	STRETCH 1		STRETCH 2		STRETCH 3		STRETCH 4		STRETCH 5		NUMBER OF DISASTER POINTS (nos.)	NUMBER OF HOUSES SUBMERGED (nos.)
	I.D. (cm)	F.D. (day)	I.D. (cm)	F.D. (day)	I.D. (cm)	F.D. (day)	I.D. (cm)	F.D. (day)	I.D. (cm)	F.D. (day)		
2 Years	21.1	0.7	7.3	2.3	11.4	2.5	13.3	3.2	13.9	6.5	0	0
5 Years	28.0	1.3	9.6	3.0	12.6	3.5	15.0	4.1	21.1	6.7	15	0
10 Years	33.1	1.8	12.0	3.4	14.8	4.3	17.8	4.9	25.5	6.7	28	30
30 Years	45.6	3.2	14.0	4.5	17.1	5.1	20.2	5.3	32.4	6.7	60	70
50 Years	47.6	3.3	15.3	4.8	18.4	5.4	21.5	6.6	34.5	6.7	75	110
100 Years	59.1	3.3	18.5	4.8	20.7	5.6	22.6	6.6	38.9	6.7	100	130

NOTE: I.D.= inundation depth F.D. = flood duration
The location and coverage of inundation areas of each stretch are presented in Fig. 3.3-2.

Table 5.4-5 BREAKDOWN OF ANNUAL AVERAGE BENEFIT OF MASTER PLAN
(in the Year of 2020)

Unit: million Bs.

RIVER REACHES	STRETCH/ ITEM	RIVER SIDE	PROJECT SCALE IN FLOOD RETURN PERIOD 5-YEAR	10-YEAR	30-YEAR	50-YEAR	100-YEAR
Lower	Stretch 1	Right	5.62	7.93	9.31	9.85	10.08
		Left	8.74	12.33	14.48	15.32	15.68
	Stretch 2	Right	6.54	8.87	10.17	10.58	10.80
		Left	5.77	7.83	8.98	9.34	9.54
	Stretch 3	Right	5.26	6.91	7.81	8.09	8.22
		Left	4.17	5.48	6.20	6.42	6.52
	Stretch 4	Right	11.64	15.17	17.05	17.60	17.83
		Left	13.10	17.06	19.18	19.80	20.06
	Stretch 5	Right	46.61	59.35	65.46	67.25	68.01
		Left	10.24	13.04	14.39	14.78	14.95
	Sub-total		117.684	153.965	173.03	179.012	181.69
Upper/ Middle	Traffic	---	27.41	37.19	46.94	48.28	48.96
	Houses	---	0.00	0.02	0.05	0.06	0.07
	Sub-total		27.411	37.214	46.99	48.344	49.025
	T o t a l		145.095	191.179	220.02	227.356	230.715

Table 5.4-6 ANNUAL COST AND BENEFIT FLOW OF MASTER PLAN

Unit: million Bs

NO.	YEAR	ECONOMIC COST				ANNUAL AVERAGE BENEFIT	ANNUAL CASH FLOW
		INVEST-MENT (1)*	INVEST-MENT (2)**	OMR	TOTAL		
1	1991	85.14	3.83		88.97	0.00	-88.97
2	1992	85.14	3.83		88.97	13.32	-75.65
3	1993	85.14	3.83		88.97	26.63	-62.34
4	1994	85.14	3.83		88.97	39.95	-49.02
5	1995	85.14	3.83		88.97	53.26	-35.71
6	1996	85.14	3.83		88.97	66.58	-22.39
7	1997	85.14	3.83		88.97	79.90	-9.07
8	1998	85.14	3.83		88.97	93.21	4.24
9	1999	85.14	3.83		88.97	106.53	17.56
10	2000	85.14	3.83		88.97	119.84	30.87
11	2001	113.86	0.00	3.50	117.36	133.16	15.80
12	2002	113.86	0.00	3.50	117.36	136.93	19.57
13	2003	113.86	0.00	3.50	117.36	140.70	23.34
14	2004	113.86	0.00	3.50	117.36	144.47	27.11
15	2005	113.86	0.00	3.50	117.36	148.24	30.88
16	2006	113.86	0.00	3.50	117.36	152.01	34.65
17	2007	113.86	0.00	3.50	117.36	155.77	38.41
18	2008	113.86	0.00	3.50	117.36	159.54	42.18
19	2009	113.86	0.00	3.50	117.36	163.31	45.95
20	2010	113.86	0.00	3.50	117.36	167.08	49.72
21	2011	83.75	0.00	5.40	89.15	170.85	81.70
22	2012	83.75	0.00	5.40	89.15	176.84	87.69
23	2013	83.75	0.00	5.40	89.15	182.82	93.67
24	2014	83.75	0.00	5.40	89.15	188.81	99.66
25	2015	83.75	0.00	5.40	89.15	194.80	105.65
26	2016	83.75	0.00	5.40	89.15	200.79	111.63
27	2017	83.75	0.00	5.40	89.15	206.77	117.62
28	2018	83.75	0.00	5.40	89.15	212.76	123.61
29	2019	83.75	0.00	5.40	89.15	218.75	129.60
30	2020	83.75	0.00	5.40	89.15	224.73	135.58
31	2021			7.40	7.40	230.72	223.32
32	2022			7.40	7.40	230.72	223.32
33	2023			7.40	7.40	230.72	223.32
34	2024			7.40	7.40	230.72	223.32
35	2025			7.40	7.40	230.72	223.32
36	2026			7.40	7.40	230.72	223.32
37	2027			7.40	7.40	230.72	223.32
38	2028			7.40	7.40	230.72	223.32
39	2029			7.40	7.40	230.72	223.32
40	2030			7.40	7.40	230.72	223.32
41	2031			7.40	7.40	230.72	223.32
42	2032			7.40	7.40	230.72	223.32
43	2033			7.40	7.40	230.72	223.32
44	2034			7.40	7.40	230.72	223.32
45	2035			7.40	7.40	230.72	223.32
46	2036			7.40	7.40	230.72	223.32
47	2037			7.40	7.40	230.72	223.32
48	2038			7.40	7.40	230.72	223.32
49	2039			7.40	7.40	230.72	223.32
50	2040			7.40	7.40	230.72	223.32
51	2041			7.40	7.40	230.72	223.32
52	2042			7.40	7.40	230.72	223.32
53	2043			7.40	7.40	230.72	223.32
54	2044			7.40	7.40	230.72	223.32
55	2045			7.40	7.40	230.72	223.32
56	2046			7.40	7.40	230.72	223.32
57	2047			7.40	7.40	230.72	223.32
58	2048			7.40	7.40	230.72	223.32
59	2049			7.40	7.40	230.72	223.32
60	2050			7.40	7.40	230.72	223.32
					IRR =	10.71%	
					B/C =	1.22	
					B-C =	244.20	

NOTE *: Investment on the basin-wide project.
**: Investment on the local project.

Table 5.4-7 RELATIONSHIP AMONG GDP, NATIONAL BUDGET AND PUBLIC INVESTMENT IN THE CHAMA RIVER BASIN

I T E M	UNIT	1984	1985	1986	1987	1988	AVERAGE
1. Gross Domestic Product (GDP) *1)	million Bs	409,487	464,620	493,765	719,423	---	521,824
- Real Growth Rate	%	---	1.8	-4.7	13.8	---	3.3
2. National Budget *2)	million Bs	77,041	102,844	122,283	158,018	185,122	129,062
- Proportion to GDP	%	18.8	22.1	24.8	22.0	---	21.9
3. Budget of MARNR *3)	million Bs	1,835	1,894	4,353	4,596	6,350	3,806
- Allocation Ratio to the National Budget (1./2.)	%	2.4	1.8	3.6	2.9	3.4	2.9
- Interannual Growth of Allocation Ratio	%	---	-22.7	93.3	-18.3	17.9	9.5
4. Public Investment in the Project Area							
- Zone No.16 Office *4)	million Bs	10	12	9	22	31	17
- Office for the Region South of Maracaibo Lake *5)	million Bs	4	73	75	72	63	57
Total	million Bs	14	85	84	94	94	74
- Allocation Ratio to the MARNR's Budget	%	0.8	4.5	1.9	2.0	1.5	2.1

SOURCE *1): "Anuario Estadistico de Venezuela 1978", OCEI
*2): Central Budgetary Office
*3): Division of Budget, Direction of Programming & Budget, MARNR Caracas
*4): Budget Section, MARNR Zone No.16
*5): Office for the Region South of Maracaibo Lake, MARNR Zone No.5

Table 5.4-8 FORECAST OF AVAILABLE FUND FROM MARNR

Unit: million Bs at 1988 price level

CASE/ITEM	1990	2000	2010	2020	TOTAL 1991-2000	TOTAL 1991-2020
CASE 1.: 3% GROWTH RATE OF GDP AND 3% BUDGET ALLOCATION TO MARNR						
1. GDP (3% GROWTH)	786,133	1,056,497	1,419,844	1,908,151	9,282,498	38,522,622
2. NATIONAL BUDGET (22% OF 1.)	172,949	232,429	312,366	419,793	2,042,150	8,474,977
3. BUDGET TO MARNR (3% OF 2.)	5,188	6,973	9,371	12,594	61,264	254,249
4. PUBLIC INVESTMENT IN MERIDA STATE AND REGION SOUTH OF MARACAIBO LAKE (2% OF 3.)	104	139	187	252	1,225	5,085
5. ALTERNATIVE ALLOCATIONS FOR THE PROJECT FUND						
- 60% OF 4.	62	84	112	151	735	3,051
- 70% OF 4.	73	98	131	176	858	3,559
- 80% OF 4.	83	112	150	202	980	4,068
CASE 2.: 4% GROWTH RATE OF GDP AND 4% BUDGET ALLOCATION TO MARNR						
1. GDP (4% GROWTH)	809,253	1,197,892	1,773,173	2,624,729	10,104,617	47,202,380
2. NATIONAL BUDGET (22% OF 1.)	178,036	263,536	390,098	577,440	2,223,016	10,384,524
3. BUDGET TO MARNR (4% OF 2.)	7,121	10,541	15,604	23,098	88,921	415,381
4. PUBLIC INVESTMENT IN MERIDA STATE AND REGION SOUTH OF MARACAIBO LAKE (2% OF 3.)	142	211	312	462	1,778	8,308
5. ALTERNATIVE ALLOCATIONS FOR THE PROJECT FUND						
- 40% OF 4.	57	84	125	185	711	3,323
- 50% OF 4.	71	105	156	231	889	4,154
- 60% OF 4.	85	126	187	277	1,067	4,985

Table 5.4-9 ANNUAL REPAYMENT SCHEDULE OF MASTER PLAN UNDER THE CONDITION OF 50% FUNDED BY LOAN

UNIT: million Bs.

YEAR (1)	LOAN (2)	AMORTIZATION (3)	ACCUMULATION (4)	INTEREST (5)	LOCAL FUND (6)	DISBURSEMENT (7)
			[Σ(2)-Σ(3)]	[(4)x8%]		[(3)+(5)+(6)]
1991	55.13		55.13	4.41	55.13	59.54
1992	55.13		110.25	8.82	55.13	63.95
1993	55.13		165.38	13.23	55.13	68.36
1994	55.13		220.50	17.64	55.13	72.77
1995	55.13		275.63	22.05	55.13	77.18
1996	55.13	3.68	327.08	26.17	55.13	84.97
1997	55.13	7.35	374.85	29.99	55.13	92.46
1998	55.13	11.03	418.95	33.52	55.13	99.67
1999	55.13	14.70	459.38	36.75	55.13	106.58
2000	55.13	18.38	496.13	39.69	55.13	113.19
2001	70.76	22.05	544.84	43.59	70.76	136.39
2002	70.76	25.73	589.87	47.19	70.76	143.67
2003	70.76	29.40	631.22	50.50	70.76	150.66
2004	70.76	33.08	668.91	53.51	70.76	157.34
2005	70.76	36.75	702.91	56.23	70.76	163.74
2006	70.76	41.47	732.20	58.58	70.76	170.80
2007	70.76	46.18	756.78	60.54	70.76	177.48
2008	70.76	50.90	776.63	62.13	70.76	183.79
2009	70.76	55.62	791.77	63.34	70.76	189.72
2010	70.76	60.34	802.19	64.18	70.76	195.27
2011	51.66	61.38	792.47	63.40	51.66	176.44
2012	51.66	62.42	781.71	62.54	51.66	176.62
2013	51.66	63.46	769.91	61.59	51.66	176.72
2014	51.66	64.50	757.07	60.57	51.66	176.73
2015	51.66	65.55	743.19	59.45	51.66	176.66
2016	51.66	65.32	729.53	58.36	51.66	175.34
2017	51.66	65.08	716.11	57.29	51.66	174.03
2018	51.66	64.85	702.92	56.23	51.66	172.75
2019	51.66	64.62	689.95	55.20	51.66	171.48
2020	51.66	64.39	677.22	54.18	51.66	170.23
2021		63.12	614.11	49.13		112.25
2022		61.85	552.26	44.18		106.03
2023		60.57	491.69	39.33		99.91
2024		59.30	432.39	34.59		93.89
2025		58.03	374.36	29.95		87.98
2026		53.31	321.05	25.68		78.99
2027		48.59	272.46	21.80		70.39
2028		43.88	228.58	18.29		62.16
2029		39.16	189.43	15.15		54.31
2030		34.44	154.98	12.40		46.84
2031		31.00	123.99	9.92		40.92
2032		27.55	96.43	7.71		35.27
2033		24.11	72.33	5.79		29.89
2034		20.66	51.66	4.13		24.80
2035		17.22	34.44	2.76		19.98
2036		13.78	20.66	1.65		15.43
2037		10.33	10.33	0.83		11.16
2038		6.89	3.44	0.28		7.16
2039		3.44	0.00	0.00		3.44
2040		0.00	0.00	0.00		0.00
TOTAL	1,775.4	1,775.4	21,305.3	1,704.4	1,775.4	5,255.3

NOTE : Loan conditions are; annual interest = 8%,
repayment period = 20 years including a 5-year grace period.

Table 6.1-1 ALTERNATIVE STUDY CASES FOR SEDIMENT CONTROL STRUCTURE

Structure	Type	Materials
Sabo Dam	Gravity concrete dam	Concrete Rubble concrete Wet masonry
	Fill dam	Rock Earth
	Arch concrete dam	Concrete
	Steel frame dam	Steel and gravel
	Concrete block dam	Concrete
Continuous Dam	Gravity concrete dam	Concrete Rubble concrete Wet masonry
	Gabion dam	Gabion
Retaining Wall	Gravity type	Concrete Wet masonry Dry masonry
	Anchor type	Concrete panel

Table 6.1-2 DESIGN FEATURES OF RIVER IMPROVEMENT

Stretch	Riverbed Gradient	Design Water Depth		Height of Dike (m)		Proposed length of dike in M/P
		1/100 (M/P)	1/10 (A/P)	1/100 (M/P)	1/10 (A/P)	
I 0.0k-12.6k	1/1,400	2.7	2.0	3.9	3.0	8.1km (3.0-9.0; 10.4-12.5)
II 12.6k-28.0k	1/880	2.3	1.8	3.5	2.8	8.6km (12.5-16.7; 17.9-22.3
III 28.0k-35.2k	1/625	2.1	1.6	3.3	2.6	-
IV 35.2k-45.6k	1/450	1.9	1.5	3.1	2.5	8.0km (35.0-43.0)
V 45.6k-48.0k	1/250	1.6	1.2	2.8	2.2	-
VI 48.0k-50.0k	1/185	1.5	1.1	2.7	2.1	-
VII 50.0k-53.4k	1/145	1.4	1.1	2.6	2.1	-
Total						24.7km

Note: The height of dike were obtained by adding the freeboard of 1.2m and 1.0m respectively for the master plan and action plan to the design water depth.

Table 6.1-3 ALTERNATIVE STUDY CASES FOR FLOOD CONTROL STRUCTURE

Structure	Materials
Revetment	Sodding
	Gabion
	Wet masonry (concrete)
	Wet masonry (asphalt)
	Concrete
	Asphalt
	Textile form concrete
Groyne	Gabion
	Concrete block
	Cobble stone concrete
	Textile form concrete
Groundsill	Concrete
	Rubble concrete
	Concrete block
	Textile form concrete

NOTE: Applicable anti-erosion work will be changed according to the current velocity and direction.

Table 6.1-4 SELECTION OF OPTIMUM CASE FOR REVETMENT

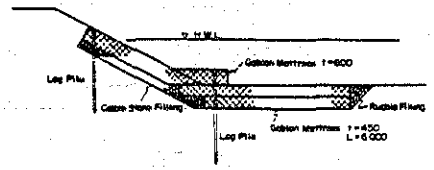
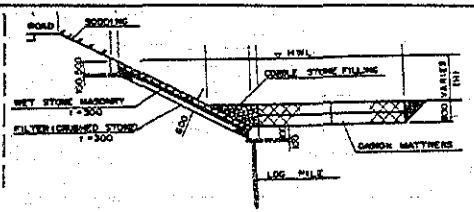
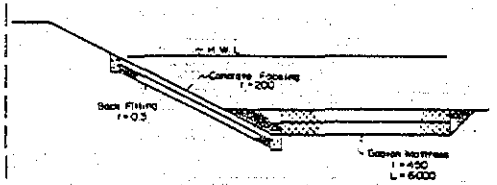
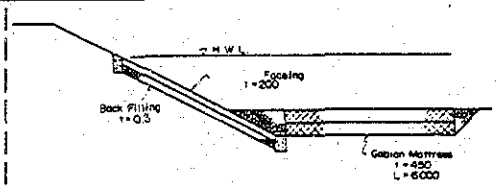
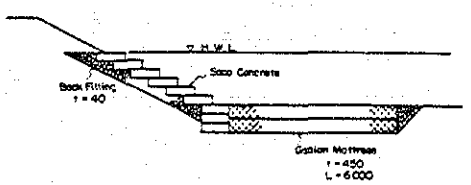
Works	Typical Cross Section	Materials	Notes	Cost(Bs/m)
Gabion		Gabion Iron Wire Cobble Stone	Flexible against embankment deformation. Not difficult to construct. Necessary to maintain the iron wire every 20 years.	17,100
Wet Masonry		Concrete Block Special Form Concrete	Inflexible against embankment deformation. Not difficult to construct. Maintenance free.	15,200
Concrete		Concrete	Inflexible against embankment deformation. Not difficult to construct. Maintenance free. Applied for the heavy stream portion and the place rubbles are not available.	17,300
Asphalt		Asphalt	Flexible against embankment deformation. Difficult to construct, especially for compaction on the slope. Maintenance free. Applied for the place where rubbles are not available.	19,900
Textile Concrete		Textile Concrete Concrete Concrete Bag	Flexible against embankment deformation. Not difficult to construct. Maintenance free.	15,800

Table 6.1-5 SELECTION OF OPTIMUM CASE FOR GROIN

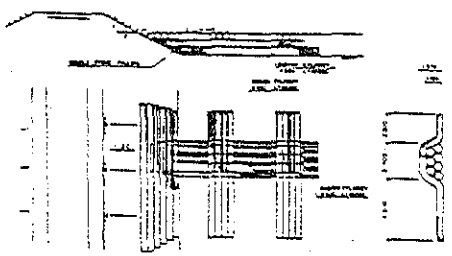
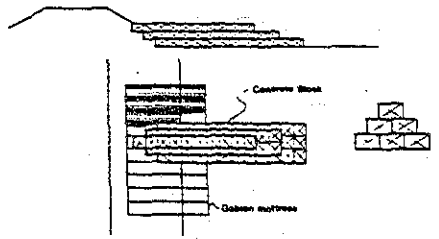
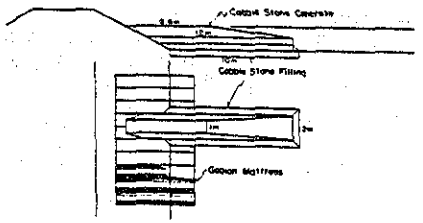
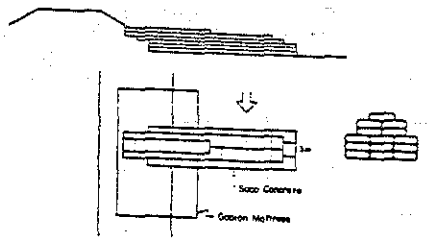
Works	Typical Cross Section	Materials	Notes	Cost(Bs/no.)
Gabion		Gabion Iron Wire Cobble Stone	Flexible against riverbed fluctuation. Not difficult to construct. Necessary to maintain the iron wire every 20 years. The least expensive type of groin.	45,700 (2,285 Bs/m)
Concrete Block		Concrete Block Special Form Concrete	Flexible against riverbed fluctuation. Not difficult to construct. Necessary to use a special form. Maintenance free. The most expensive type of groin.	127,300 (6,365 Bs/m)
Concrete		Concrete	Inflexible against riverbed fluctuation. Necessary to divert river water. Maintenance free.	111,700 (5,585 Bs/m)
Textile Concrete		Textile Concrete Concrete Concrete Bag	Inflexible against riverbed fluctuation. Not difficult to construct. Maintenance free.	78,700 (3,935 Bs/m)

Table 6.2-1 STRUCTURAL PLAN OF PROPOSED RETAINING WALLS
(Action Plan)

No.	Location	Length (m)	Height (m)	Type *
1.	Mesa de Virgen	200	2.0	Concrete
2.	La Honda	150	2.0	Concrete
3.	La Palmita	150	2.0	Concrete
4.	La Providencia	50	2.0	Concrete
5.	Cacute	70	2.0	Concrete
6.	La Vega **	200	2.0	Concrete
	T o t a l	820	---	---

Note *: Leaning-to-slope type with a slope of 1.0:0.5.
**: Around the confluence between the Chama and the Nuestra Senora Rivers.

Table 6.2-2 STRUCTURAL PLAN OF PROPOSED REVETMENT
(Action Plan)

No.	Location/River	Length (m)	Height (m)	Type *
1.	El Pedregal/ Chama	20	4.5	Wet masonry
2.	Cacute/ Chama	160	4.5	Wet masonry
3.	Tampaul/ Chama	60	4.5	Wet masonry
4.	El Salado/ Chama	60	4.5	Wet masonry
5.	La Vega*/ Chama	400	4.5	Wet masonry
6.	La Vega/ Qd. El Diablo	20	4.5	Wet masonry
	T o t a l	720	---	---

Note *: Slope of revetment is generally set at 1.0:0.5 to protect the rever bank from scouring by flood
**: La Vega is located at around the confluence of the Chama and Nuestra Senora rivers.

Table 6.3-1 BREAKDOWN OF ACTION PLAN CONSTRUCTION COST FOR BASIN-WIDE PROJECT

Unit: Bs

WORK ITEM	UNIT	UNIT COST	QUANTITY	COST
I. DIRECT COST				
A. Sediment Control Works				
(1) Preparatory Works (10% of (2) to (16))	l.s.			37,240,140
(2) Sabo Dam C-1, Rubblestone Concrete	m3	2,390	62,500	149,375,000
(3) Sabo Dam C-2, Rubblestone Concrete	m3	2,310	0	0
(4) Sabo Dam C-3, Steel Frame	m3	2,590	0	0
(5) Sabo Dam C-4, Steel Frame	m3	2,660	0	0
(6) Sabo Dam C-5, Steel Frame	m3	2,640	14,600	38,544,000
(7) Sabo Dam C-6, Steel Frame	m3	2,590	0	0
(8) Sabo Dam C-7, Steel Frame	m3	2,600	0	0
(9) Sabo Dam C-8, Steel Frame	m3	2,590	0	0
(10) Sabo Dam C-9, Steel Frame	m3	2,590	0	0
(11) Sabo Dam N-1, Rubblestone Concrete	m3	2,070	65,000	134,550,000
(12) Continuous Dam, Mucusos	nos.	903,000	3	2,709,000
(13) Continuous Dam, Mucusas	nos.	1,364,000	10	13,640,000
(14) Continuous Dam, Mucusuru	nos.	1,640,000	5	8,200,000
(15) Continuous Dam, Other Sites	nos.	574,000	0	0
(16) Retaining Wall (Wet Masonry)	nos.	22,500	340	7,650,000
(17) Miscellaneous Works(5% of (2) to (16))	l.s.			17,733,400
Sub-Total				409,641,540
B. Flood Control Works				
(1) Preparatory Works (10% of (2) to (10))				35,812,820
(2) Land Clearing	ha	37,000	674	24,938,000
(3) Excavation of Riverbed	m3	-	-	-
(4) Dike Embankment	m3	167	745,000	124,415,000
(5) Sodding	ha	240,000	28	6,720,000
(6) Gravel Pavement	m3	560	15,420	8,635,200
(7) Revetment	m	15,200	10,300	156,560,000
(8) Groin	nos.	45,600	325	14,820,000
(9) Ground-sill	no.	22,040,000	1	22,040,000
(10) Puerto Chama Bridge Extension	m2	20,000	0	0
Sub-Total				393,941,020
Total of I.				803,582,560
II. Land Acquisition				
(1) Platano	Ha	100,000	183	18,300,000
(2) Pasture	Ha	30,000	491	14,730,000
Total of II.				33,030,000
III. Administration Cost (5% of I & II)	L.S.			41,830,628
IV. Engineering Service (10% of I)	L.S.			80,358,256
V. Physical Contingency(10% of I,II,III & IV)	L.S.			95,880,144
Grand Total				1,054,681,588

Note : (1) 1 US$ = 40 Bs. = 130 Yen
(2) Cost of excavation of riverbed of Item I.B.(3) is included in cost of dike embankment because materials excavated are used for dike.

Table 6.3-2 BREAKDOWN OF ACTION PLAN CONSTRUCTION COST FOR LOCAL PROJECT

Unit : Bs

WORK ITEM	UNIT	UNIT COST	QUANTITY	COST
I. DIRECT COST				
A. Sediment Control Works				
(1) Preparatory Works (10% of (2) to (4))	l.s.			1,753,490
(2) Check Dam	nos.	60,800	88	5,350,400
(3) Retaining Wall	m	8,230	750	6,172,500
(4) Revetment	m	8,350	720	6,012,000
Total				19,288,390
B. Flood Control Works				
(1) Preparatory Works (10% of (2) to (4))	l.s.			1,683,880
(2) Improvement of Albarregas River	m3	4,630	660	3,055,800
(3) Improvement of Q'da Milla	l.s.	13,000,000	1	13,000,000
(4) Improvement of Q'da La Portuguesa	m3	174	4,500	783,000
Total				18,522,680
Total of I.				37,811,070
II. Administration Cost (5% of I.)				1,890,554
III. Engineering Service (10% of I.)				3,781,107
IV. Physical Contingency (10% of I,II & III)				4,348,273
Grand Total				47,831,004

Note: 1 US$ = 40 Bs. = 130 Yen

Table 6.3-3 DISBURSEMENT SCHEDULE OF ACTION PLAN FOR BASIN-WIDE PROJECT

Unit: 1000 Bs.

Work Item	Total Cost	ANNUAL DISBURSEMENT									
		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. Direct Cost											
1.1 Sediment Control	409,642	0	0	60,703	80,843	69,671	24,886	24,886	46,305	59,564	42,784
1.2 Flood Control	393,941	0	0	56,314	67,039	37,105	48,190	48,190	48,190	48,190	40,723
Total of 1.	803,583	0	0	117,017	147,882	106,776	73,076	73,076	94,495	107,754	83,507
2. Land Acquisition	33,030	0	4,955	4,955	4,955	4,955	3,303	3,303	3,303	3,301	0
3. Administration Expenses	41,831	4,183	4,183	4,183	6,275	4,183	4,183	4,183	4,183	4,183	2,092
4. Engineering Services	80,358	12,053	4,018	9,361	11,831	8,542	5,846	5,846	7,560	8,620	6,681
5. Physical Contingency	95,880	1,624	1,316	13,552	17,094	12,446	8,641	8,641	10,954	12,386	9,228
Grand Total	1,054,682	17,860	14,472	149,068	188,037	136,902	95,049	95,049	120,495	136,244	101,508

NOTE: Exchange rate is US$1.0 = Bs.40.0 = JYE130. Price level is January of 1989.

Table 6.3-4 DISBURSEMENT SCHEDULE OF ACTION PLAN FOR LOCAL PROJECT

Unit: 1000 Bs.

Work Item	Total Cost	ANNUAL DISBURSEMENT									
		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. Direct Cost											
1.1 Sediment Control	19,288	0	2,462	2,995	2,469	2,407	2,407	1,136	1,804	1,804	1,804
1.2 Flood Control	18,523	0	4,235	8,955	5,333	0	0	0	0	0	0
Total of 1.	37,811	0	6,697	11,950	7,802	2,407	2,407	1,136	1,804	1,804	1,804
2. Administration Expenses	1,891	378	189	189	189	189	189	189	189	95	95
3. Engineering Services	3,781	756	378	1,017	664	205	205	97	153	153	153
4. Physical Contingency	4,348	113	726	1,316	866	280	280	142	215	205	205
Grand Total	47,831	1,134	8,035	14,530	9,552	3,078	3,078	1,553	2,353	2,259	2,259

NOTE: Exchange rate is US$1.0 = Bs.40.0 = JYE130. Price level is January of 1989.

Table 6.4-1 BREAKDOWN OF ANNUAL AVERAGE BENEFIT OF ACTION PLAN (in the Year of 2000)

Unit: 1000 Bs

RIVER REACHES	STRETCH/ ITEM	RIVER SIDE	ANNUAL BENEFIT
Lower Reaches	Stretch 1	Right	0
		Left	7,800
	Stretch 2	Right	0
		Left	6,716
	Stretch 3	Right	0
		Left	0
	Stretch 4	Right	14,824
		Left	16,677
	Stretch 5	Right	58,012
		Left	0
	Sub-total		104,029
Upper/Middle Reaches	Traffic	---	29,063
	Houses	---	70
	Sub-total		29,133
	T o t a l		133,162

Table 6.4-2(1/2) COMPOSITION OF FINANCIAL COST AND CALCULATION OF CONVERSION RATES TO ECONOMIC COST (Basin-wide Project)

Unit: %

No.	Work Item	F.C.	Local Currency								Total
			Labor		Materials				Rental Equip-ment	Over-head	
			Common	Others	L.O.	Lub.	Concrete	Others			
1.	Sediment Control Works										
1.1	C-1 Sabo Dam	0.7	6.4	6.4	0.1	0.1	43.5	2.2	17.7	22.9	100.0
		0.7	3.5	6.4	0.5	0.1	33.0	1.7	12.9	22.9	81.9
1.2	C-5 Sabo Dam	2.1	13.0	9.7	0.1	0.1	0.0	43.5	13.0	18.5	100.0
		2.1	7.2	9.7	0.3	0.1	0.0	34.8	9.5	18.5	82.2
1.3	N-1 Sabo Dam	0.8	5.9	6.2	0.1	0.1	47.7	2.4	13.9	22.9	100.0
		0.8	3.3	6.2	0.3	0.1	36.3	1.9	10.2	22.9	81.9
1.4	Continuous Dam, Mucusos	0.5	14.1	13.2	0.1	0.1	21.0	9.3	18.7	23.0	100.0
		0.5	7.8	13.2	0.6	0.2	16.0	7.4	13.6	23.0	82.2
1.5	Continuous Dam, Mucusas	0.5	13.9	12.8	0.1	0.1	21.7	8.4	19.4	23.0	100.0
		0.5	7.6	12.8	0.6	0.2	16.5	6.8	14.1	23.0	82.1
1.6	Continuous Dam, Mucusuru	0.5	13.9	12.9	0.1	0.1	21.6	8.7	19.1	23.0	100.0
		0.5	7.7	12.9	0.6	0.2	16.5	6.9	14.0	23.0	82.1
1.7	Retaining Wall	1.4	4.3	6.0	0.0	0.0	57.0	1.7	6.7	22.8	100.0
		1.4	2.4	6.0	0.1	0.0	43.3	1.4	4.9	22.8	82.3
2.	Flood Control Works										
2.1	Land Clearing	0.0	32.5	6.8	0.2	0.1	0.0	0.0	37.3	23.1	100.0
		0.0	17.9	6.8	1.0	0.2	0.0	0.0	27.2	23.1	76.1
2.2	Dike Embankment	5.1	4.3	7.6	0.4	0.2	0.0	0.0	60.5	21.9	100.0
		5.1	2.4	7.6	1.4	0.3	0.0	0.0	44.2	21.9	82.9
2.3	Sodding	0.0	22.5	15.8	0.1	0.1	0.0	7.5	31.0	23.1	100.0
		0.0	12.4	15.8	0.6	0.2	0.0	6.0	22.6	23.1	80.5
2.4	Gravel Pavement	0.2	2.7	4.1	0.1	0.1	0.0	57.5	12.3	23.0	100.0
		0.2	1.5	4.1	0.4	0.1	0.0	46.0	9.0	23.0	84.3
2.5	Revetment	0.2	24.0	14.4	0.1	0.1	8.7	21.3	8.2	23.0	100.0
		0.2	13.2	14.4	0.2	0.1	6.6	17.1	6.0	23.0	80.8
2.6	Groin	0.0	35.5	13.8	0.0	0.0	0.0	22.1	5.4	23.1	100.0
		0.0	19.6	13.8	0.2	0.1	0.0	17.6	4.0	23.1	78.3
2.7	Groundsill	0.4	23.9	11.3	0.1	0.1	14.3	13.9	13.1	23.0	100.0
		0.4	13.1	11.3	0.3	0.1	10.9	11.1	9.5	23.0	79.8

NOTE: F.C. = foreign currency, L.O. = light oil, Lub. = Lubricant

Upper row shows the distribution of financial cost, and lower row shows the percentage for calculation of economic cost, multiplied by the following conversion rates:

Common Labor	0.55
Light Oil	4.06
Lubricant	1.46
Concrete	0.76
Other Materials	0.80
Rental Equipment	0.73

Table 6.4-2(2/2) COMPOSITION OF FINANCIAL COST AND CALCULATION OF CONVERSION RATES TO ECONOMIC COST (Local Project)

Unit: %

No.	Work Item	F.C.	Local Currency								Total
			Labor		Materials				Rental Equip-ment	Over-head	
			Common	Others	L.O.	Lub.	Concrete	Others			
1.	Sediment Control Works										
1.1	Check Dam	0.6	14.6	16.1	0.0	0.0	26.4	11.7	7.6	22.9	100.0
		0.6	8.0	16.1	0.2	0.0	20.1	9.4	5.5	22.9	82.9
1.2	Retaining Wall	0.5	7.9	18.0	0.0	0.0	31.9	13.9	4.8	23.0	100.0
		0.5	4.3	18.0	0.1	0.0	24.2	11.1	3.5	23.0	84.8
1.3	Revetment	0.2	23.5	15.9	0.1	0.0	9.8	20.3	7.2	23.0	100.0
		0.2	12.9	15.9	0.2	0.1	7.5	16.2	5.2	23.0	81.3
2.	Flood Control Works										
2.1	Improvement of Albarregas River	0.8	7.0	15.5	0.0	0.0	35.1	14.1	4.6	22.9	100.0
		0.8	3.8	15.5	0.1	0.0	26.7	11.2	3.4	22.9	84.5
2.2	Improvement of Q'da Milla	1.0	6.1	10.7	0.1	0.0	43.6	7.0	8.7	22.8	100.0
		1.0	3.3	10.7	0.2	0.0	33.1	5.6	6.4	22.8	83.2
2.3	Improvement of Q'da La Portugues	0.0	12.3	9.4	0.4	0.3	0.0	0.0	54.6	23.1	100.0
		0.0	6.8	9.4	1.7	0.4	0.0	0.0	39.9	23.1	81.1

NOTE: F.C. = foreign currency, L.O. = light oil, Lub. = Lubricant

Upper row shows the distribution of financial cost, and lower row shows the percentage for calculation of economic cost, multiplied by the following conversion rates:

Common Labor	0.55
Light Oil	4.06
Lubricant	1.46
Concrete	0.76
Other Materials	0.80
Rental Equipment	0.73

Table 6.4-3(1/2) CALCULATION OF ECONOMIC PROJECT COST FOR ACTION PLAN
(Basin-wide Project)

NO.	WORK ITEM	FINANCIAL COST (million Bs.)	CONVERSION RATE *	ECONOMIC COST (million Bs.)
I.	DIRECT COST			
	A. Sediment Control Works			
	(1) Preparatory Works [10% of (2) to (9)]	37.24	---	30.52
	(2) C-1 Sabo Dam, Rubblestone Concrete	149.38	0.82	122.34
	(3) C-5 Sabo Dam, Steel Frame	38.54	0.82	31.68
	(4) N-1 Sabo Dam, Rubblestone Concrete	134.55	0.82	110.20
	(5) Mucusos Continuous Dam	2.71	0.82	2.23
	(6) Mucusas Continuous Dam	13.64	0.82	11.20
	(7) Mucusuru Continuous Dam	8.20	0.82	6.73
	(8) Retaining Wall (Wet Masonry)	7.65	0.82	6.30
	(9) Miscellaneous Works [5% of (2) to (8)]	17.73	---	14.53
	Sub-total	409.64		335.73
	B. Flood Control Works			
	(1) Preparatory Works [10% of (2) to (8)]	35.81	---	29.05
	(2) Land Clearing	24.94	0.76	18.98
	(3) Dike Embankment	124.42	0.83	103.14
	(4) Sodding	6.72	0.81	5.41
	(5) Gravel Pavement	8.64	0.84	7.28
	(6) Revetment	156.56	0.81	126.50
	(7) Groin	14.82	0.78	11.60
	(8) Groundsill	22.04	0.80	17.59
	Sub-total	393.94		319.55
	Total of I	803.58		655.27
II.	LAND ACQUISITION			
	(1) Plantain	18.30	1.00	18.30
	(2) Pasture	14.73	1.00	14.73
	Total of II	33.03		33.03
III.	ADMINISTRATION COST (5% of I & II)	41.83	---	34.42
IV.	ENGINEERING SERVICE (10% of I)	80.36	---	65.53
V.	PHYSICAL CONTINGENCY (10% of I to IV)	95.88	---	78.82
	Grand Total	1,054.68	---	867.07

NOTE *: Refer to Table IX-9.

Table 6.4-3(2/2) CALCULATION OF ECONOMIC PROJECT COST FOR ACTION PLAN
(Local Project)

NO.	WORK ITEM	FINANCIAL COST (million Bs.)	CONVERSION RATE *	ECONOMIC COST (million Bs.)
I.	DIRECT COST			
	A. Sediment Control Works			
	(1) Preparatory Works [10% of (2) to (4)]	1.75	---	1.46
	(2) Check Dam	5.35	0.83	4.44
	(3) Retaining Wall	6.17	0.85	5.23
	(4) Revetment	6.01	0.81	4.89
	Sub-total	19.29		16.01
	B. Flood Control Works			
	(1) Preparatory Works [10% of (2) to (4)]	1.68	---	1.40
	(2) Improvement of Albarregas River	3.06	0.85	2.58
	(3) Improvement of Q'da Milla	13.00	0.83	10.82
	(4) Improvement of Q'da La Portuguesa	0.78	0.81	0.64
	Sub-total	18.52		15.44
	Total of I	37.81		31.45
II.	ADMINISTRATION COST (5% of I)	1.89	---	1.57
III.	ENGINEERING SERVICE (10% of I)	3.78	---	3.15
V.	PHYSICAL CONTINGENCY (10% of I to III)	4.35	---	3.62
	Grand Total	47.83	---	39.78

NOTE *: Refer to Table IX-9.

Table 6.4-4 ANNUAL COST AND BENEFIT FLOW OF ACTION PLAN

Unit: million Bs

	YEAR	ECONOMIC COST				ANNUAL AVERAGE BENEFIT	ANNUAL CASH FLOW
		INVEST-MENT (1)*	INVEST-MENT (2)**	OMR	TOTAL		
1	1991	14.60	1.04		15.64	0.00	-15.64
2	1992	12.84	6.65		19.49	0.00	-19.49
3	1993	122.60	12.05		134.64	0.00	-134.64
4	1994	154.39	7.92		162.31	16.65	-145.67
5	1995	112.67	2.56		115.23	33.29	-81.94
6	1996	78.21	2.56		80.77	49.94	-30.83
7	1997	78.21	1.30		79.51	66.58	-12.93
8	1998	98.96	1.96		100.92	83.23	-17.70
9	1999	111.80	1.88		113.68	99.87	-13.81
10	2000	82.79	1.88		84.67	116.52	31.85
11	2001			3.50	3.50	133.16	129.66
12	2002			3.50	3.50	133.16	129.66
13	2003			3.50	3.50	133.16	129.66
14	2004			3.50	3.50	133.16	129.66
15	2005			3.50	3.50	133.16	129.66
16	2006			3.50	3.50	133.16	129.66
17	2007			3.50	3.50	133.16	129.66
18	2008			3.50	3.50	133.16	129.66
19	2009			3.50	3.50	133.16	129.66
20	2010			3.50	3.50	133.16	129.66
21	2011			3.50	3.50	133.16	129.66
22	2012			3.50	3.50	133.16	129.66
23	2013			3.50	3.50	133.16	129.66
24	2014			3.50	3.50	133.16	129.66
25	2015			3.50	3.50	133.16	129.66
26	2016			3.50	3.50	133.16	129.66
27	2017			3.50	3.50	133.16	129.66
28	2018			3.50	3.50	133.16	129.66
29	2019			3.50	3.50	133.16	129.66
30	2020			3.50	3.50	133.16	129.66
31	2021			3.50	3.50	133.16	129.66
32	2022			3.50	3.50	133.16	129.66
33	2023			3.50	3.50	133.16	129.66
34	2024			3.50	3.50	133.16	129.66
35	2025			3.50	3.50	133.16	129.66
36	2026			3.50	3.50	133.16	129.66
37	2027			3.50	3.50	133.16	129.66
38	2028			3.50	3.50	133.16	129.66
39	2029			3.50	3.50	133.16	129.66
40	2030			3.50	3.50	133.16	129.66

IRR =	13.22%
B/C =	1.58
NVP =	346.52 Million Bs.

NOTE *: Investment on the basin-wide project.
**: Investment on the local project.

Table 6.4-5 FORECAST OF AVAILABLE FUND FROM MTC

CASE/ITEM	1990	1995	2000	TOTAL OF 1991-2000
CASE 1.: 3% GROWTH RATE OF GDP				
1. GDP (3% GROWTH)	786,133	911,344	1,056,497	9,282,497
2. NATIONAL BUDGET (22% OF 1.)	172,949	200,496	232,429	2,042,149
3. BUDGET TO MTC (5.5% OF 2.)	9,512	11,027	12,784	112,318
4. PUBLIC INVESTMENT IN MERIDA STATE (4.5% OF 3.)	428	496	575	5,054
5. ROAD MAINTENANCE EXPENSES (8% OF 4.)	34	40	46	404
6. AVAILABLE FUND FOR THE PROJECT (50% OF 5.)	17	20	23	202
CASE 2.: 4% GROWTH RATE OF GDP				
1. GDP (4% GROWTH)	809,253	984,580	1,197,892	10,104,618
2. NATIONAL BUDGET (22% OF 1.)	178,036	216,608	263,536	2,223,016
3. BUDGET TO MTC (5.5% OF 2.)	9,792	11,913	14,494	122,266
4. PUBLIC INVESTMENT IN MERIDA STATE (4.5% OF 3.)	441	536	652	5,502
5. ROAD MAINTENANCE EXPENSES (8% OF 4.)	35	43	52	440
6. AVAILABLE FUND FOR THE PROJECT (50% OF 5.)	18	21	26	220

Table 6.4-6 ANNUAL REPAYMENT SCHEDULE OF ACTION PLAN
UNDER THE CONDITION OF 50% FUNDED BY LOAN

UNIT: million Bs.

YEAR (1)	LOAN (2)	AMORTIZATION (3)	ACCUMULATION (4)	INTEREST (5)	LOCAL FUND (6)	DISBURSEMENT (7)
			[Σ(2) - Σ(3)]	[(4)x8%]		[(3)+(5)+(6)]
1991	9.50		9.50	0.76	9.50	10.26
1992	11.25		20.75	1.66	11.25	12.91
1993	81.80		102.55	8.20	81.80	90.00
1994	98.79		201.34	16.11	98.79	114.90
1995	69.99		271.33	21.71	69.99	91.70
1996	49.06	0.63	319.76	25.58	49.06	75.28
1997	48.30	1.38	366.68	29.33	48.30	79.02
1998	61.42	6.84	421.27	33.70	61.42	101.96
1999	69.25	13.42	477.10	38.17	69.25	120.84
2000	51.88	18.09	510.89	40.87	51.88	110.84
2001		21.36	489.53	39.16		60.52
2002		24.58	464.95	37.20		61.78
2003		28.67	436.28	34.90		63.58
2004		33.29	402.99	32.24		65.53
2005		36.75	366.24	29.30		66.05
2006		36.75	329.49	26.36		63.11
2007		36.75	292.73	23.42		60.17
2008		36.75	255.98	20.48		57.23
2009		36.75	219.23	17.54		54.29
2010		36.75	182.48	14.60		51.35
2011		36.12	146.37	11.71		47.83
2012		35.37	111.00	8.88		44.25
2013		29.91	81.08	6.49		36.40
2014		23.33	57.76	4.62		27.95
2015		18.66	39.10	3.13		21.79
2016		15.39	23.71	1.90		17.29
2017		12.17	11.53	0.92		13.09
2018		8.08	3.46	0.28		8.35
2019		3.46	0.00	0.00		3.46
2020		0.00	0.00	0.00		0.00
TOTAL	551.3	551.3	6,615.1	529.2	551.3	1,631.7

NOTE : Loan conditions are; annual interest = 8%,
repayment period = 20 years including a 5-year grace period.

FIGURES

STUDY SCHEDULE

Study Item \ Year / Month	1988		1989												1990		
	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1. Preparatory Work																	
2. Collection and Review of Existing Data																	
3. Reconnaissance, Field Survey, Analysis and Study																	
4. Formulation of Master Plan																	
5. Additional Data Collection and Field Survey																	
6. Formulation of Action Plan																	
7. Reporting		IC/R *		P/R (I) *				IT/R *			P/R(II) *			DF/R *		F/R *	

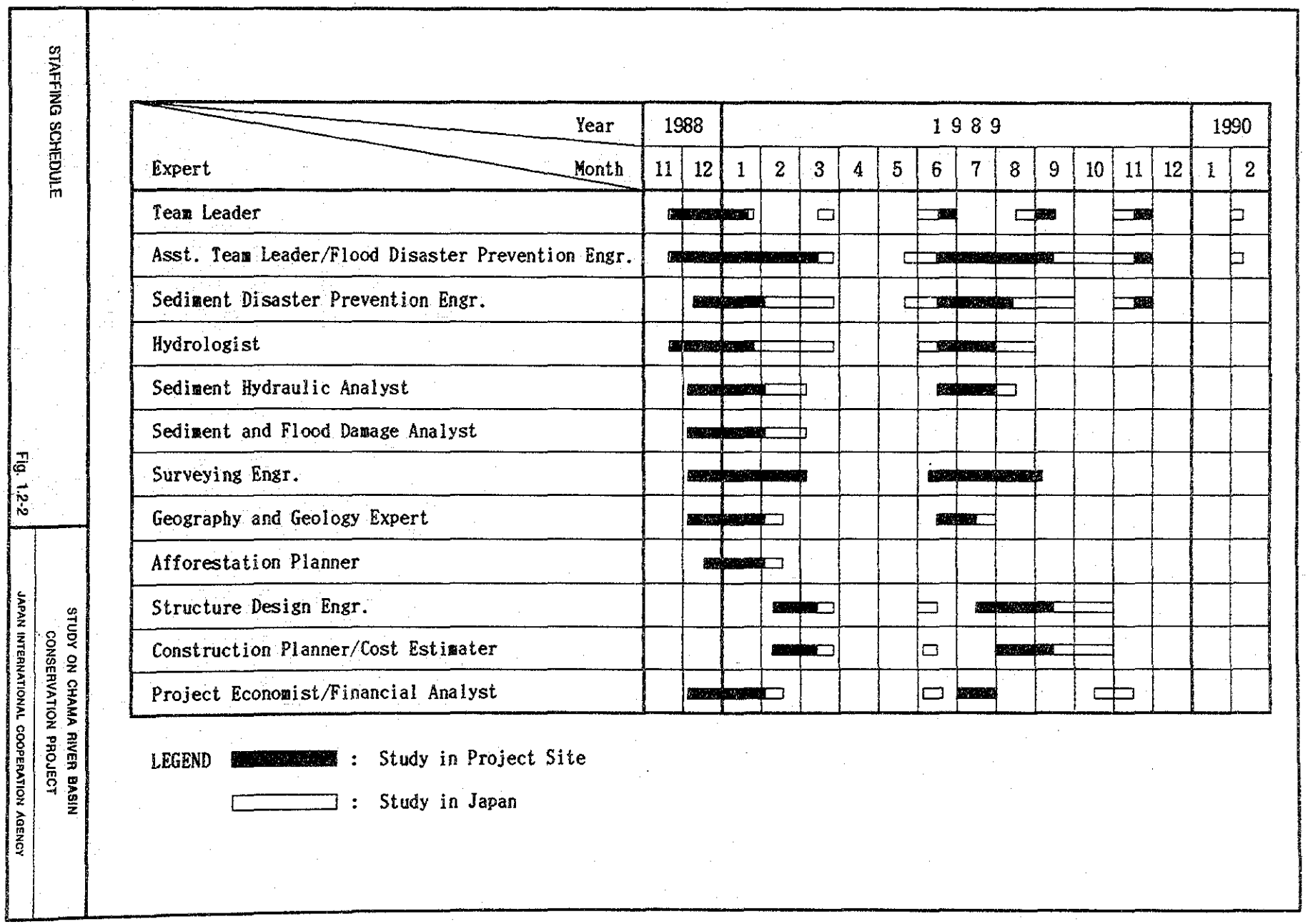
LEGEND
- : Study in Project Site
- : Study in Japan
- * : Submission of Report

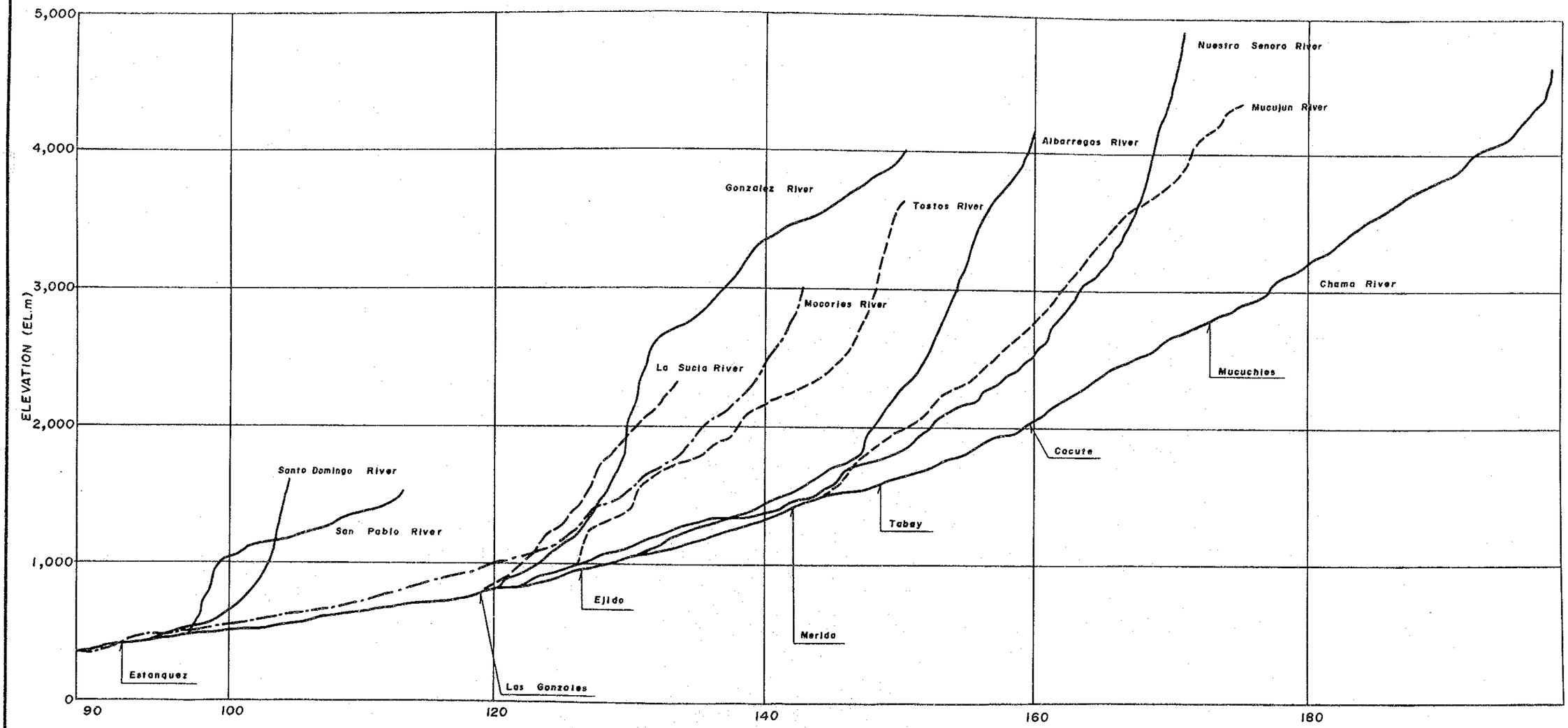
IC/R : Inception Report
P/R (I) : Progress Report (I)
IT/R : Interim Report
P/R(II): Progress Report(II)
DF/R : Draft Final Report
F/R : Final Report

Fig. 1.2-1

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

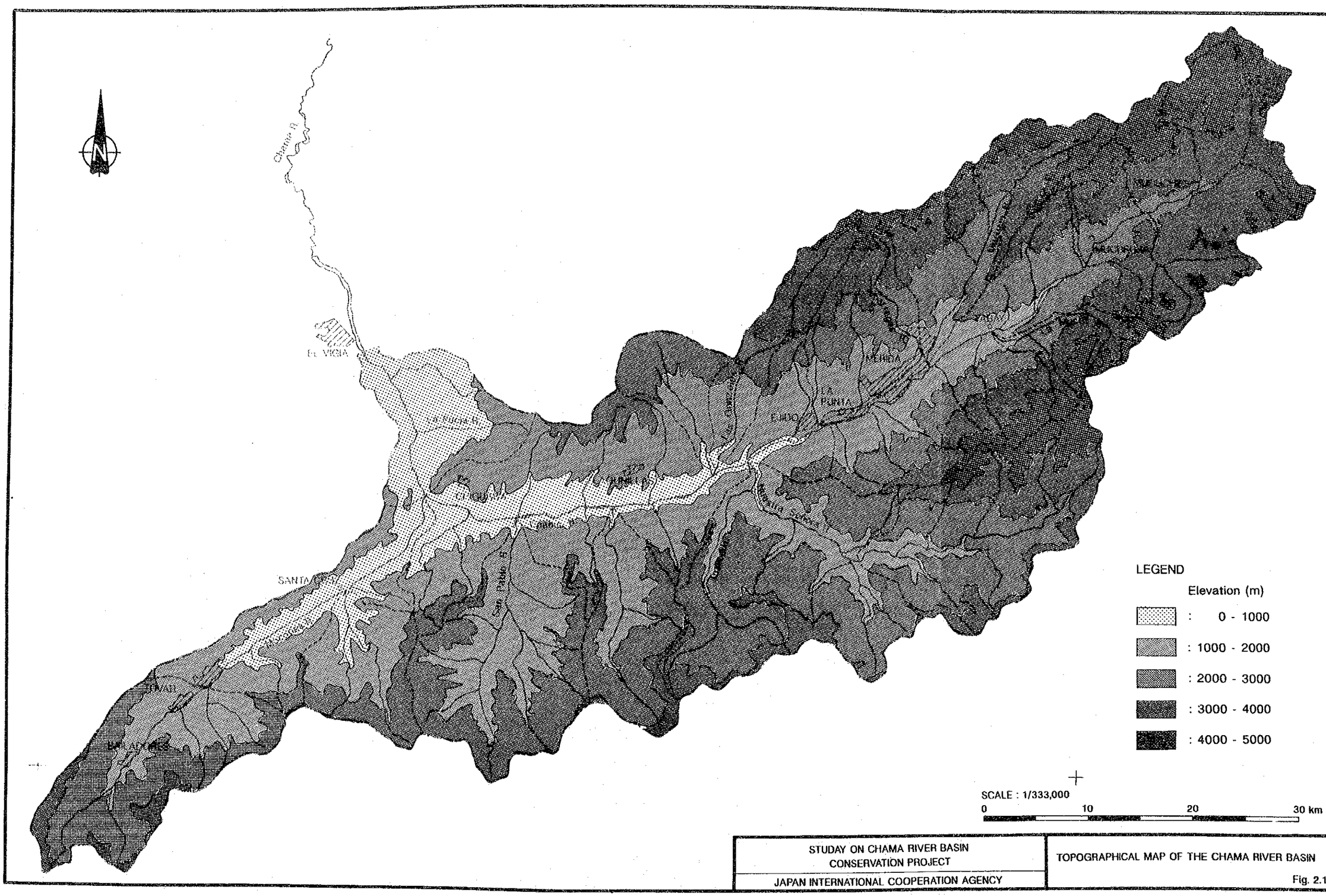

STAFFING SCHEDULE
Fig. 1.2-2
STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY
Year
Month
Expert
1988
1989
1990
11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2
Team Leader
Asst. Team Leader/Flood Disaster Prevention Engr.
Sediment Disaster Prevention Engr.
Hydrologist
Sediment Hydraulic Analyst
Sediment and Flood Damage Analyst
Surveying Engr.
Geography and Geology Expert
Afforestation Planner
Structure Design Engr.
Construction Planner/Cost Estimater
Project Economist/Financial Analyst
LEGEND : Study in Project Site
: Study in Japan



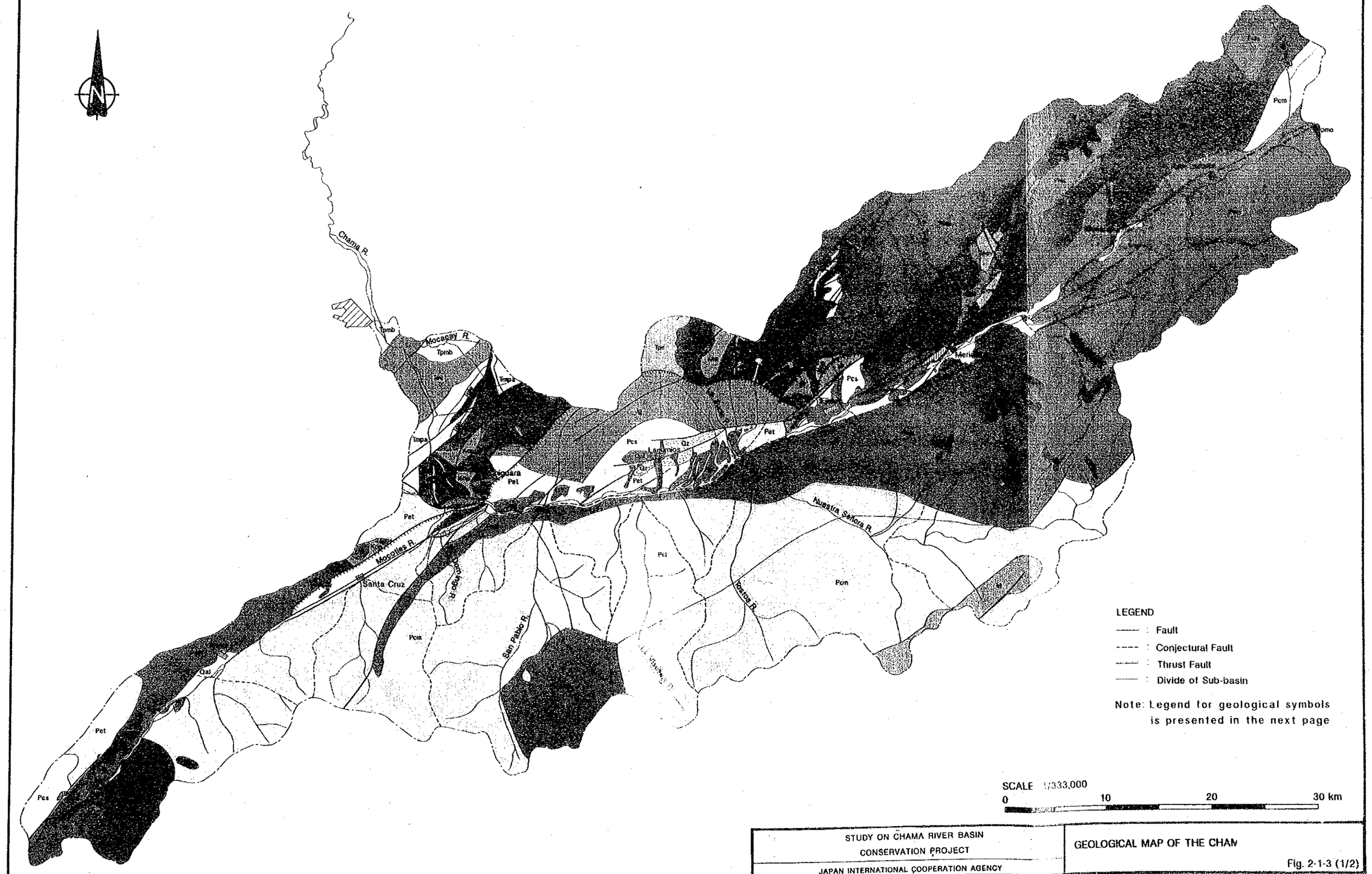
Scale V : 1/30,000

H : 1/300,000

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	LONGITUDINAL PROFILE OF THE CHAMA RIVER AND MAJOR TRIBUTARIES Fig. 2.1-1



STUDAY ON CHAMA RIVER BASIN CONSERVATION PROJECT	TOPOGRAPHICAL MAP OF THE CHAMA RIVER BASIN
JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 2.1-2



STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	GEOLOGICAL MAP OF THE CHAM Fig. 2-1-3 (1/2)

Chart	Symbol	Formation	Facies	Epoch	Era
	Qal	Alluvium Deposits	Gravel, Sand, Silt, Clay	Holocene	Cenozoic Quaternary
	Qpmo	Moraine Deposits	Gravel, Sand, Silt, Clay, Peat	Holocene	
	Qpt	Terrace Deposits	Gravel, Sand	Pleistocene	
	Qz	Tectonicted Quaternary Deposits	Conglomerate	Pleistocene	
	Tpmb	Betijoque Formation	Mudstone, Conglomerate	Pliocene	Cenozoic Tertiary
	Tmi	Isnotu Formation	Mudstone, Sandstone	Miocene	
	Tmm	Mucujún Formation	Sandstone, Calcareous Shale	Miocene	
	Tmpa	Palmar Formation	Sandstone, Mudstone, Shale	Miocene	
	Tole	León Formation	Shale	Oligocene	
	Teca	Carbonera Formation	Sandy Shale, Coal	Eocene	
	Tpev	El Valle Formation	Mudstone, Sandstone	Paleocene-Eocene	
	Tpe	Unidentified Tertiary	Mudstone, Sandstone	Paleocene-Eocene	
	Kc	Colon Formation	Shale	Upper Cretaceous	Mesozoic
	Kl	La Luna Formation	Limestone	Upper Cretaceous	
	Kcp	Capacho Formation	Shale, Siltstone, Limestone	Middle Cretaceous	
	Kag	Aguardiente Formation	Sandstone, Limestone, Shale	Middle Cretaceous	
	Ka	Apon Formation	Limestone, Calcareous Shale	Lower Cretaceous	
	Karn	Apon Formation and Río Negro Formation	Limestone, Shale, Sandstone	Lower Cretaceous	
	Krn	Río Negro Formation	Sandstone, Arkose, Conglomerate, Shale	Lower Cretaceous	
	Jq	La Quinta Formation	Red Sandstone, Siltstone, Conglomerate	Jurassic	
	M	Unidentified Mesozoic			
	Ppp	Palmarito Formation	Shale, Maristone, Limestone	Permian	Paleozoic
	Pcs	Sabaneta Formation	Siltstone, Sandstone	Carboniferous	
	Pcm	Mucuchachi Formation	Slate, Metasandstone, Green Schist	Carboniferous	
	Pet	Tostos Formation	Phyllite, Slate, Green Schist, Gneiss		Pre-Cambrian
	Peis	Sierra Nevada Formation	Schist, Gneiss, Migmatite		
	Gr	Granite of El Carmen, Monzonite of La Carlota, Others	Granodirite, Quartz Monzonite		Paleozoic

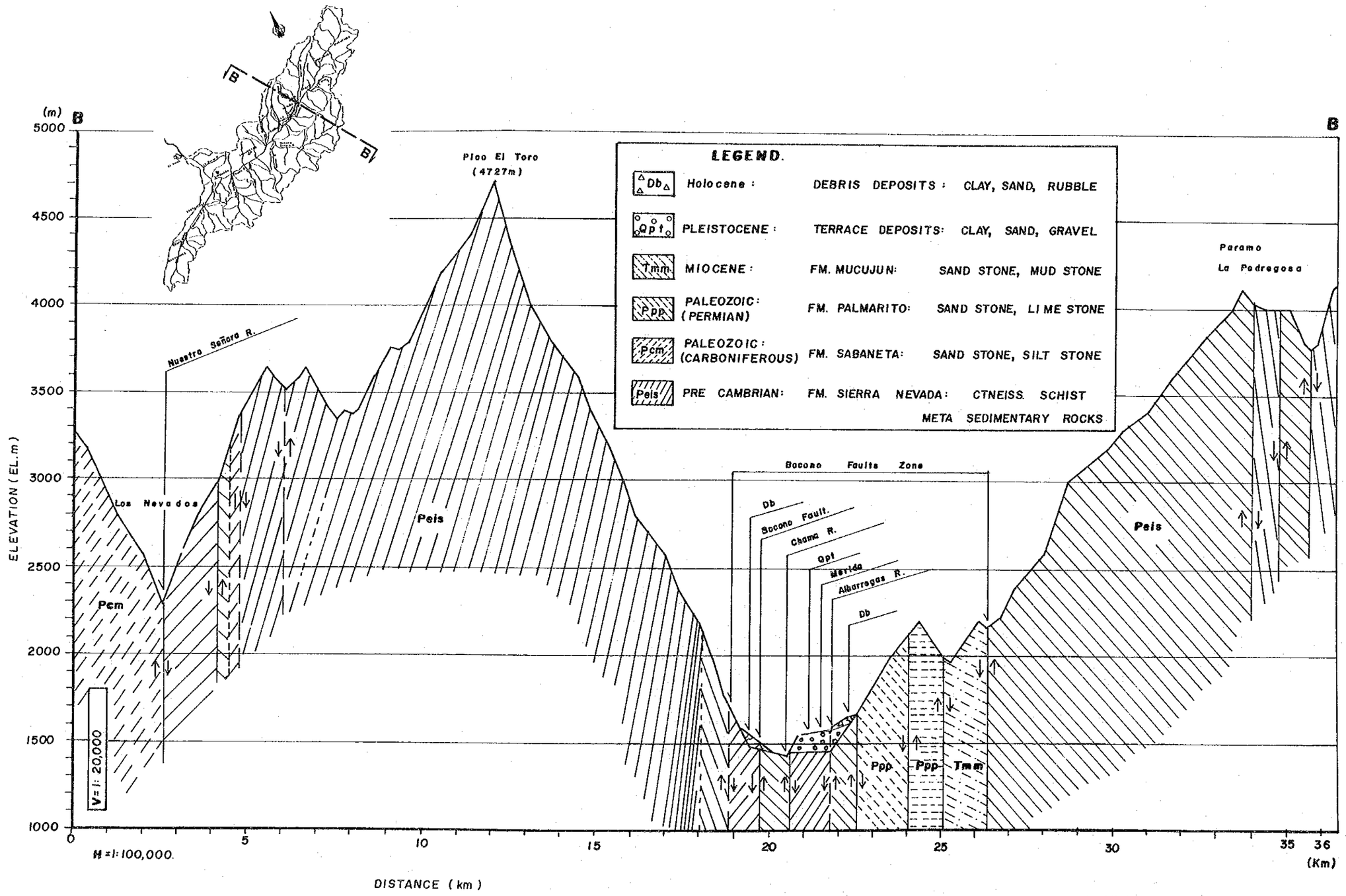
GEOLOGY OF CHAMA RIVER BASIN

GEOLOGICAL MAP OF THE CHAMA RIVER BASIN

Fig. 2-1-3 (2/2)

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

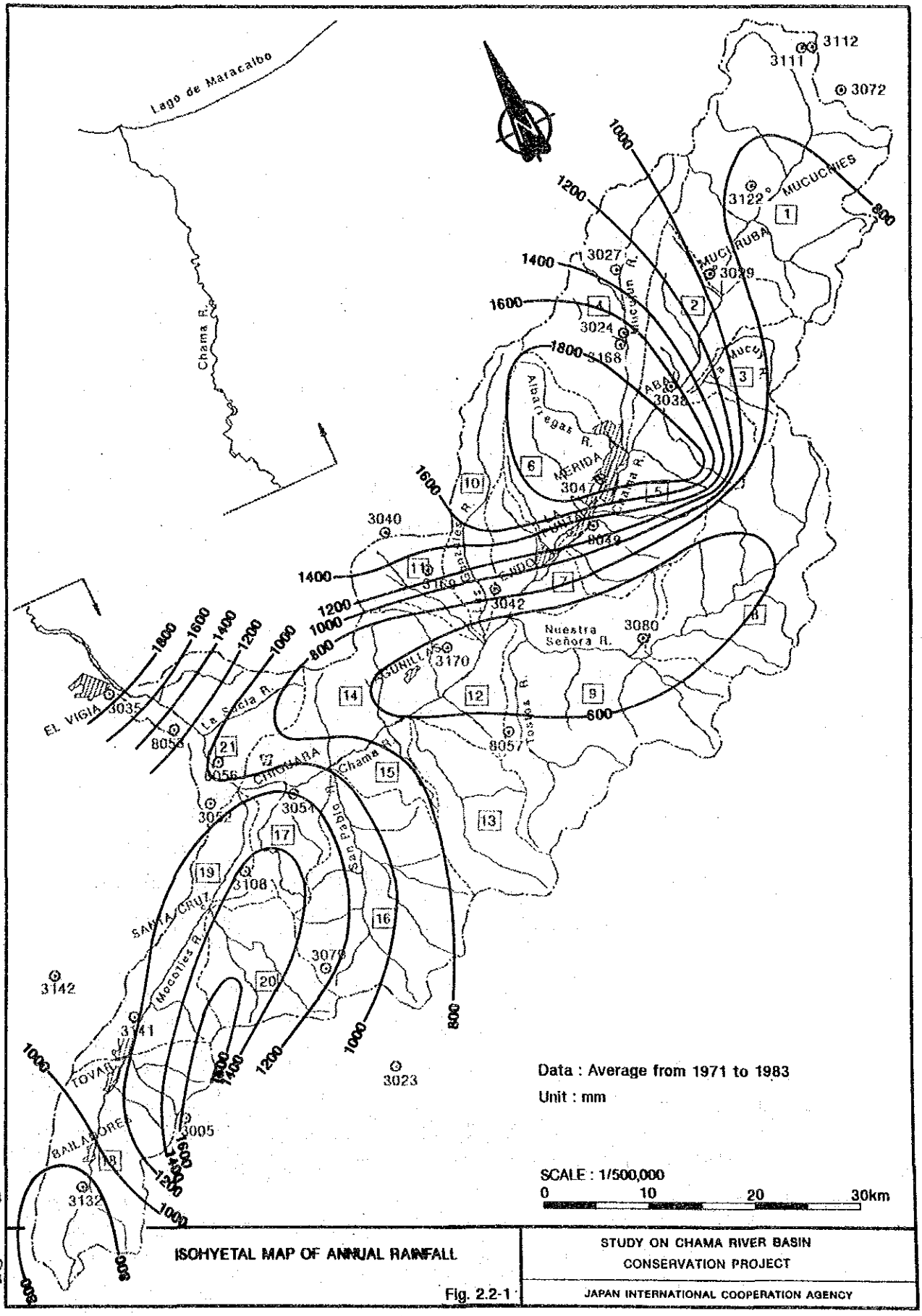


STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

GEOLOGICAL CROSS SECTIONS OF THE CHAMA RIVER BASIN

Fig. 2.1-4

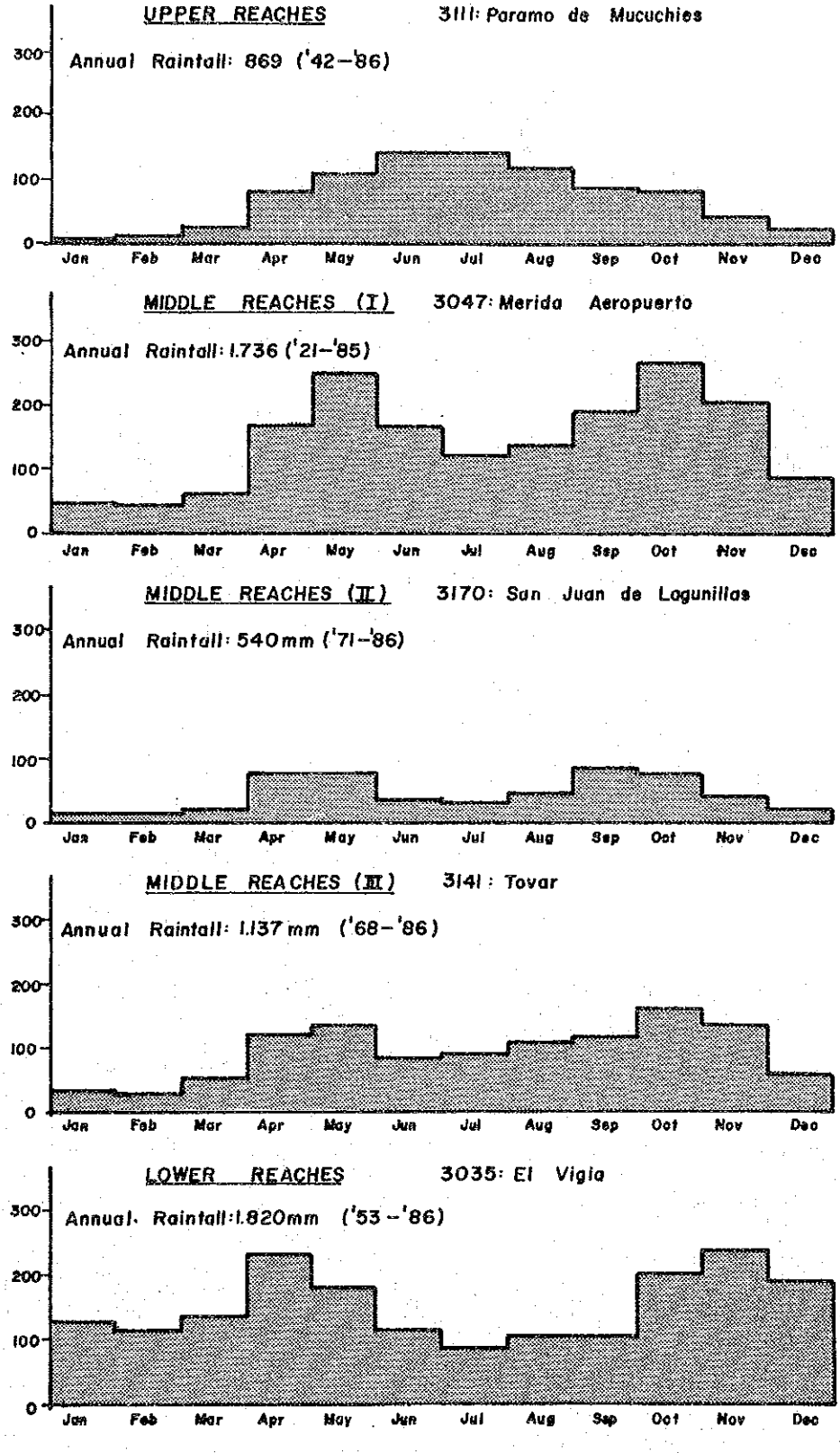


ISOHYETAL MAP OF ANNUAL RAINFALL

Fig. 2.2-1

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

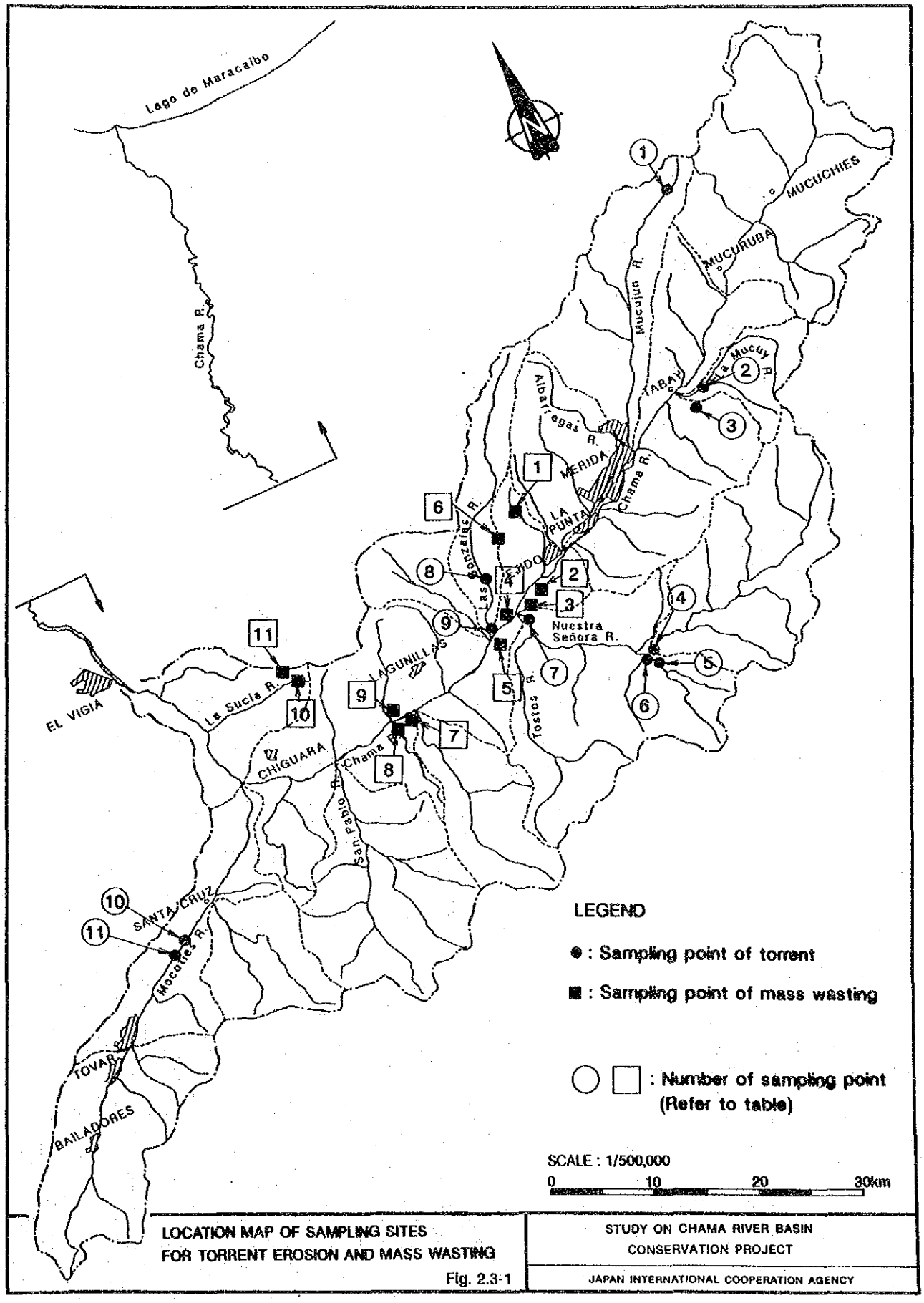


ANNUAL RAINFALL PATTERNS

Fig. 2.2-2

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

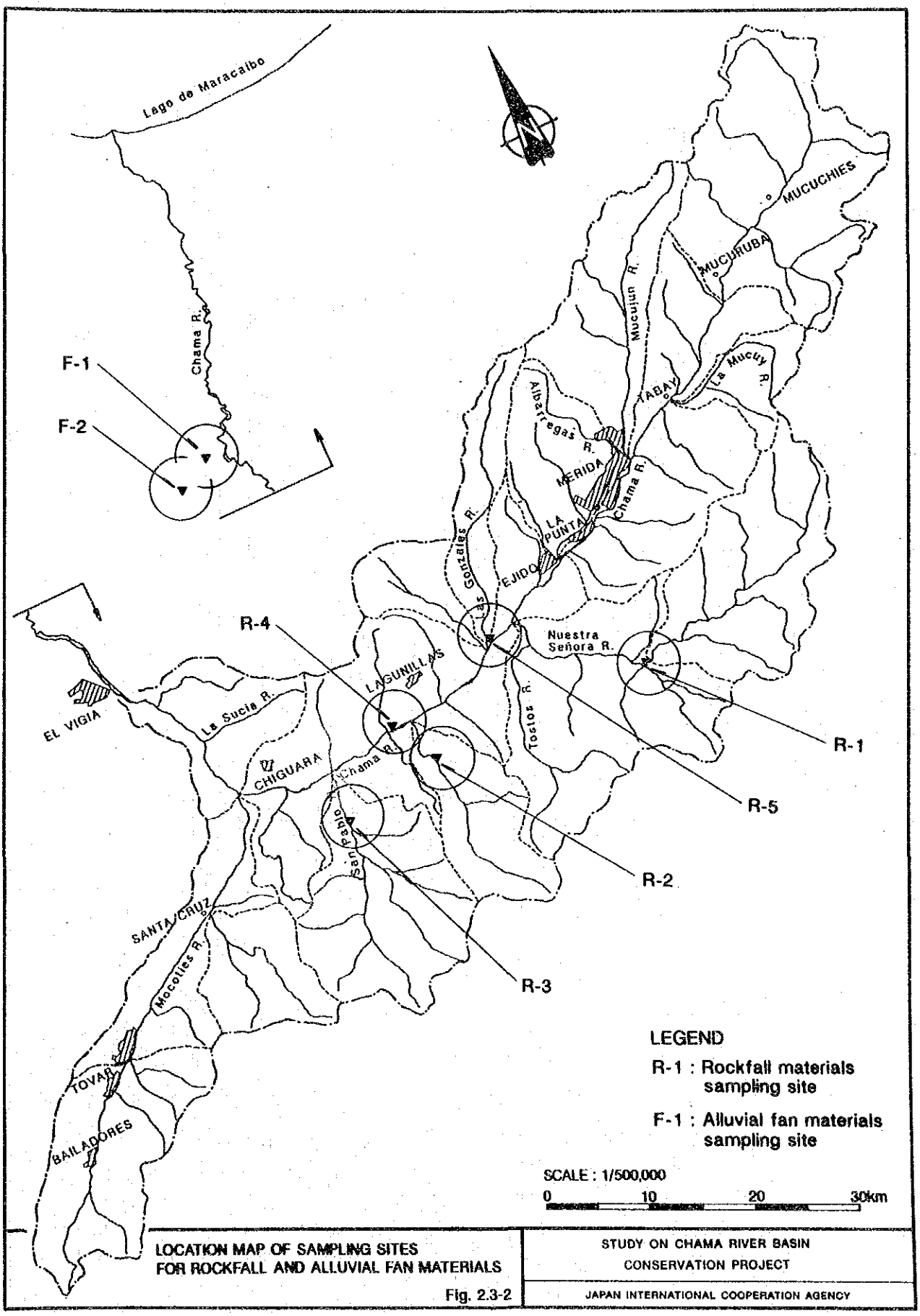


LOCATION MAP OF SAMPLING SITES FOR TORRENT EROSION AND MASS WASTING

Fig. 2.3-1

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

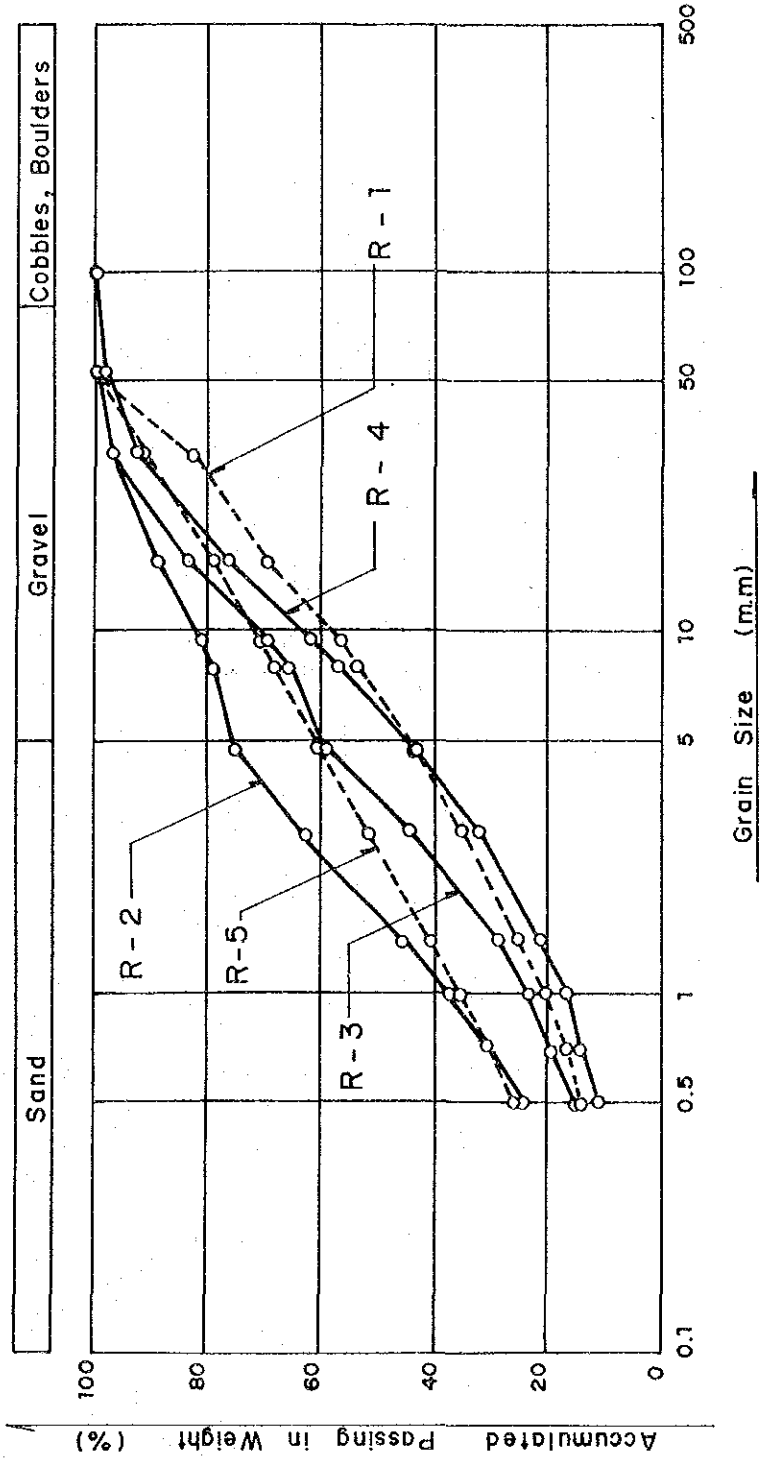


LOCATION MAP OF SAMPLING SITES FOR ROCKFALL AND ALLUVIAL FAN MATERIALS

Fig. 2.3-2

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

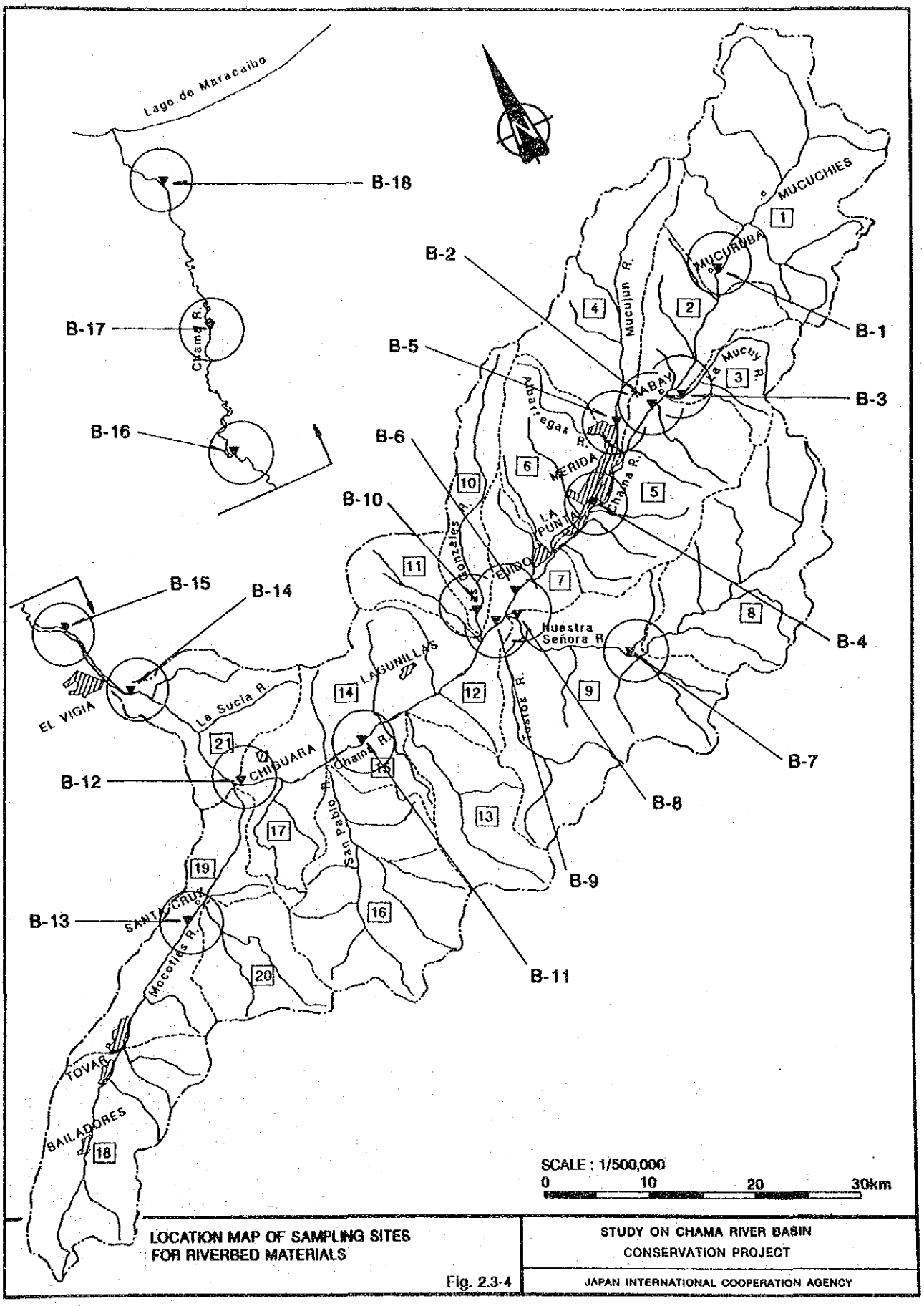


GRAIN SIZE ACCUMULATION CURVES OF ROCKFALL MATERIALS

Fig. 2.3-3

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

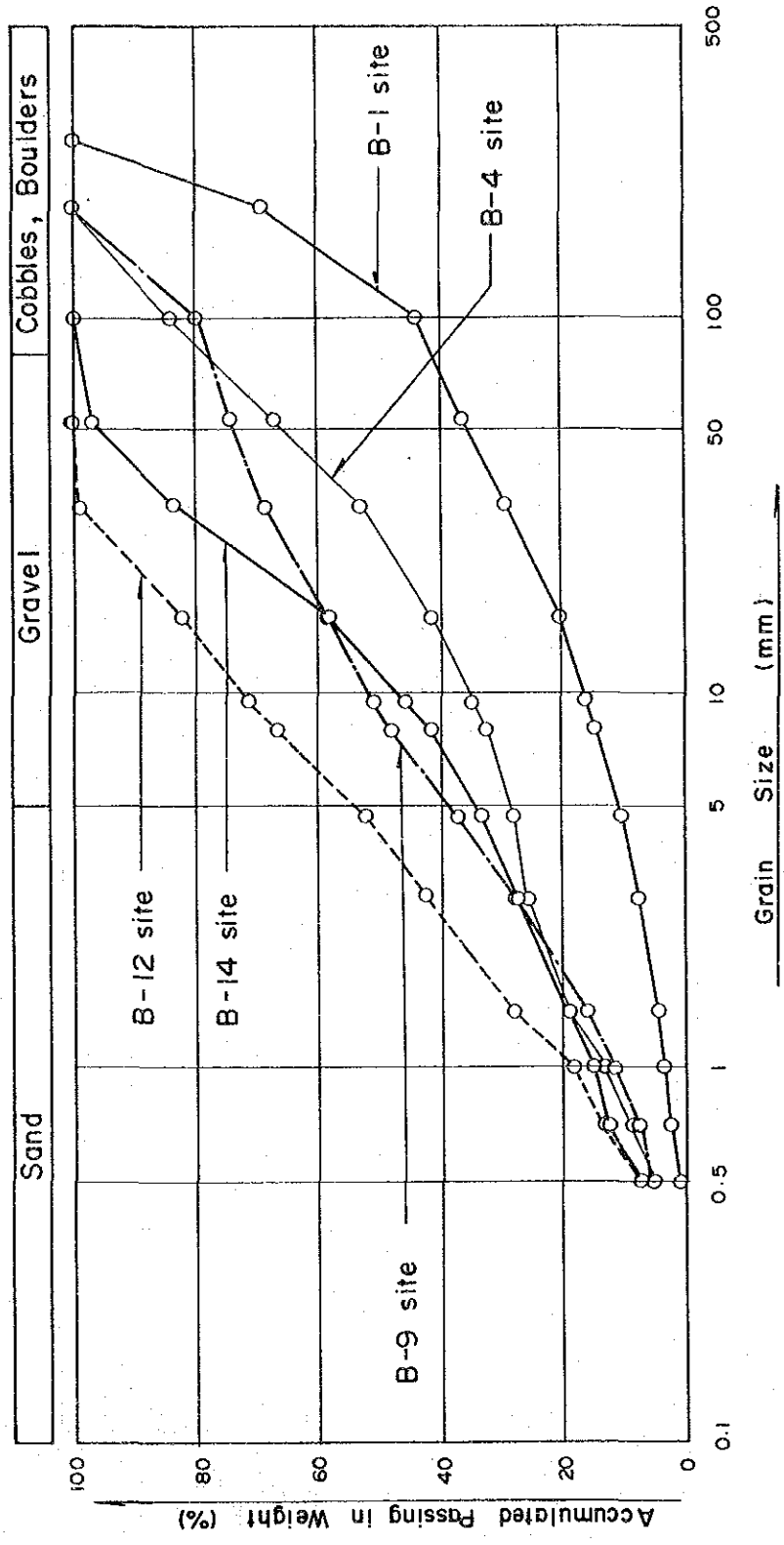


LOCATION MAP OF SAMPLING SITES FOR RIVERBED MATERIALS

Fig. 2.3-4

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

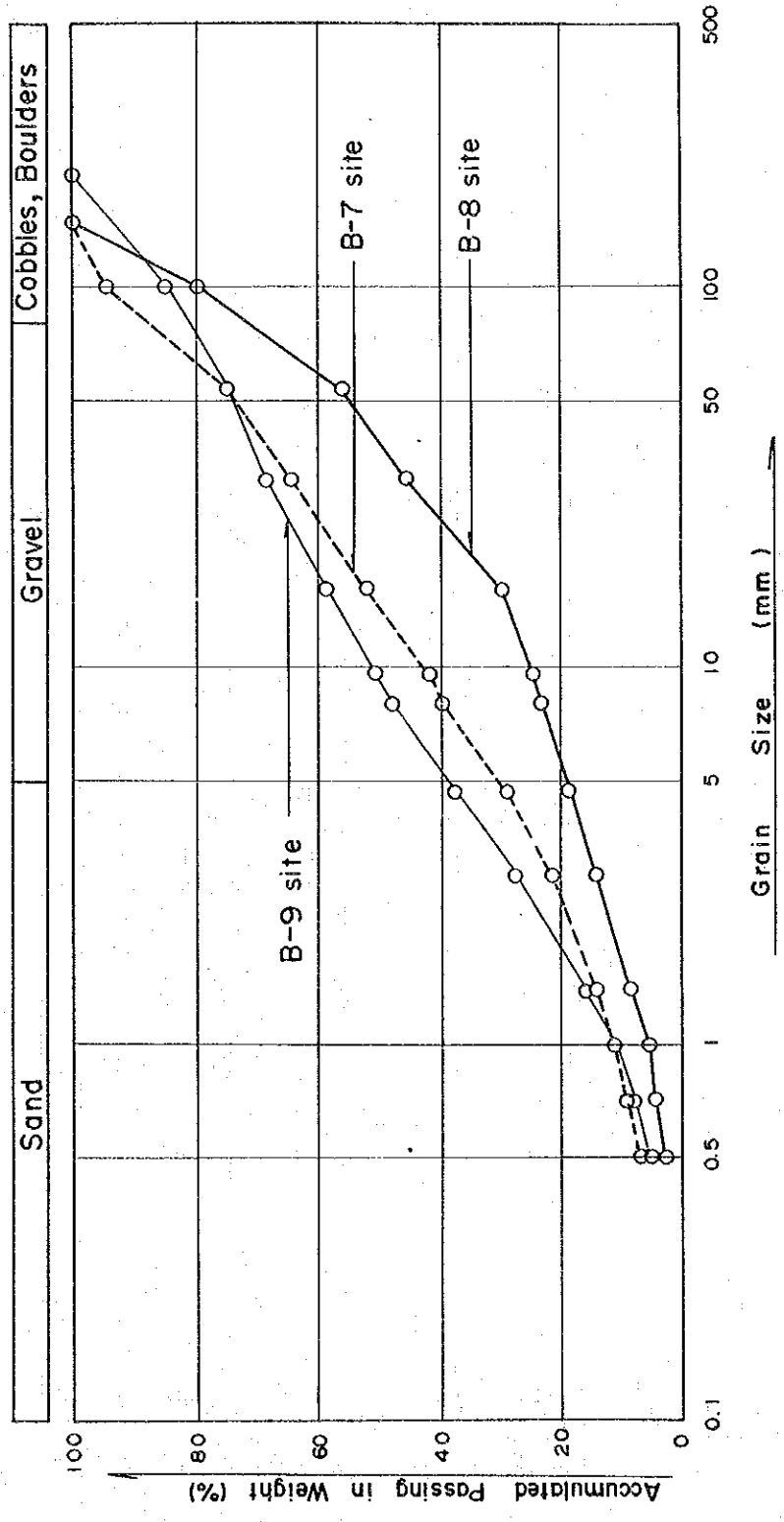


GRAIN SIZE ACCUMULATION CURVES OF RIVERBED MATERIALS IN CHAMA RIVER

Fig. 2.3-5

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

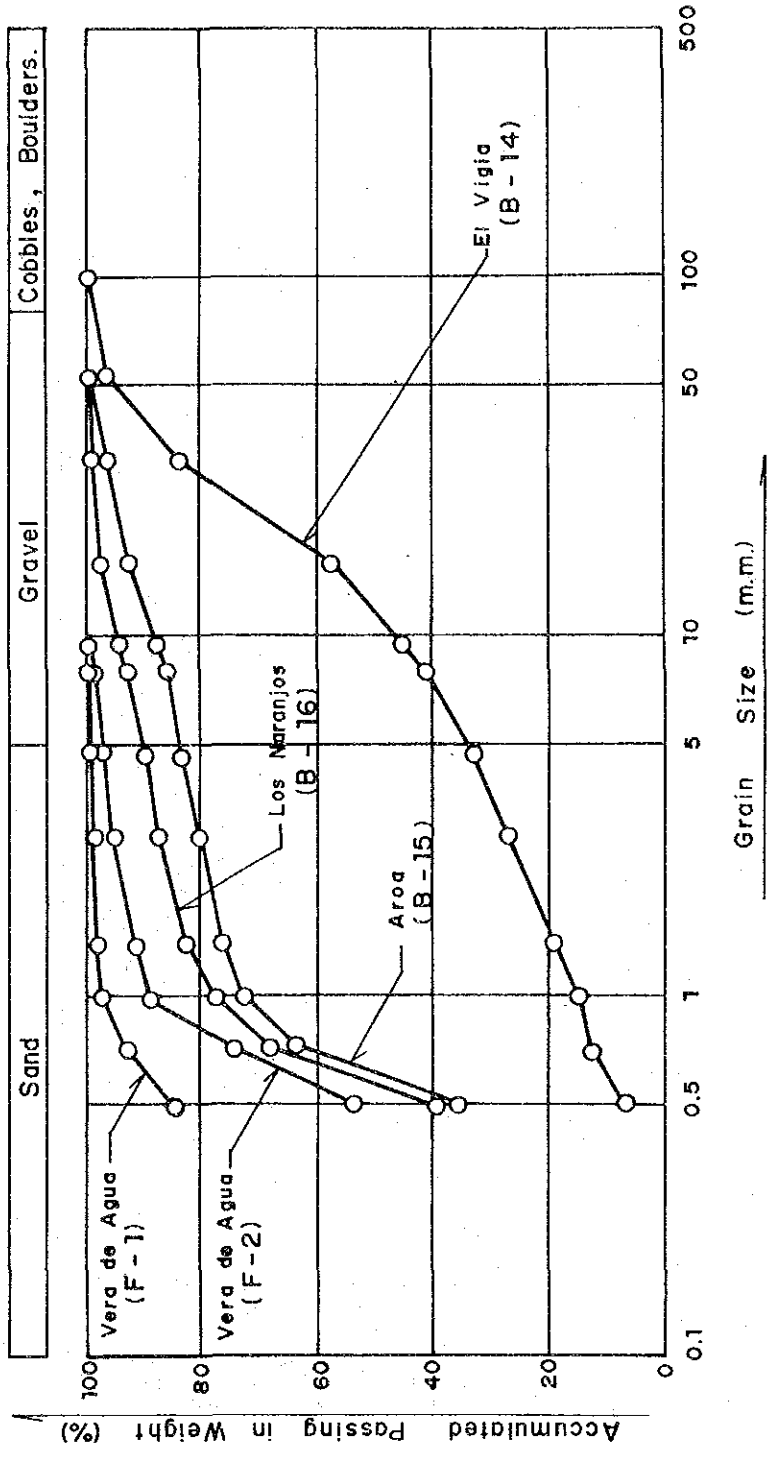


GRAIN SIZE ACCUMULATON CURVES OF RIVERBED MATERIALS IN NUESTRA SENORA RIVER

Fig. 2.3-6

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

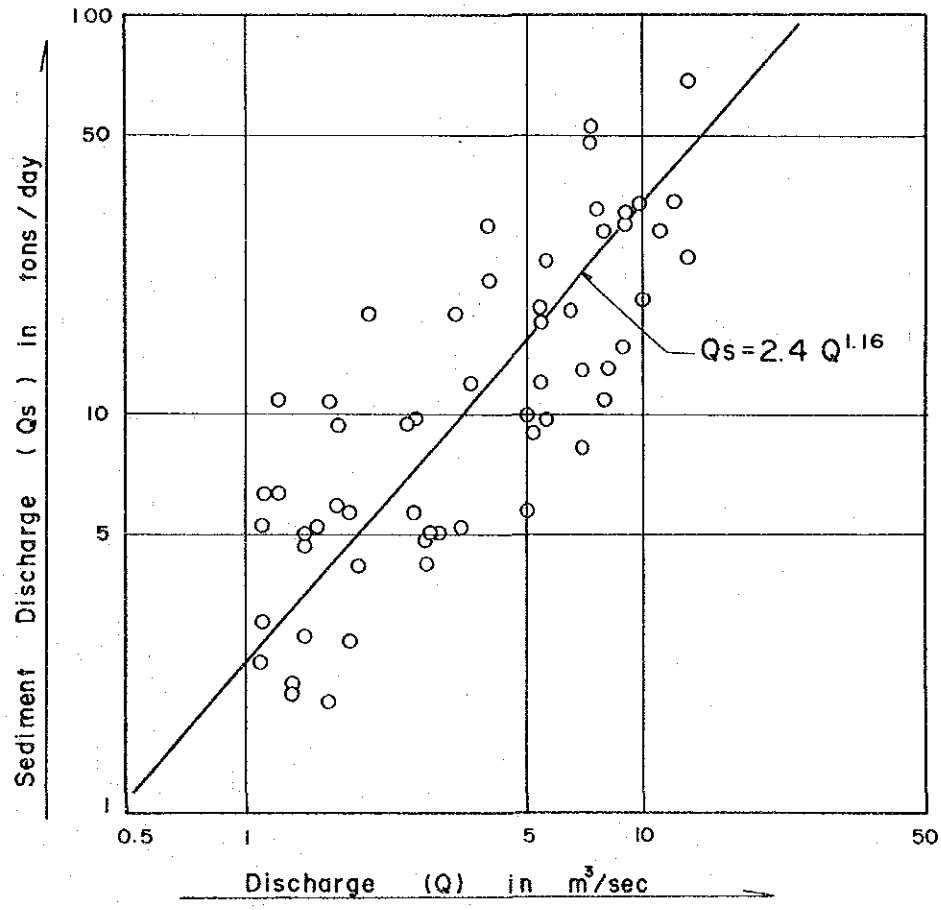


COMPARISON OF GRAIN SIZE ACCUMULATION CURVES FOR RIVERBED MATERIALS WITH ALLUVIAL FAN MATERIALS IN LOWER REACHES OF CHAMA RIVER

Fig. 2.3-7

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

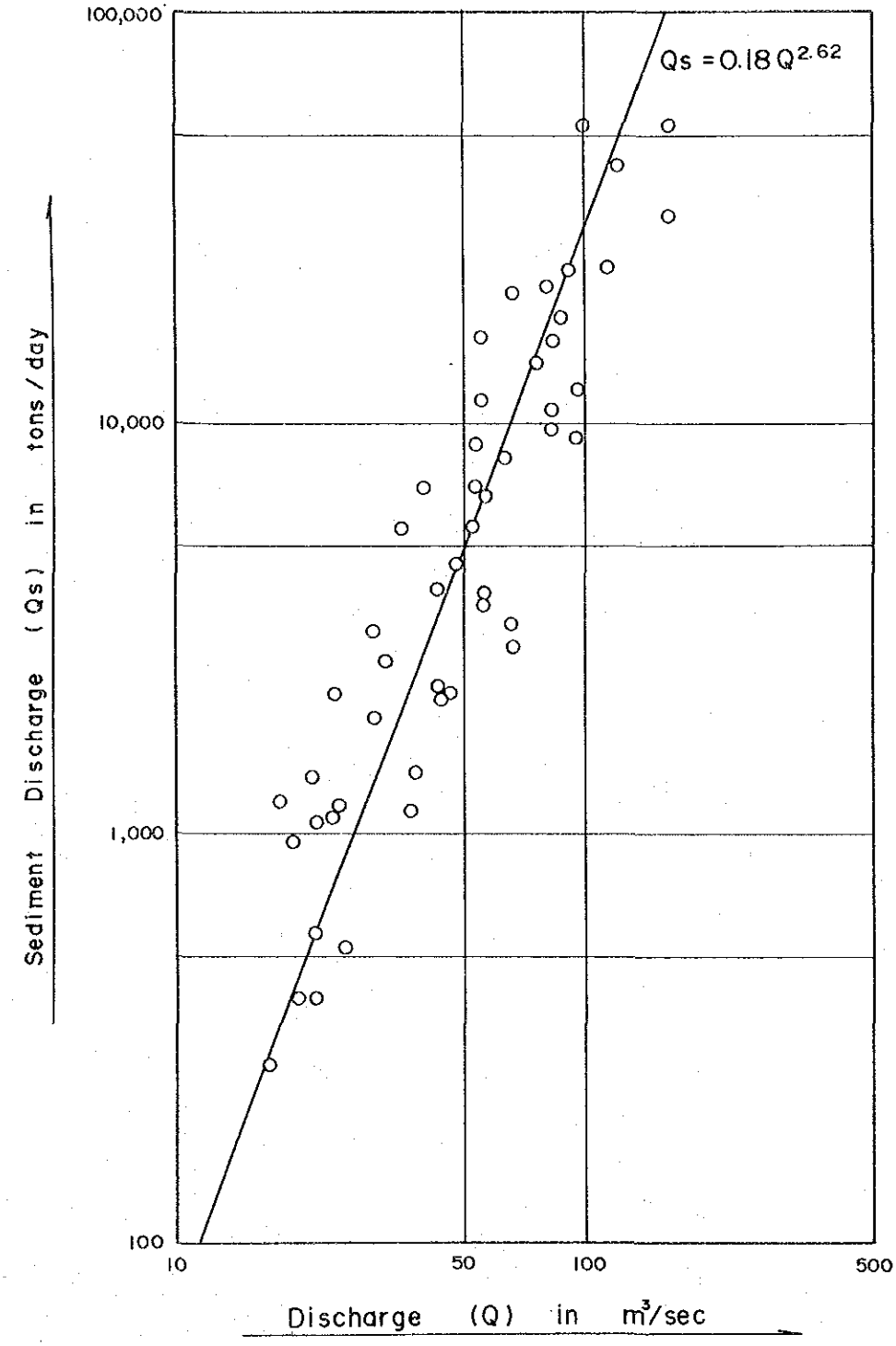


SUSPENDED LOAD RATING CURVE AT MUCURUBÁ STATION

Fig. 2.3-8

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

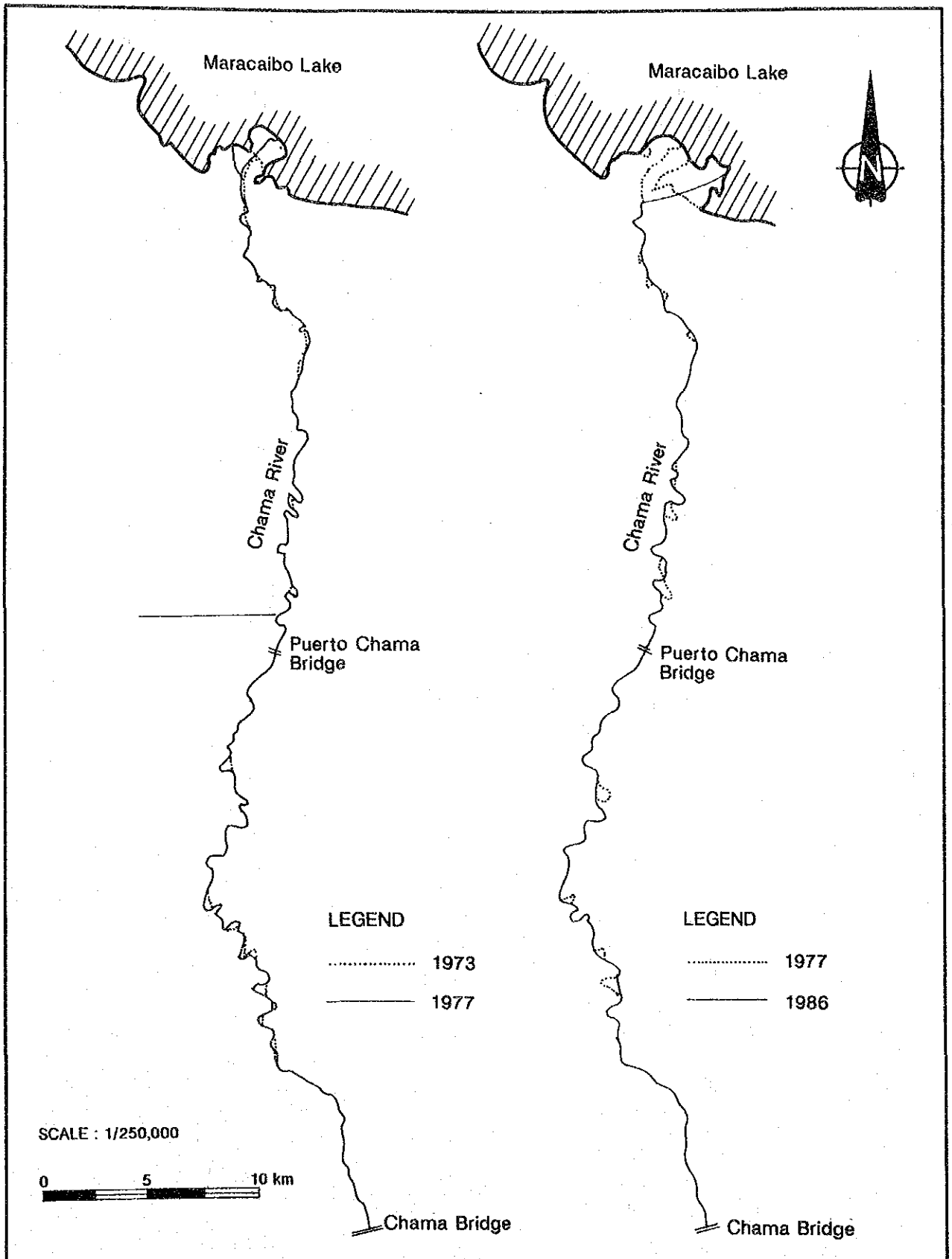


SUSPENDED LOAD RATING CURVE AT PUERTO CHAMA BRIDGE

Fig. 2.3-9

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

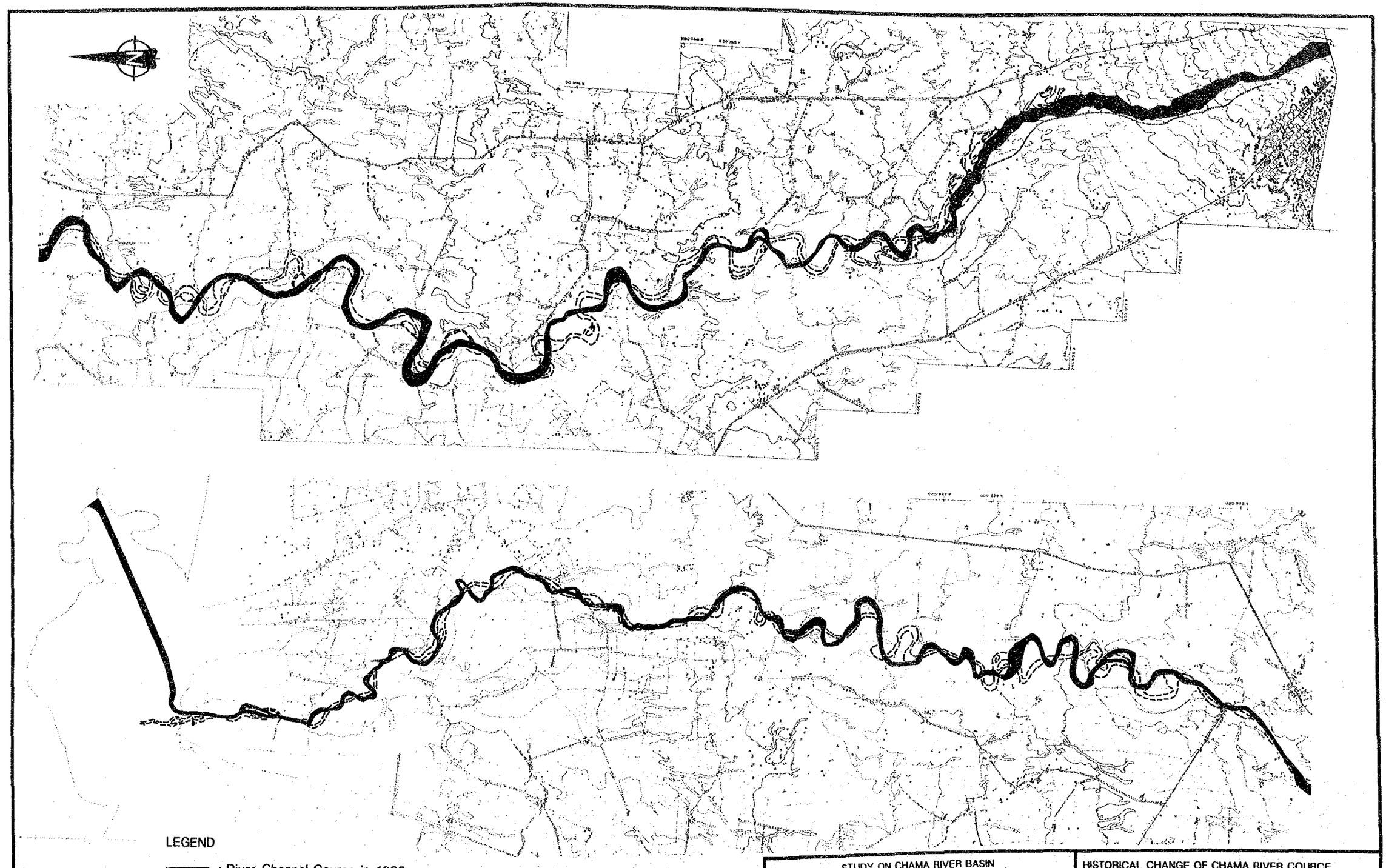


HISTORICAL CHANGE OF CHAMA RIVER COURCE

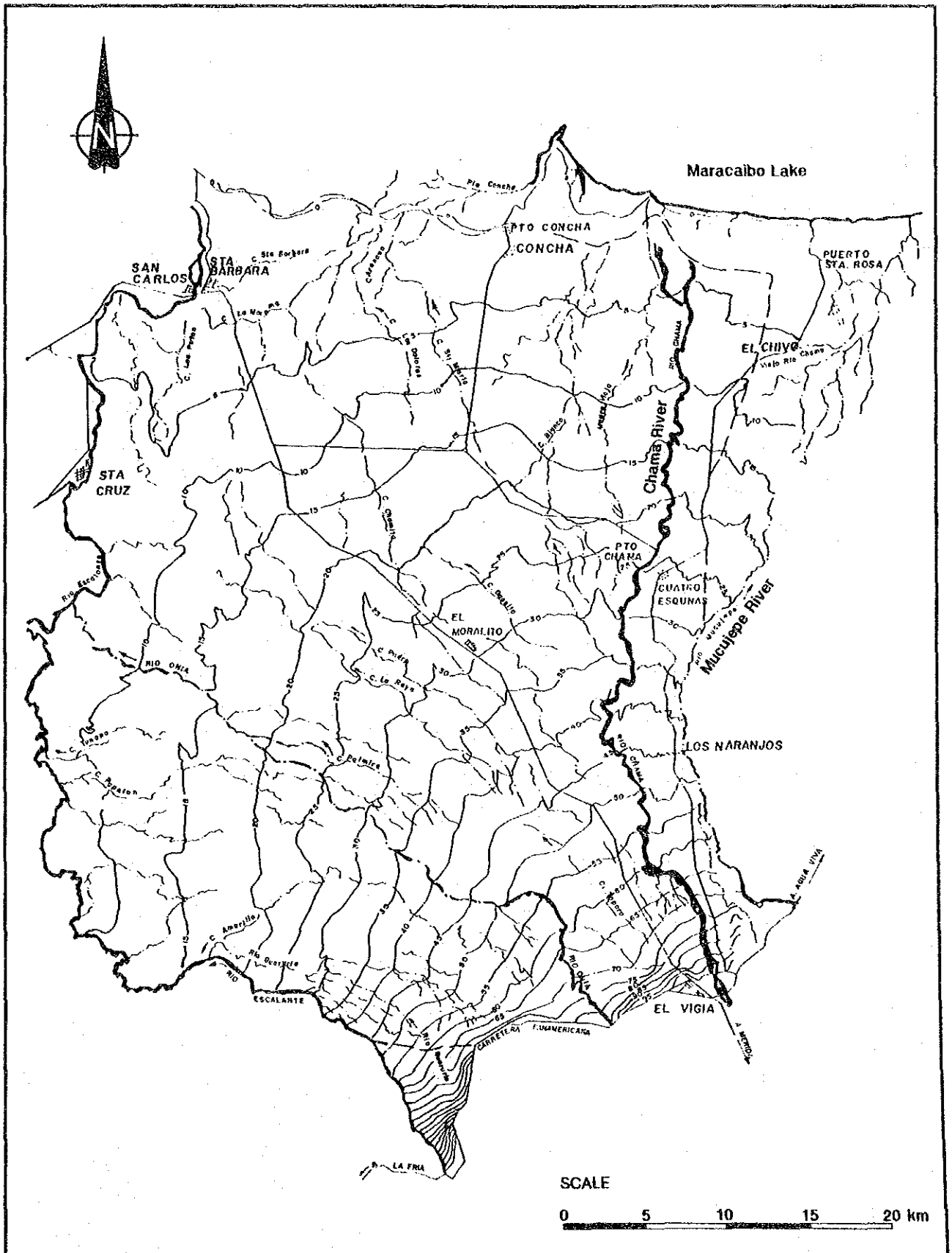
Fig. 2.4-1 (1/2)

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY



STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	HISTORICAL CHANGE OF CHAMA RIVER COURCE Fig. 2-4-1 (2/2)

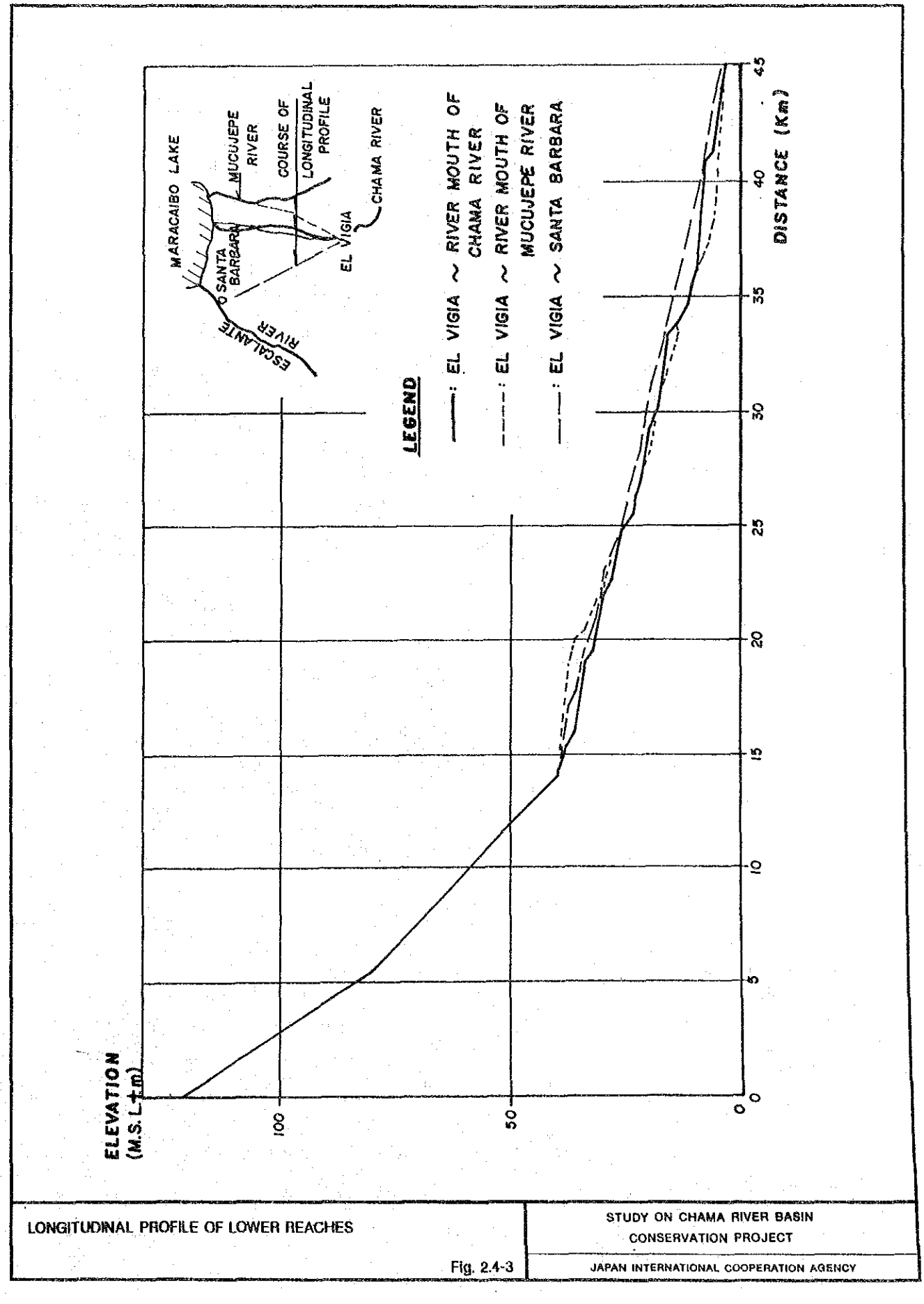


CONTOUR MAP OF THE LOWER REACHES

Fig. 2.4-2

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

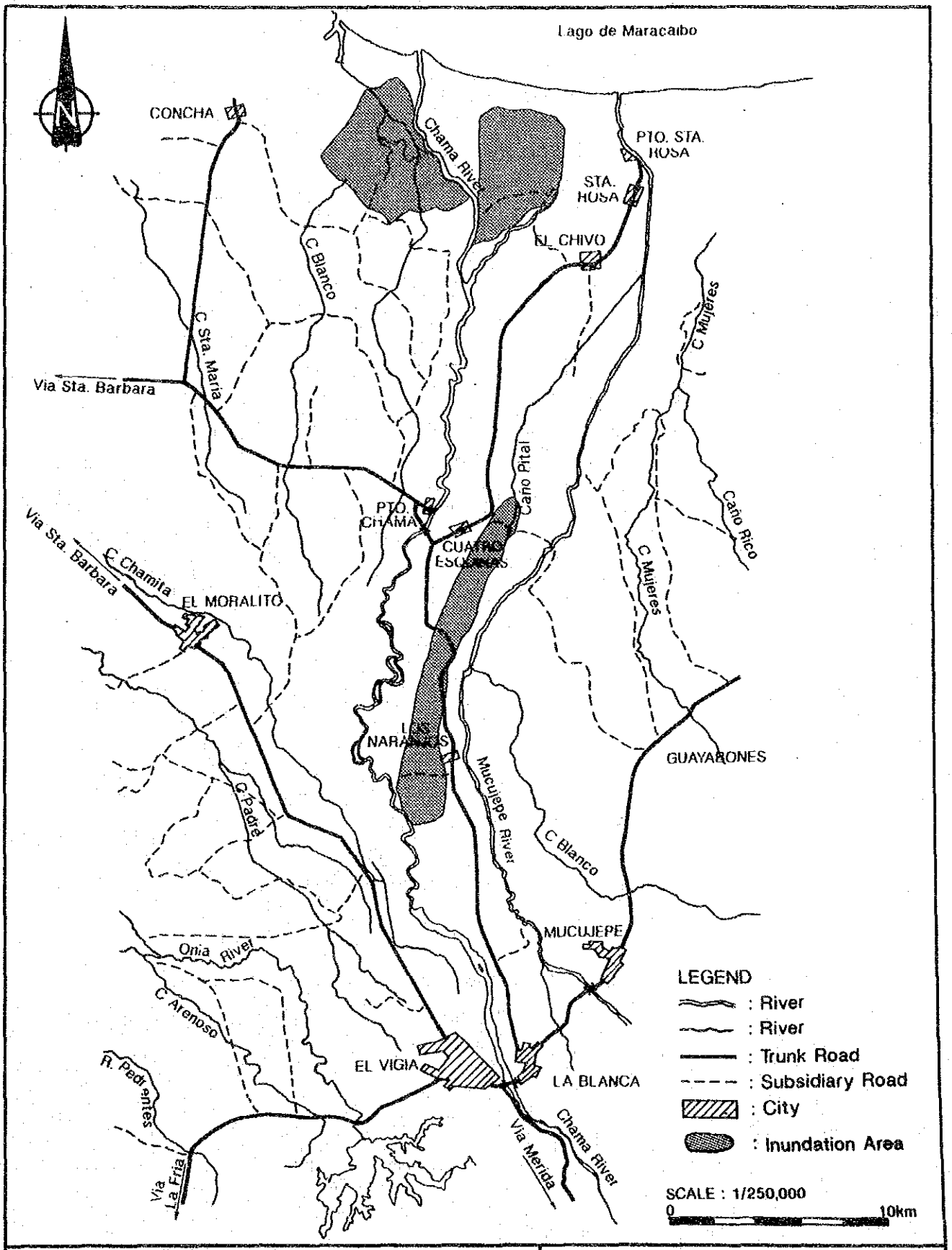


LONGITUDINAL PROFILE OF LOWER REACHES

Fig. 2.4-3

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

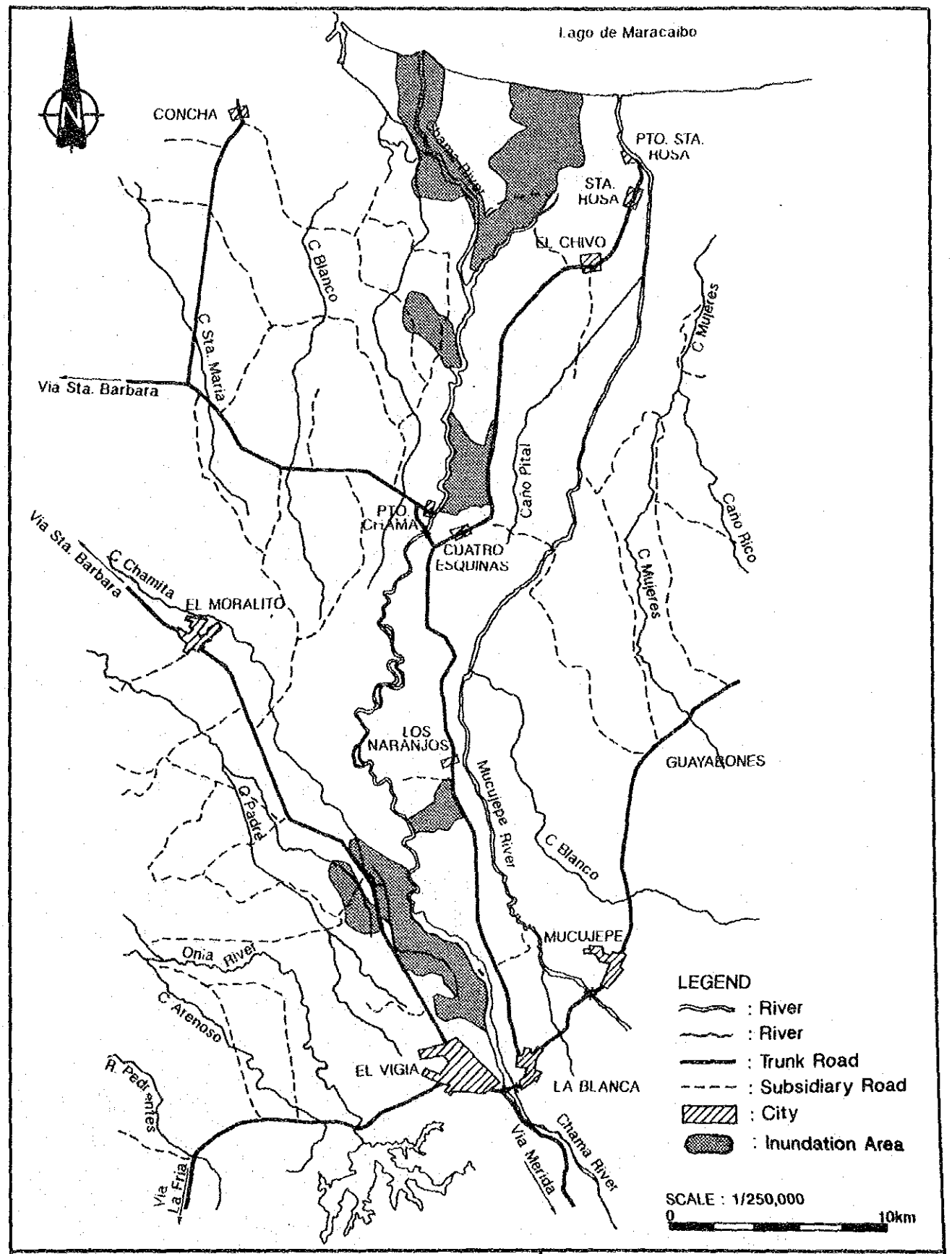


INUNDATION AREA BY 1972 FLOOD

Fig. 2.5-1

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

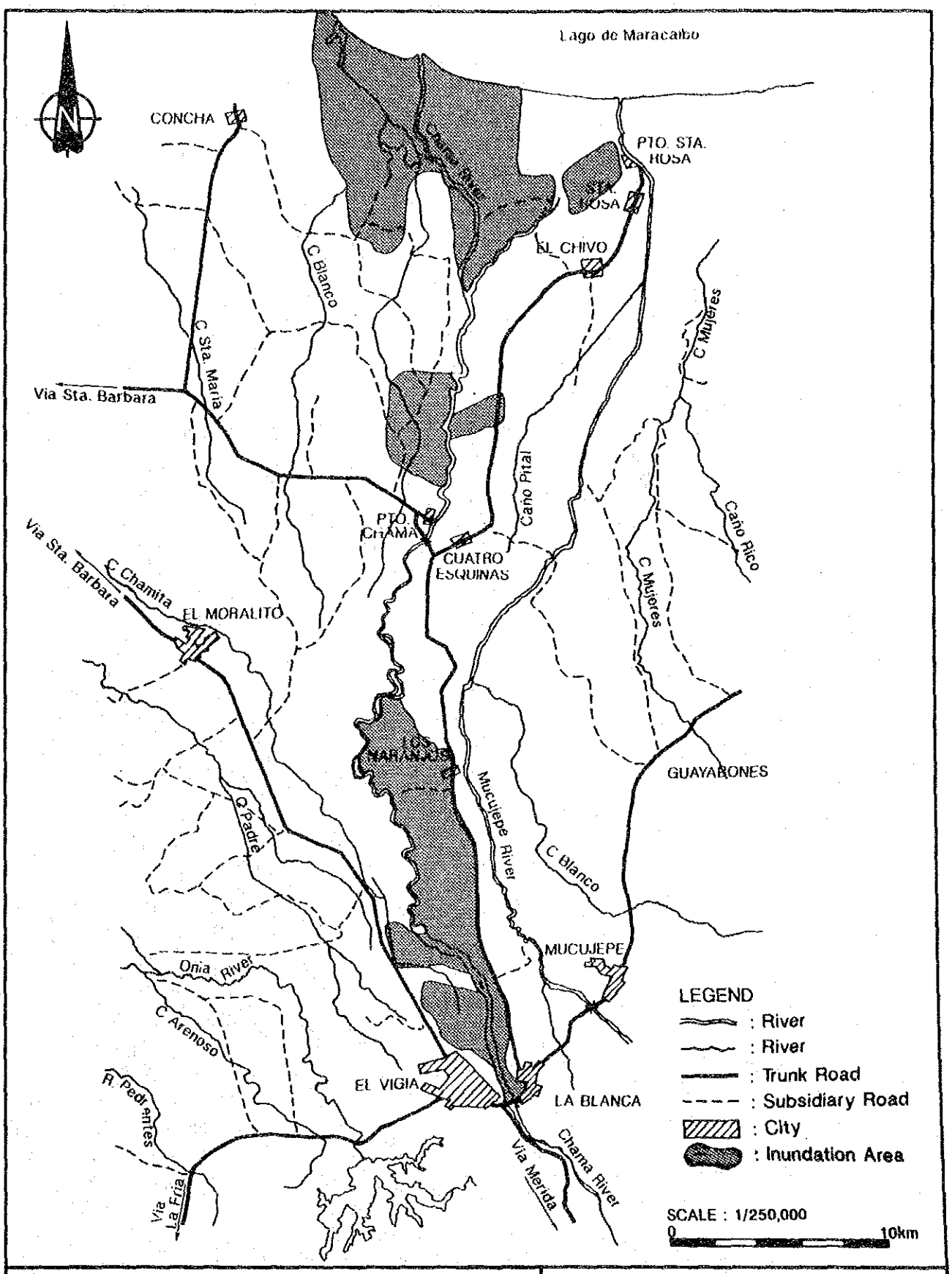


INUNDATION AREA BY 1982 FLOOD

Fig. 2.5-2

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

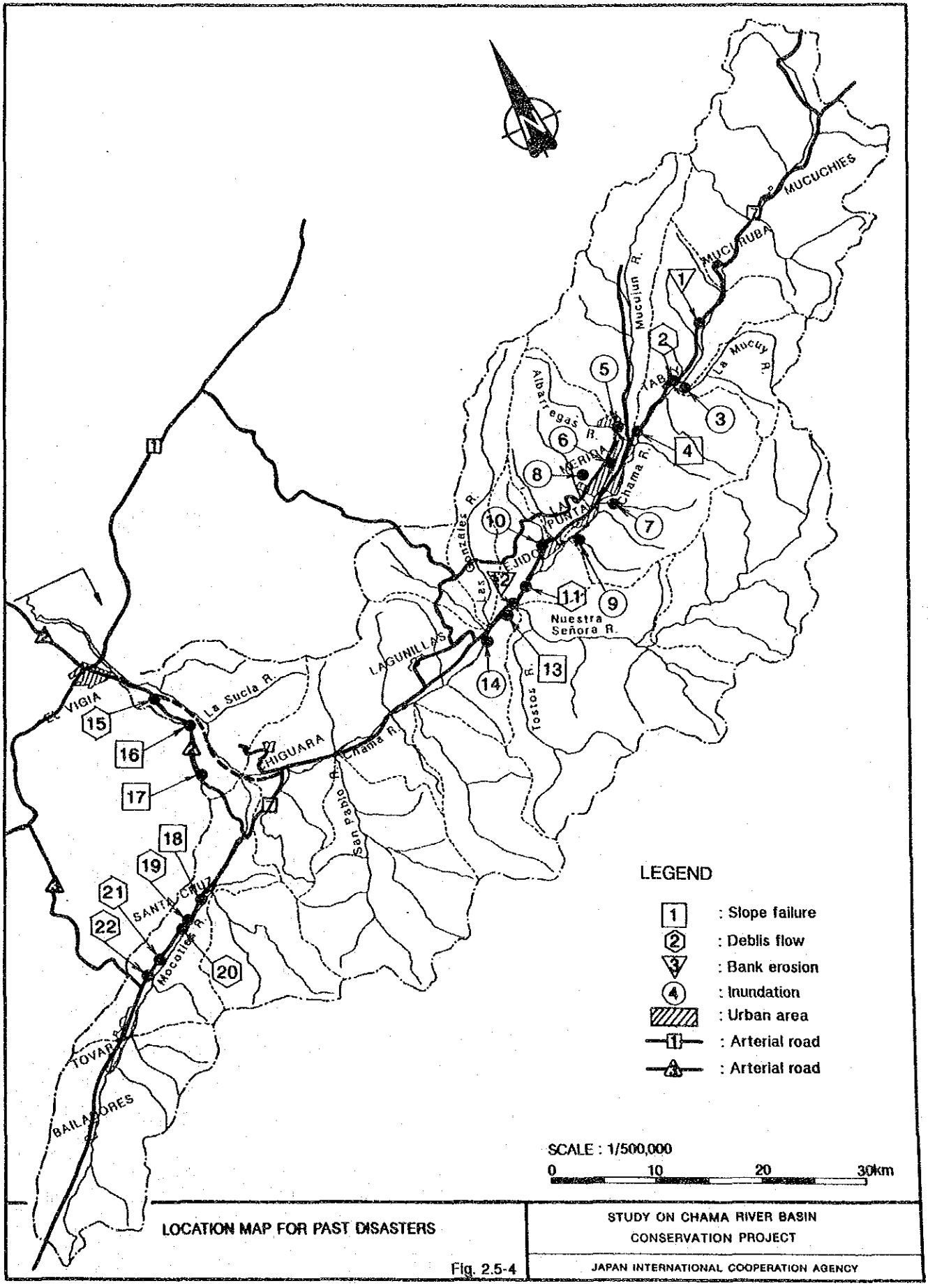


INUNDATION AREA BY 1988 FLOOD

Fig. 2.5-3

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

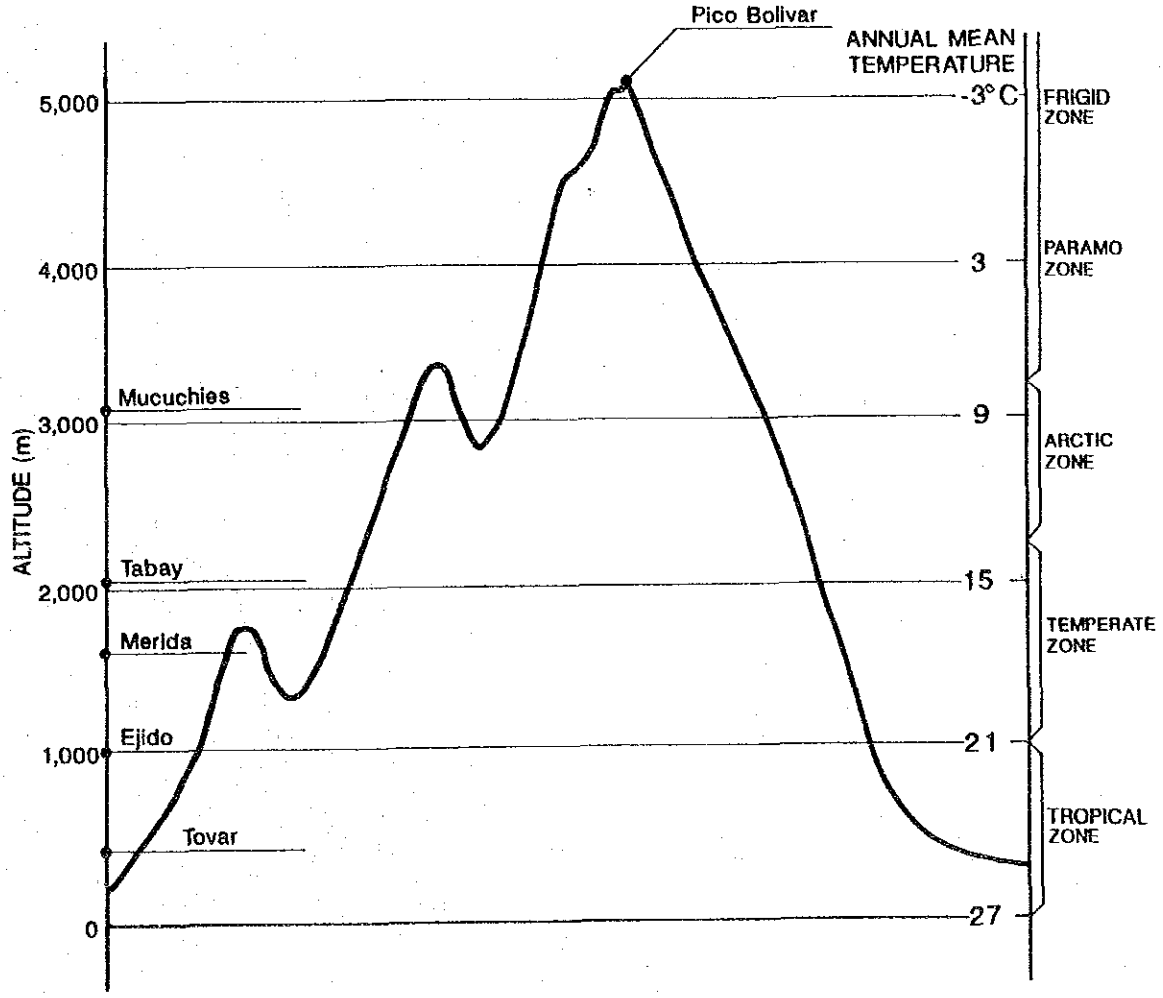


LOCATION MAP FOR PAST DISASTERS

Fig. 2.5-4

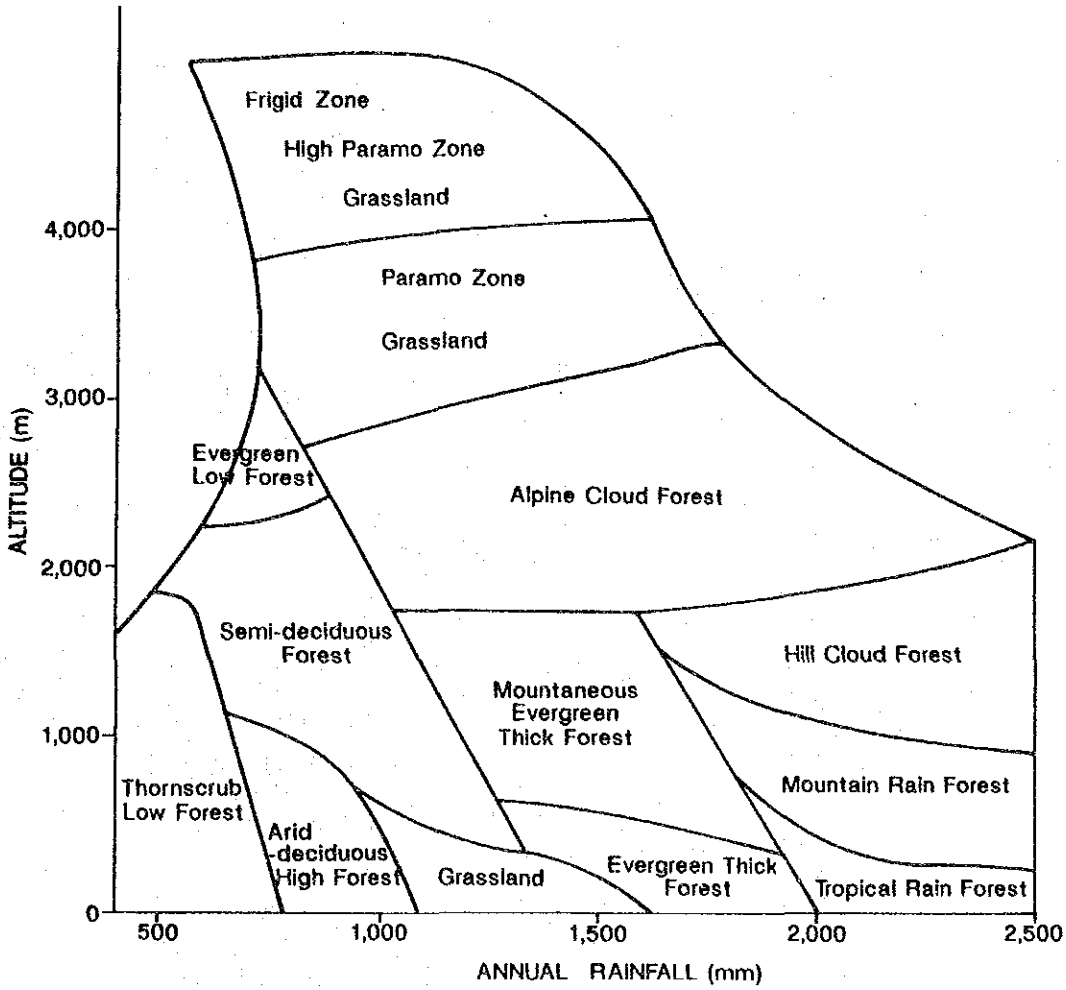
STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY



Source: ESTUDIOS ECOLOGICOS EN LOS PARAMOS ANDINOS 1980

VERTICAL DISTRIBUTION OF CLIMATE AT THE ANDES MOUNTAINS	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT
Fig. 2.6-1	JAPAN INTERNATIONAL COOPERATION AGENCY



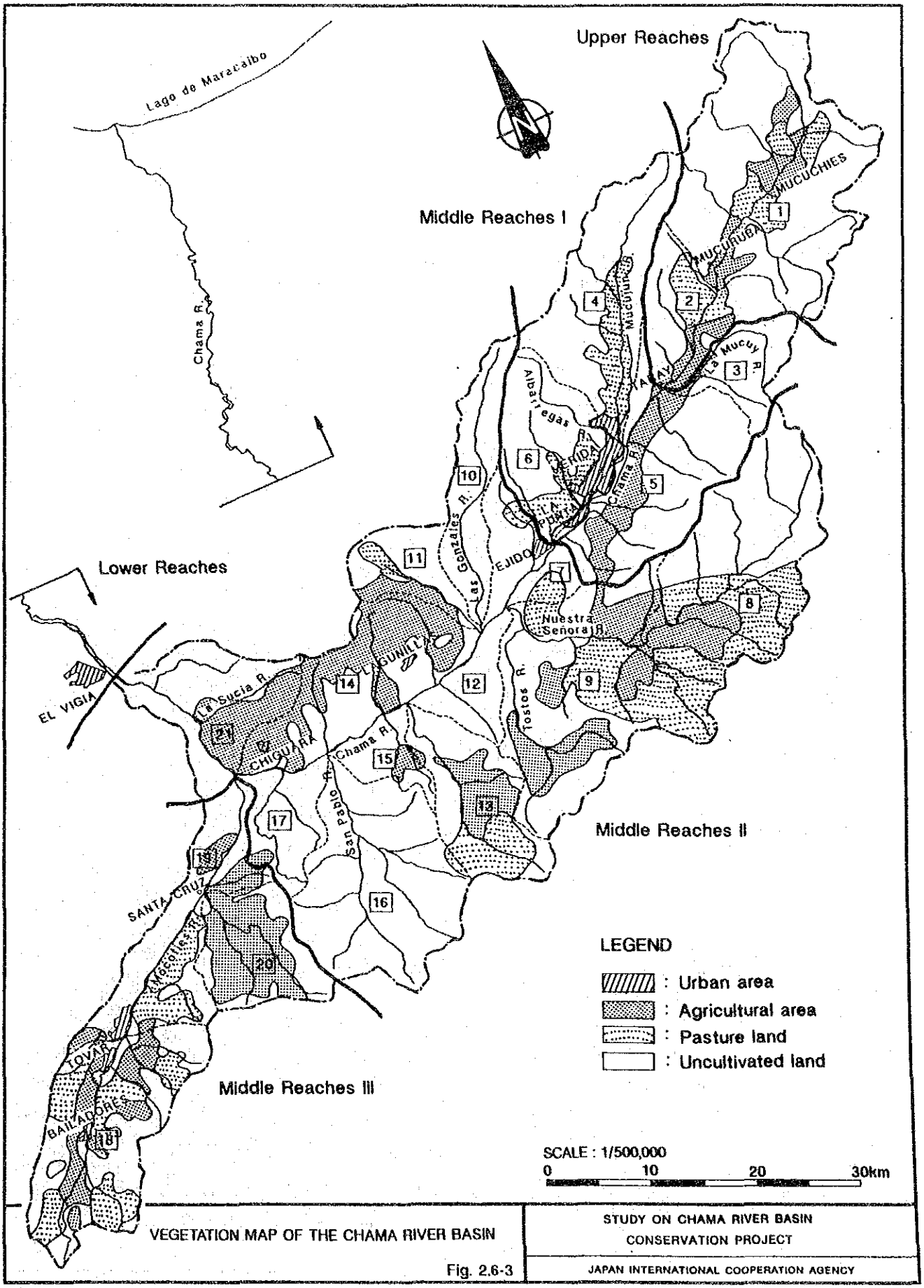
Source: ESTUDIOS ECOLOGICOS EN LOS PARAMOS ANDINOS 1980

VEGETATION-ALTITUDE-ANNUAL RAINFALL RELATIONSHIP AT THE ANDES MOUNTAINS

Fig. 2.6-2

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

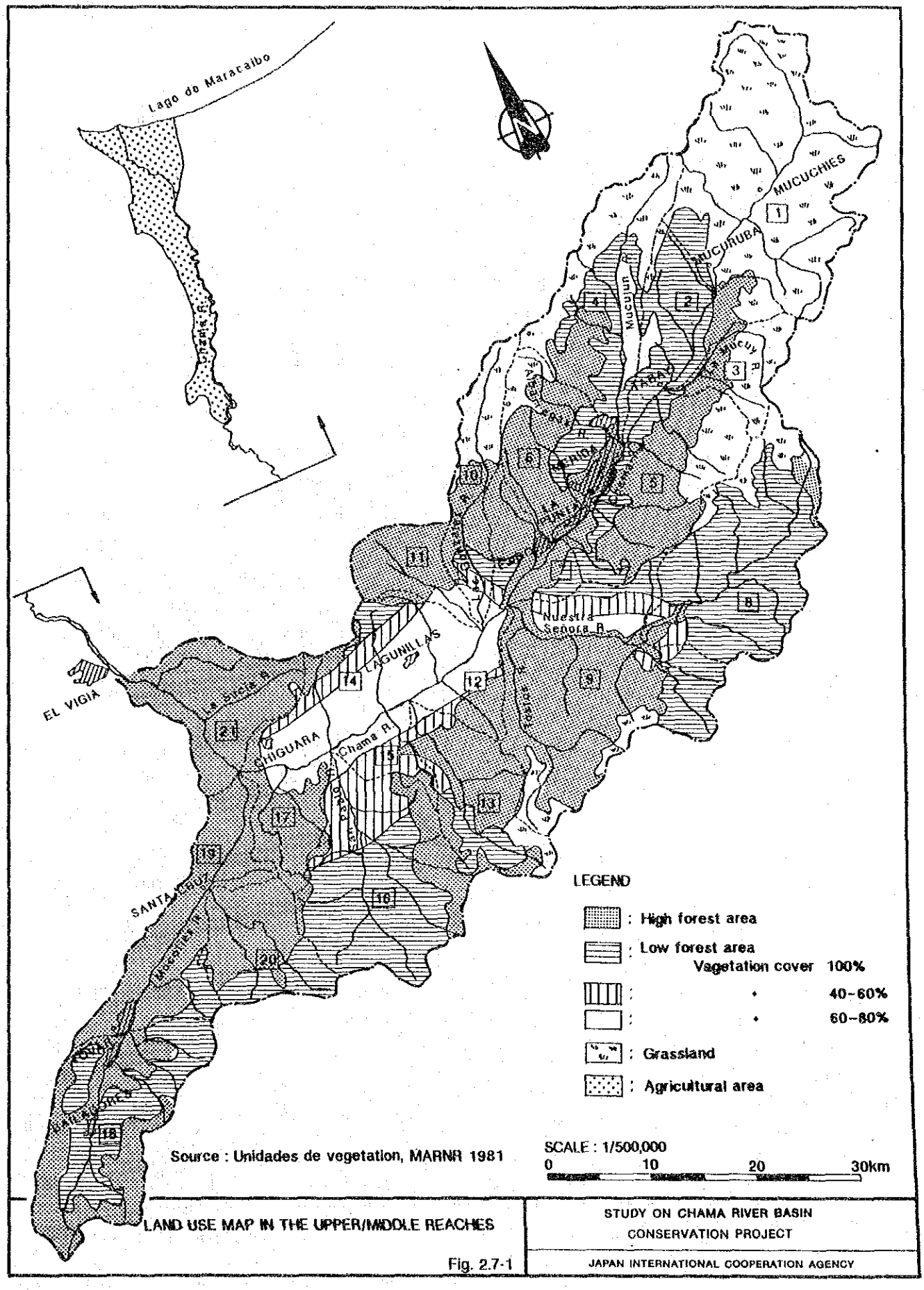


VEGETATION MAP OF THE CHAMA RIVER BASIN

Fig. 2.6-3

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

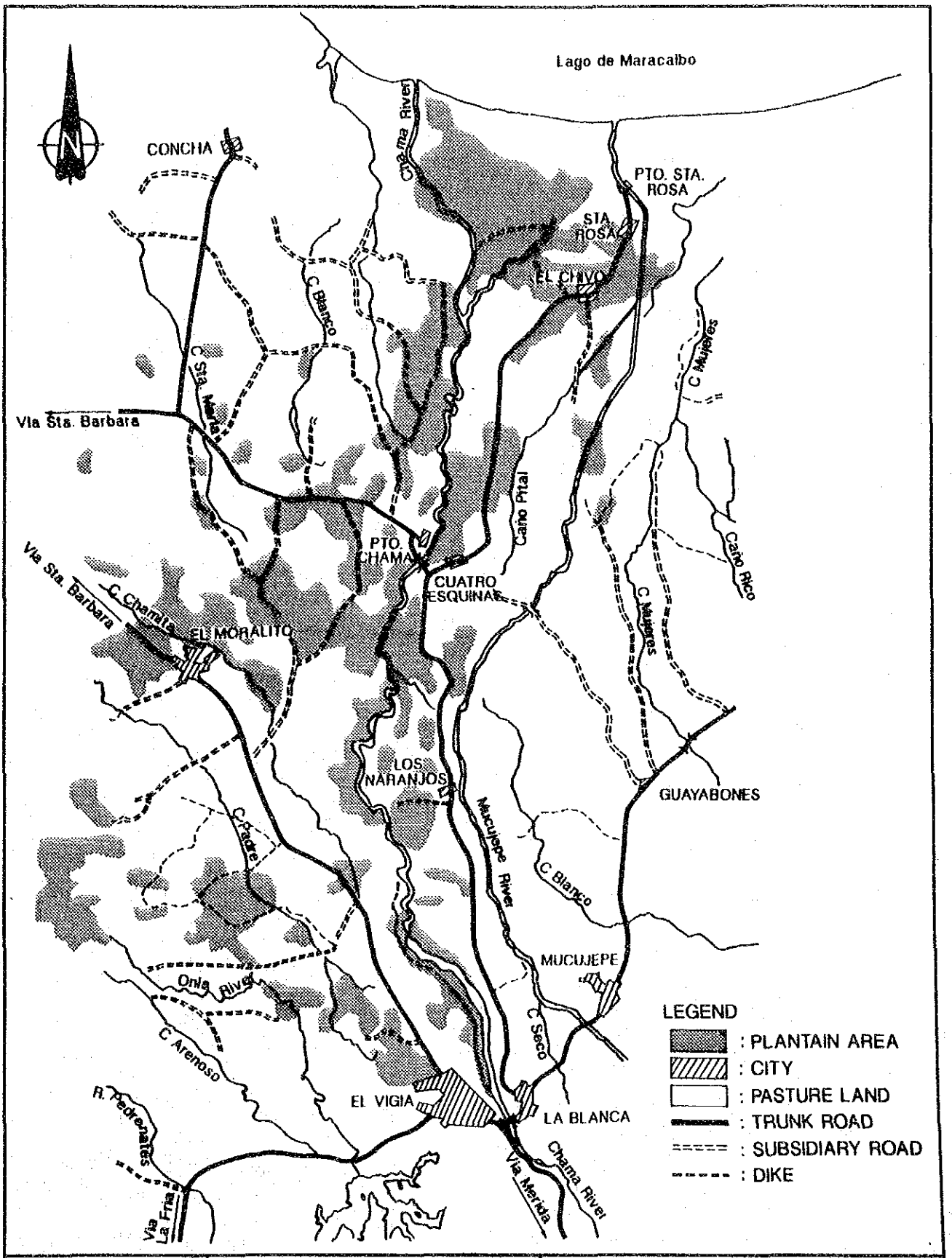


LAND USE MAP IN THE UPPER/MIDDLE REACHES

Fig. 2.7-1

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

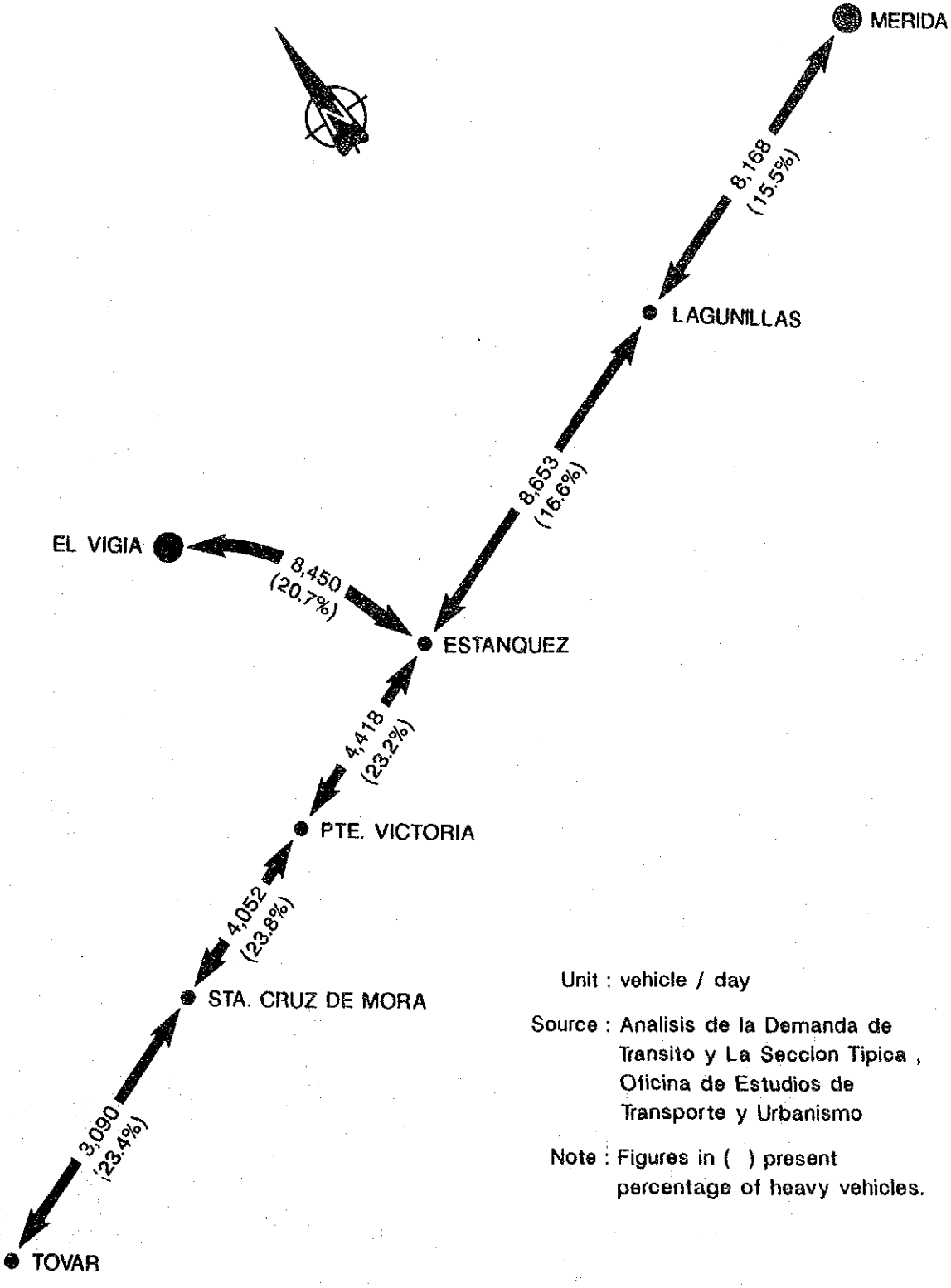


LAND USE MAP IN LOWER REACHES

Fig. 2.7-2

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

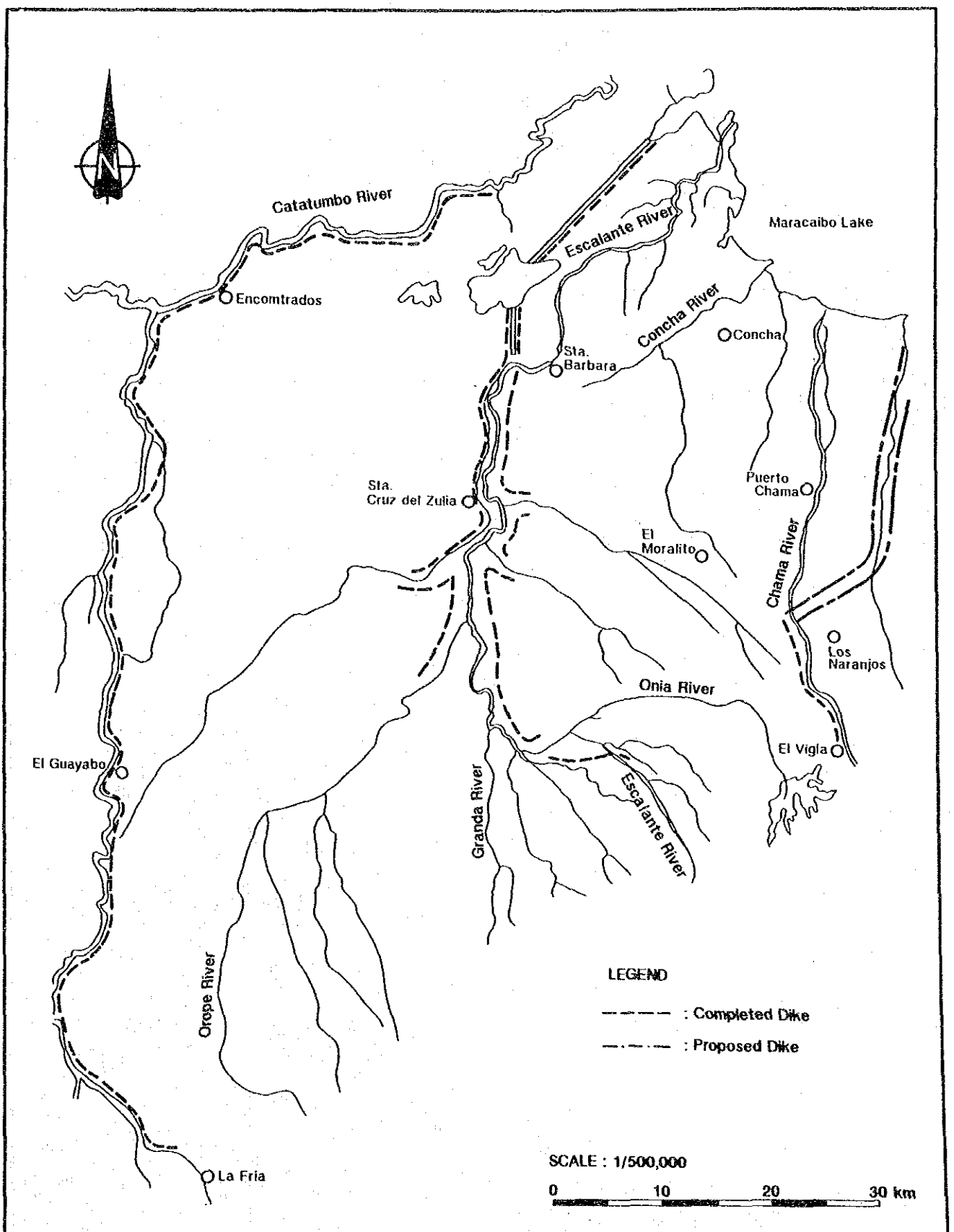


TRAFFIC VOLUME OF ARTERIAL ROAD ROUTE 2 AND 7 IN 1985

Fig. 2.7-3

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

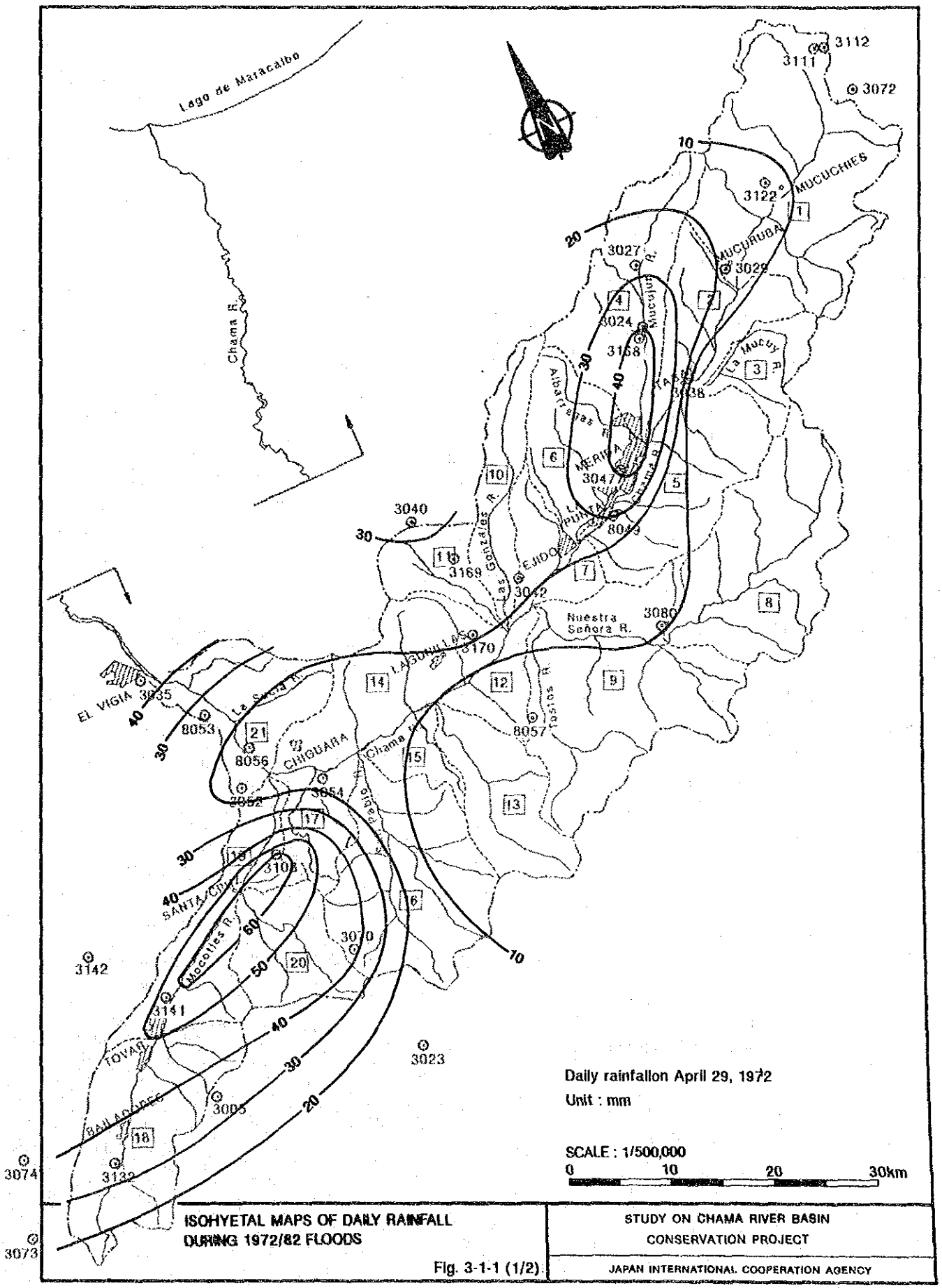


RIVER IMPROVEMENT STRETCHES IN THE SOUTHERN MARACAIBO AREA

Fig. 2.9-1

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

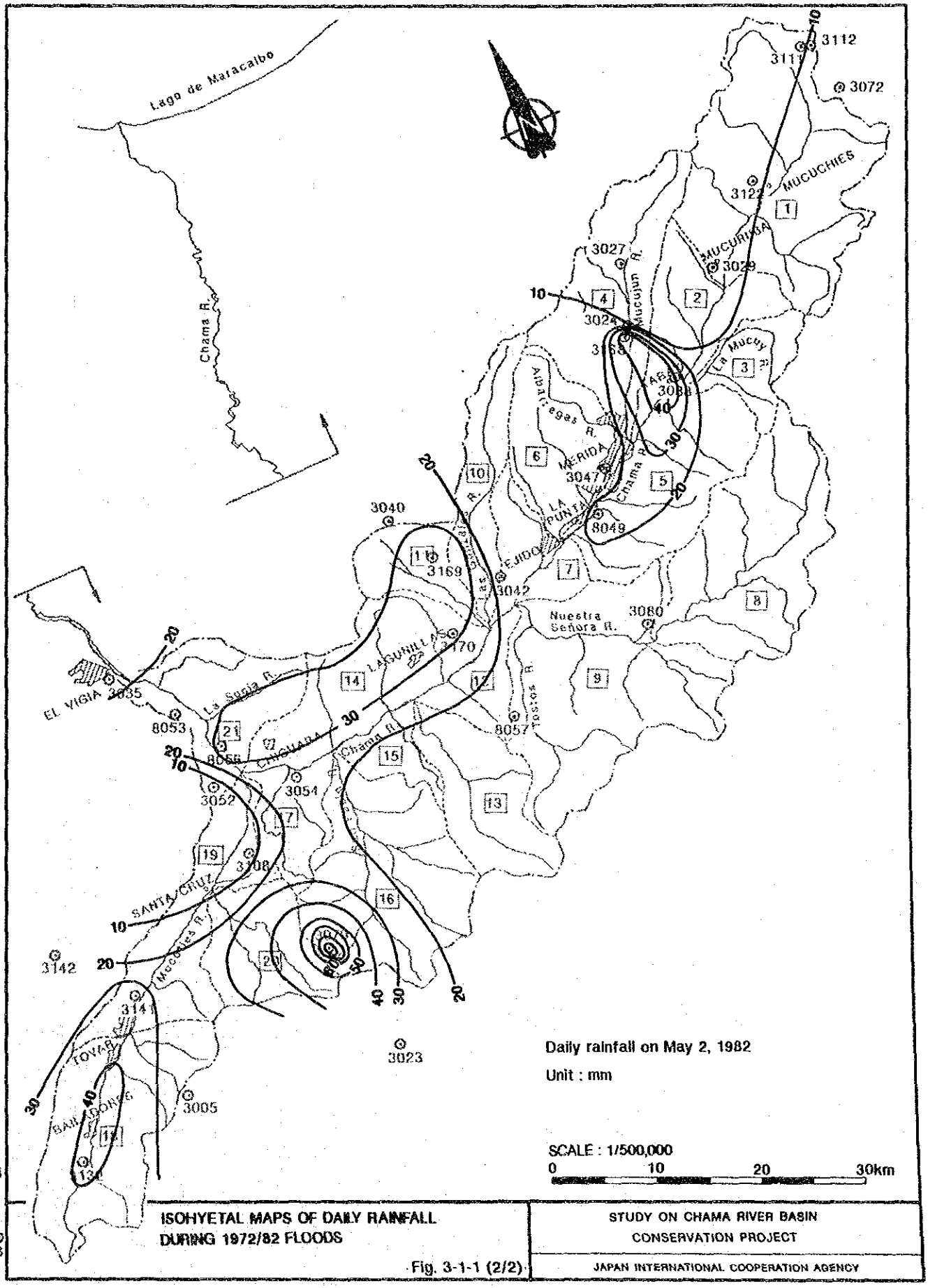


ISOHYETAL MAPS OF DAILY RAINFALL DURING 1972/82 FLOODS

Fig. 3-1-1 (1/2)

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

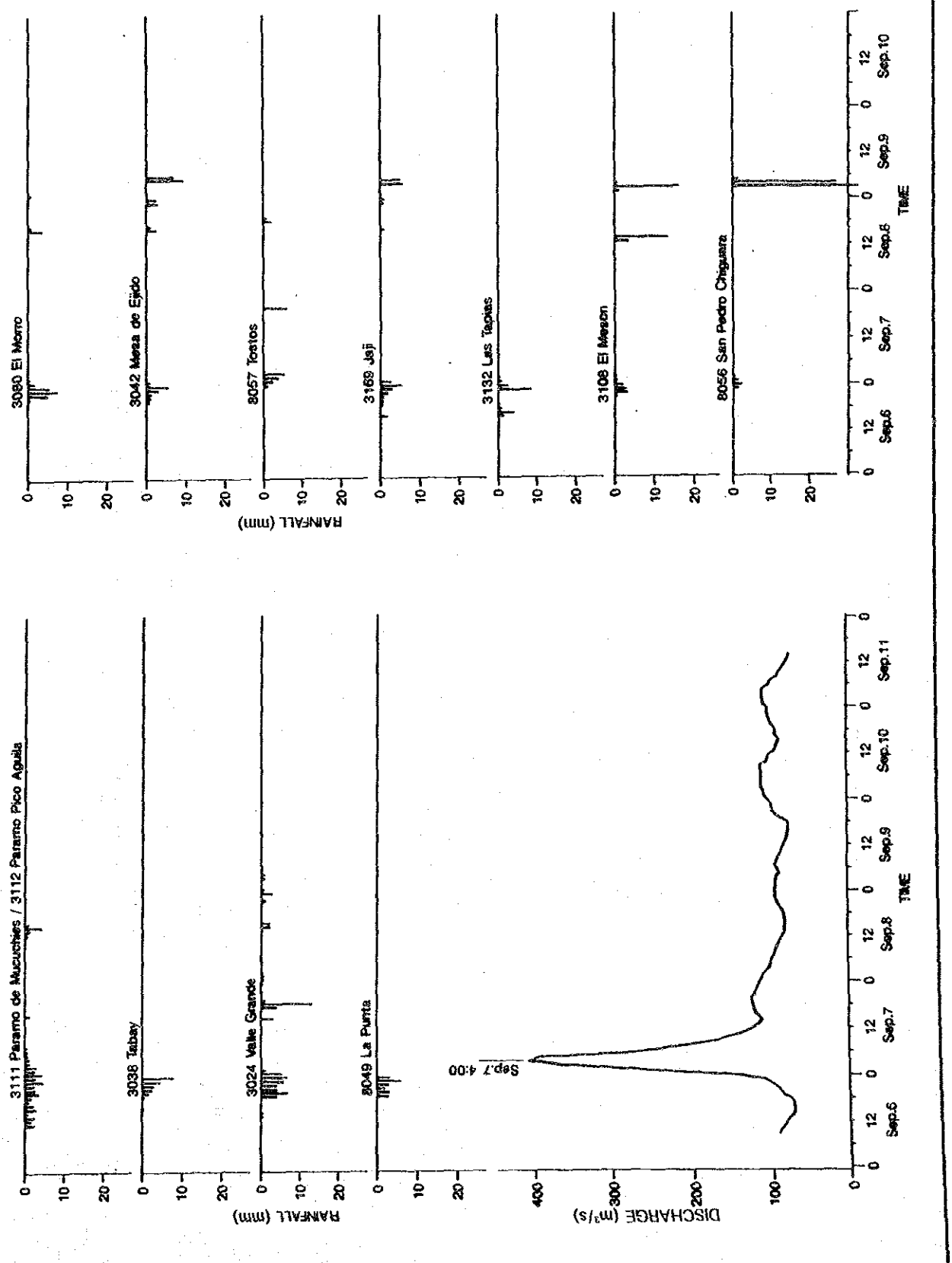


ISOHYETAL MAPS OF DAILY RAINFALL DURING 1972/82 FLOODS

Fig. 3-1-1 (2/2)

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

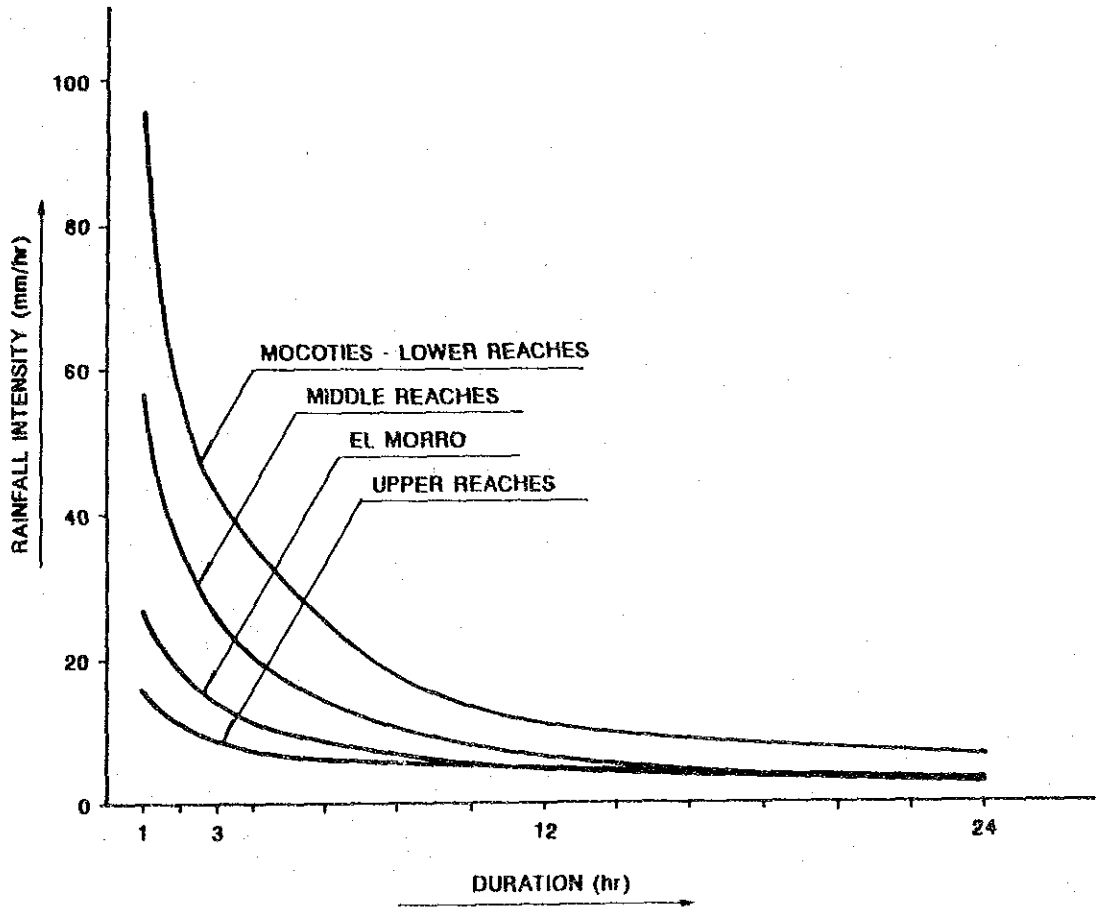


HOURLY RAINFALL DISTRIBUTION AND HYDROGRAPH OF CHAMA-EJIDO DURING SEPTEMBER 1988 FLOODS

Fig. 3.1-2

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

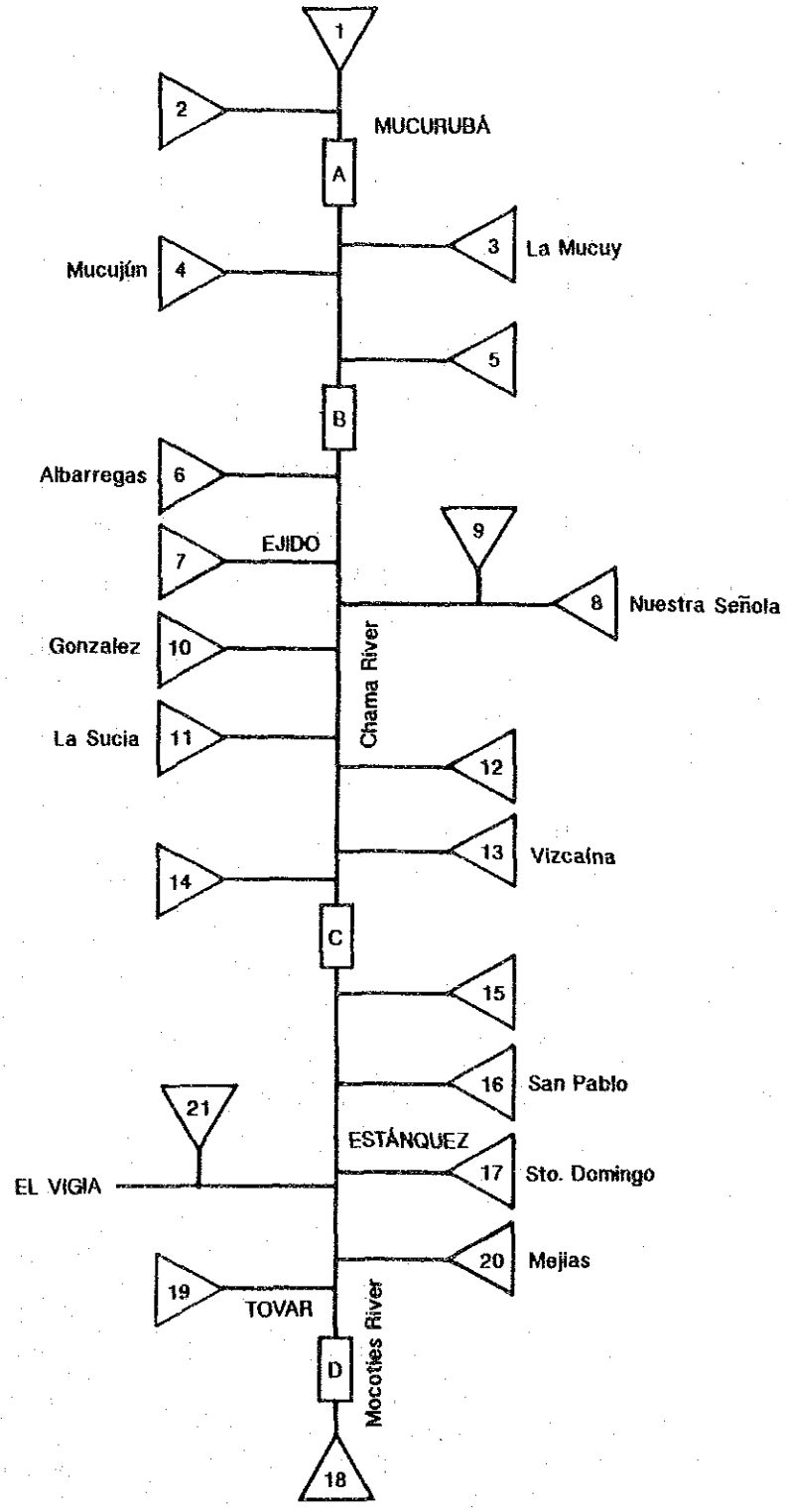


RAINFALL INTENSITY-DURATION CURVE (100-YEAR RETURN PERIOD)

Fig. 3.1-3

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

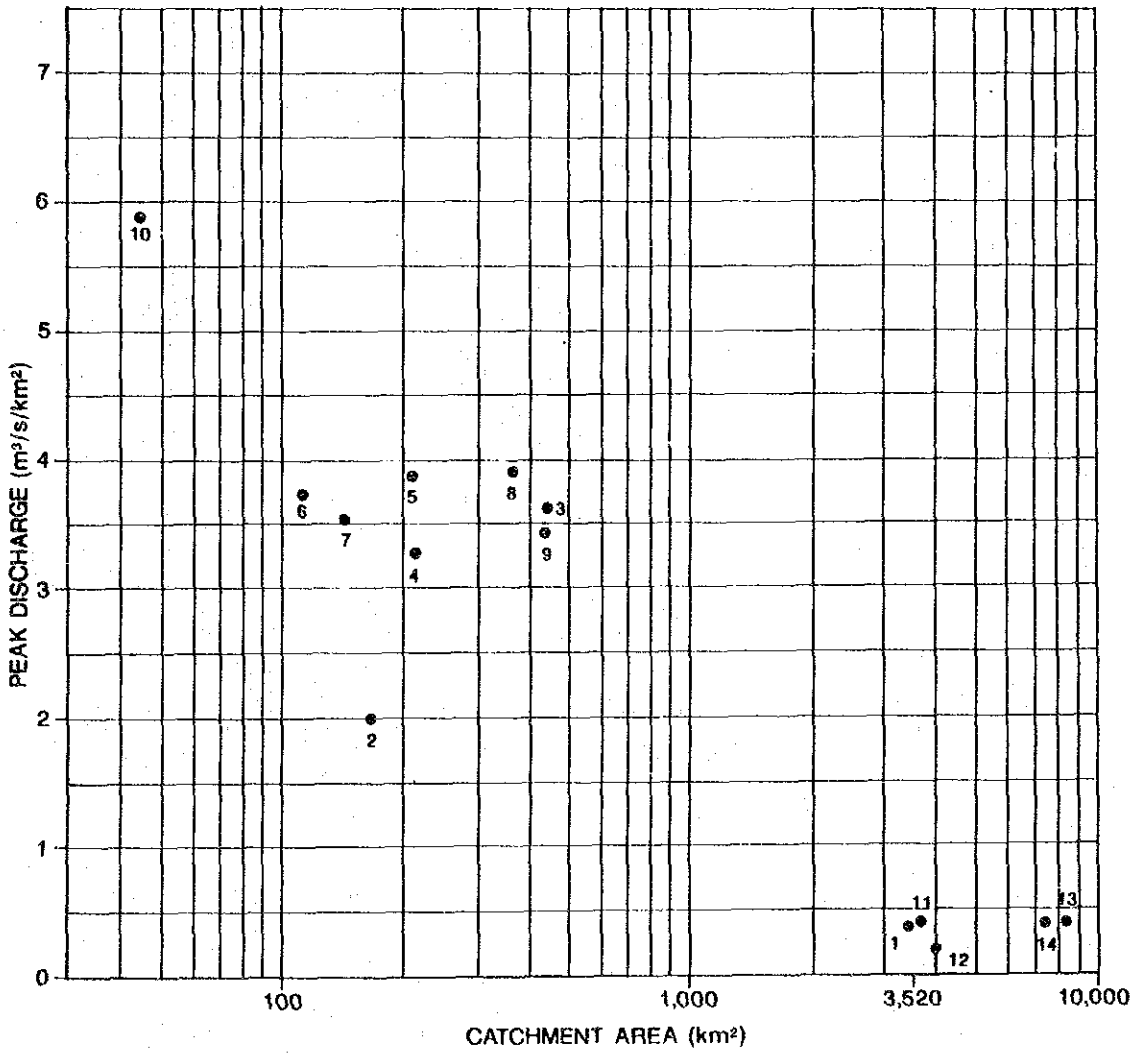


MODEL DIAGRAM FOR STORAGE FUNCTION MODEL SIMULATION

Fig. 3.1-4

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY



LEGEND

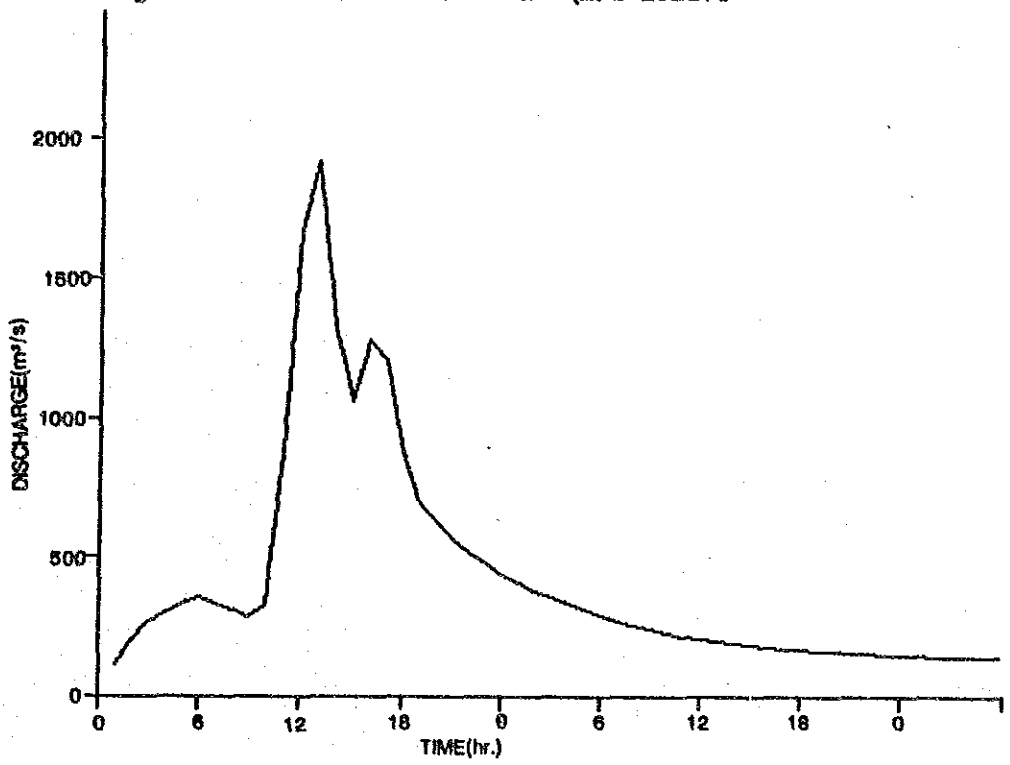
1 : Chama - El Vigia
2 : Mocoties - La Victoria
3 : Torondoy
4 : Chirurl
5 : Cans
6 : Vichu
7 : Poco
8 : Tucani
9 : Capaz
10 : Arapuey
11 : Chama
12 : Escalante
13 : Catatumbo
14 : Zulia

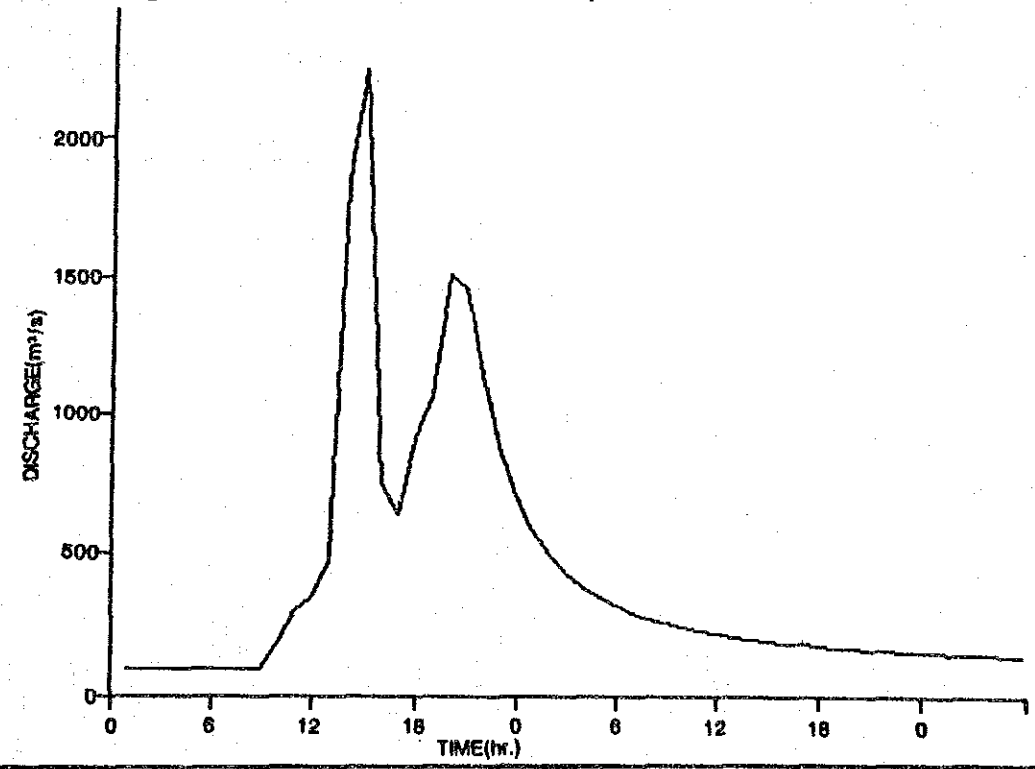
SPECIFIC PEAK DISCHARGE PLOT

Fig. 3.1-5

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY





SIMULATED FLOOD HYDROGRAPH

Fig. 3.1-6

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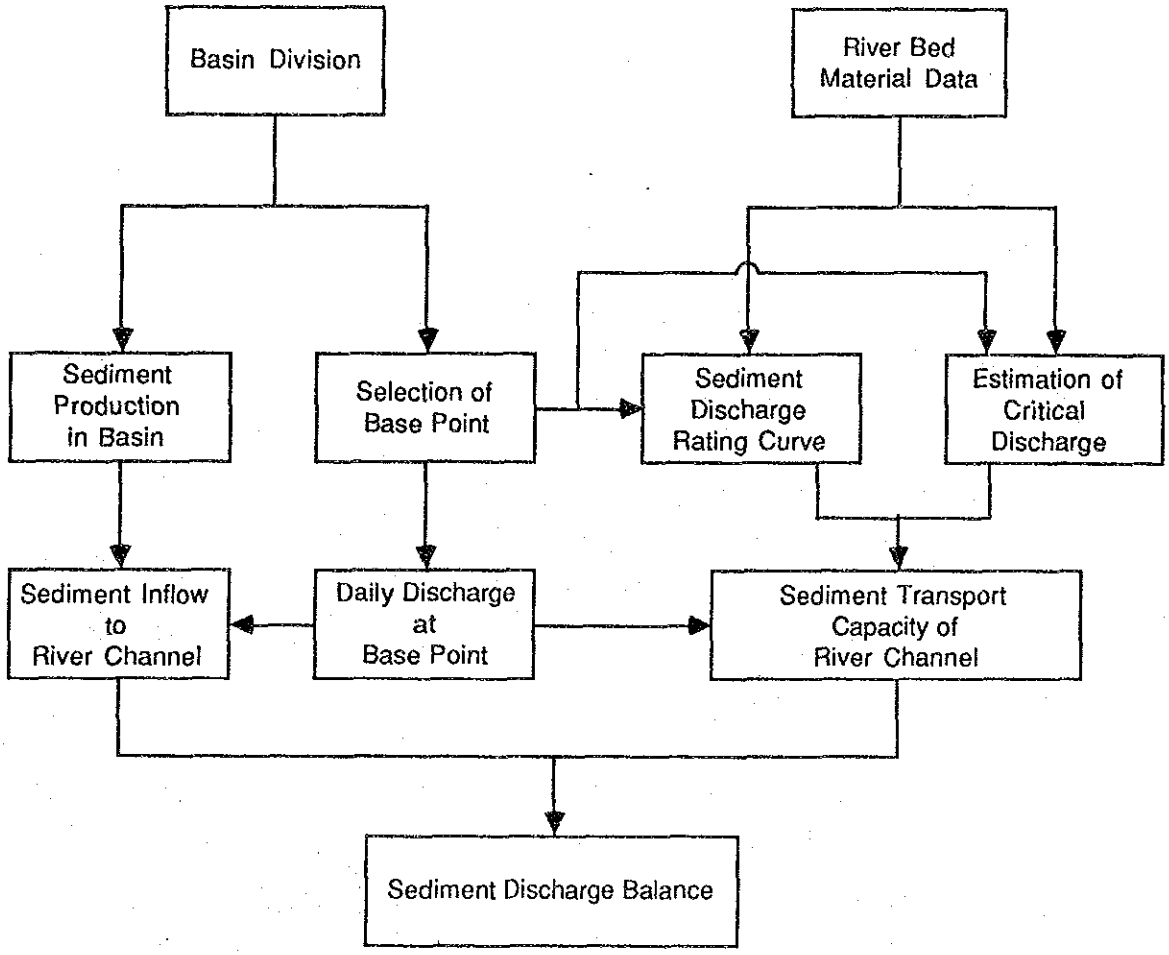

GENERAL PROCEDURE OF SEDIMENT TRANSPORTATION AND BALANCE STUDY

Fig. 3.2-1

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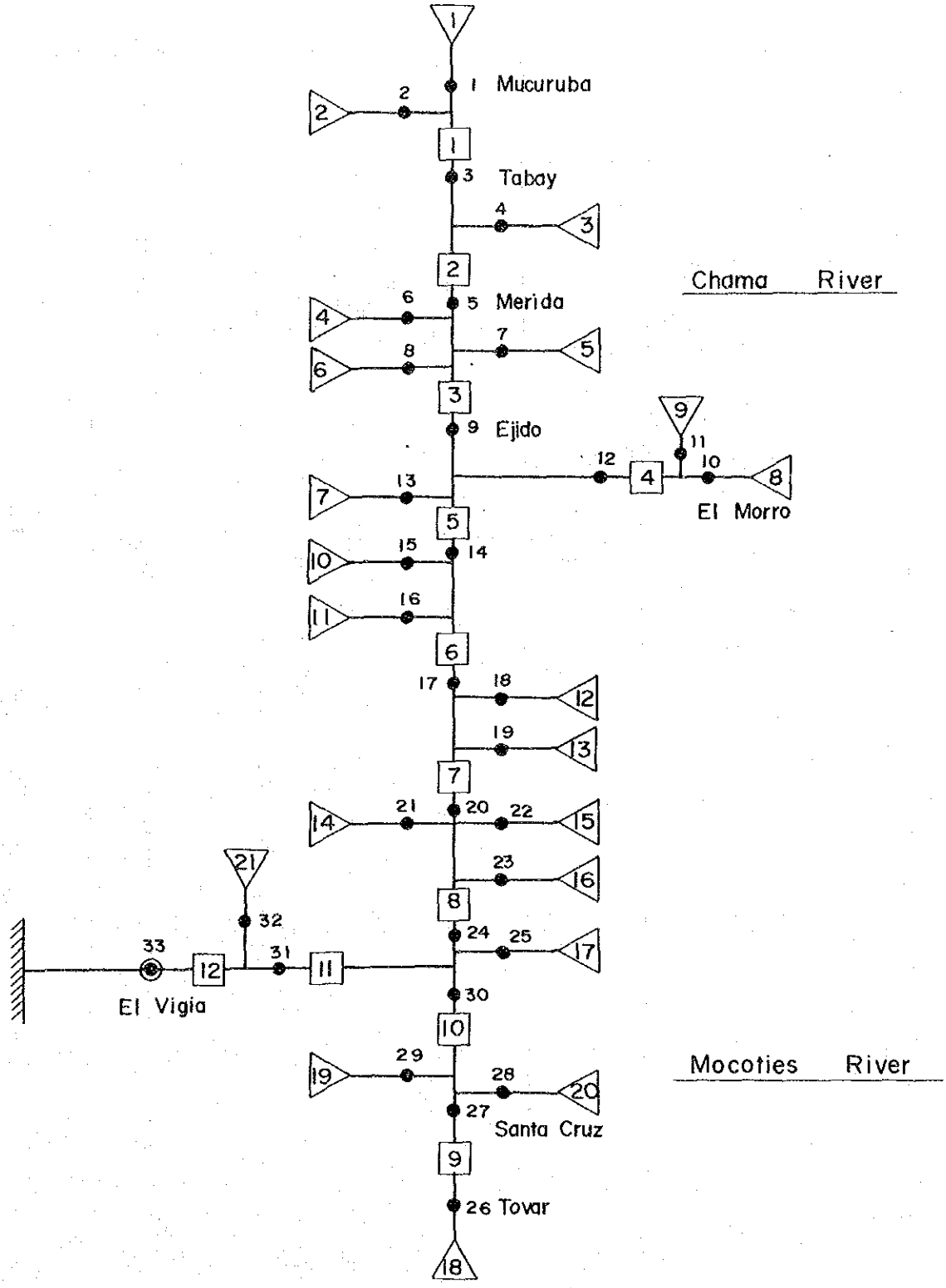

MODEL DIAGRAM FOR SEDIMENT TRANSPORTATION AND BALANCE STUDY

Fig. 3.2-2

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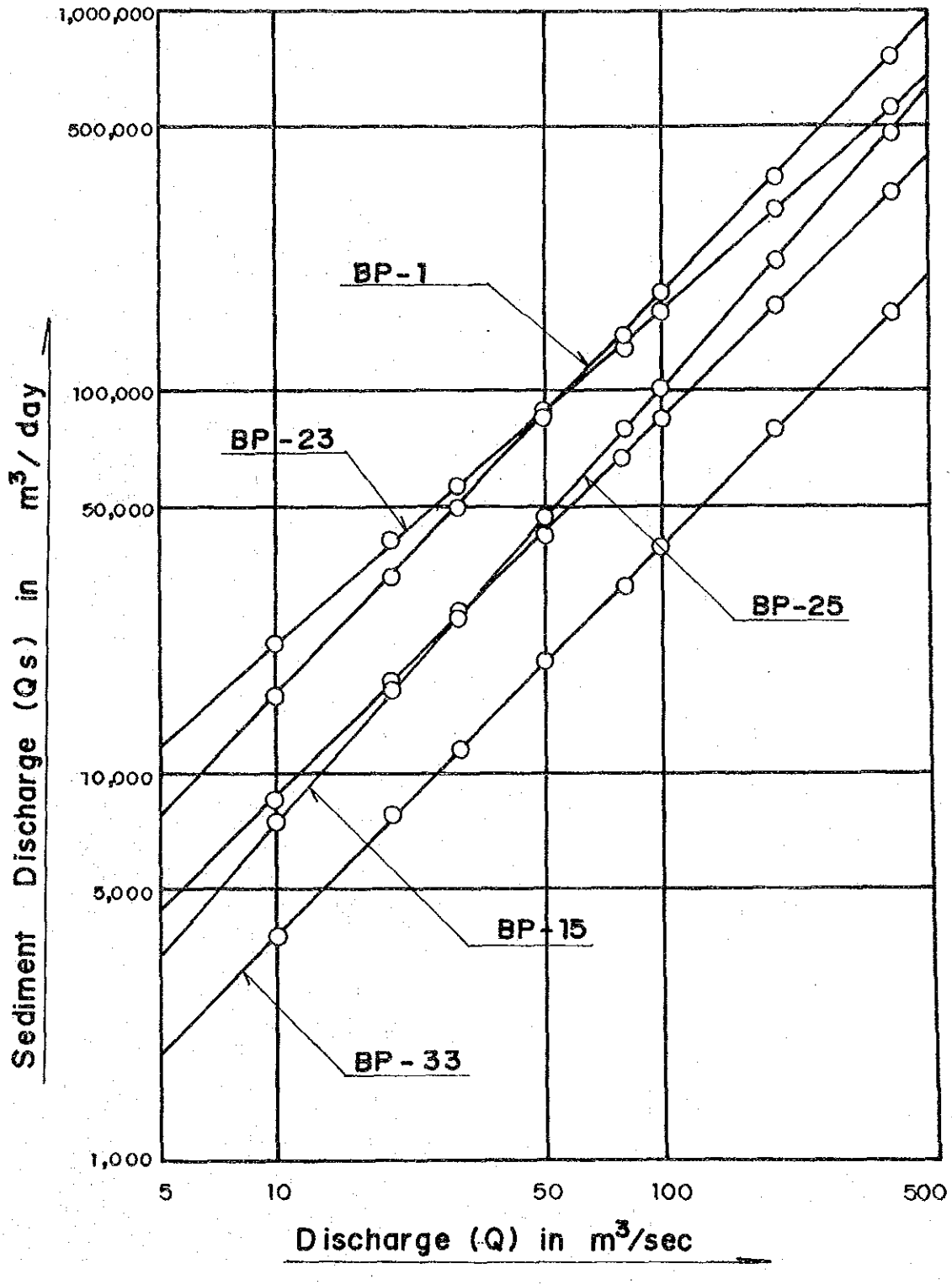

BED LOAD RATING CURVES AT BASE POINT

Fig. 3.2-3

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