Table 3.20 Economic Benefit of Irrigation Water Supply

Dam Development Case		Reduction of Annual Deficit (cms)	Increment of Irrigation Area (ha)	Increment of Paddy Production (Mil.M$/year)	Annual 1/ Average Benefit (Mil.M$/year)
Dam Location	Firm Discharge (cms)				
Lebir	55	5.6	2,750	0.91	0.51
	60	6.2	3,044	1.01	0.57
	65	6.8	3,339	1.10	0.62
	70	7.3	3,584	1.19	0.65
	75	7.6	3,732	1.23	0.69
	80	7.9	3,879	1.28	0.72
Dabong	160	8.5	4,174	1.38	0.78
	180	8.5	4,174	1.38	0.78
	200	8.5	4,174	1.38	0.78
	220	8.5	4,174	1.38	0.78
	240	8.5	4,174	1.38	0.78
Nenggiri	75	7.7	3,781	1.25	0.70
	80	8.0	3,928	1.30	0.73
	85	8.2	4,026	1.33	0.75
	90	8.3	4,075	1.35	0.76

Note : 1/ Assuming discount rate of 10%, the benefit was calculated in terms of the annual average value for a 57-year period covering the dam construction period of 7 years and the dam project life of 50 years.

Table 3.21 Dam Investment Cost for the Purpose of Water Resources Development

Dam	NHWL, El.m	Dam crest El.,m	Installed capacity, MW	Plant discharge, m^3/sec	Investment cost, million M$			
					Dam	Power	Relocation	Total
Lebir	65.0	78.2	67.0	220.0	232.5	131.0	103.5	467.0
	70.0	82.7	87.0	260.0	260.0	155.0	130.5	545.5
	75.0	86.8	112.0	300.0	276.5	179.0	159.0	614.5
	80.0	91.1	126.0	300.0	291.9	204.1	190.1	686.1
Dabong	54.0	69.6	160.0	720.0	59.0	356.8	264.4	680.2
	56.0	71.1	187.0	800.0	64.2	370.8	265.6	700.6
	58.0	72.7	201.0	800.0	70.4	384.2	267.0	721.6
	60.0	74.5	214.0	800.0	77.8	396.0	268.2	742.0
	62.0	76.4	246.0	880.0	83.8	407.6	269.5	760.9
	64.0	78.2	262.0	880.0	88.7	418.7	270.5	777.9
	66.0	78.5	296.0	960.0	89.7	428.9	270.6	789.2
	66.7	80.0	302.0	960.0	94.2	431.7	270.9	796.8
Nenggiri	135.0	151.3	175.0	300.0	251.2	234.0	15.1	500.7
	140.0	155.4	188.0	300.0	263.8	241.4	15.1	520.7
	145.0	159.7	213.0	320.0	280.2	268.4	15.1	564.1
	150.0	164.1	227.0	320.0	299.1	274.5	15.1	589.1
	155.0	168.4	255.0	340.0	318.9	288.1	15.1	622.5
	157.0	169.0	275.0	360.0	353.6	292.6	15.1	661.8

Table 3.22 Economic Evaluation of Dam Development Project

Dam	Normal High Water Level (EL.m)	Firm Discharge (cms)	Dependable Capacity (MW)	Average Annual Energy (GWH)	Cost for Dam Development			Benefit from Dam Development			(B)/(C) Ratio	Net Benefit (B)-(C) 2/	EIRR (%)
					Investment Cost (Mil.M$)	O/M 1/ Cost (Mil.M$/yr)	Annual 2/ Cost (Mil.M$/yr)	Hydropower 2/ (Mil.M$/yr)	Irrigation Supply 2/ (Mil.M$/yr)	Total (Mil.M$/yr)		(Mil.M$/yr)	
Lebir	80	75	110	359	733.6	1.64	41.88	27.85	0.89	28.74	0.59	-20.14	5.30
	75	75	88	322	648.3	1.46	43.20	23.87	0.89	24.76	0.57	-18.44	5.15
	70	65	73	279	570.2	1.13	37.92	20.34	0.75	21.09	0.56	-16.83	4.97
	65	55	59	238	488.5	0.87	32.44	17.01	0.56	17.57	0.54	-14.87	4.82
Dabang	66.7	240	272	935	857.8	3.93	58.19	71.02	1.16	72.18	1.24	13.99	12.78
	66	240	264	918	850.1	3.85	57.64	69.41	1.16	70.57	1.22	12.93	12.59
	64	220	236	870	838.4	3.41	56.65	64.30	1.16	65.46	1.16	8.81	11.77
	62	220	217	822	821.2	3.20	55.42	60.13	1.16	61.29	1.11	5.87	11.20
	60	200	194	773	802.2	2.78	53.96	55.49	1.16	56.65	1.05	2.69	10.56
	58	200	179	728	781.7	2.61	52.53	51.88	1.16	53.04	1.01	0.51	10.11
	56	200	162	680	760.6	2.43	51.06	47.91	1.16	49.07	0.96	-1.98	9.57
	54	180	149	633	739.8	2.08	49.51	44.42	1.16	45.58	0.92	-3.94	9.11
Neng-giri	157	90	266	762	670.2	3.58	45.72	62.50	1.06	63.56	1.39	17.84	14.64
	155	85	249	746	657.8	3.32	44.78	60.00	1.02	61.02	1.36	16.25	14.28
	150	80	221	705	611.7	2.95	41.57	55.21	0.98	56.19	1.35	14.62	14.11
	145	80	206	665	581.1	2.77	39.47	51.82	0.98	52.80	1.34	13.33	13.94
	140	75	182	623	534.0	2.44	36.22	47.40	0.92	48.32	1.33	12.10	13.87
	135	75	168	583	499.5	2.28	33.88	44.12	0.92	45.04	1.33	11.16	13.81

Notes: 1/ O/M Cost = Firm Capacity (MW) x 13(M$/KW.year)
2/ Assuming discount rate of 10%

Table 3.23 Villages and Population to be Affected by Dabong Reservoir Development

Name of Town / Kampung	Population	Number of Households		
		Farming	Non-Farming	Total
A. Dabong Dam (Jeli District)				
1. Kg. Tunku Abdul Rahman Kuala Balah	2,645	503	26	529
2. Kg. Bukit Tok Ali (Dusun Manal)	608	128	7	135
3. Kg. Bukit Jering	1,527	239	18	257
4. Kg. Jerimbong	580	96	4	100
5. Kg. Tebing Timbah	186	48	6	54
6. Kg. Bukit Selai	334	64	3	67
7. Kg. Kubur Datu	816	157	9	166
8. Kg. Jaber	190	49	3	52
9. Kg. Lubok Bongor	1,057	193	22	215
10. Kg. Renyut	141	30	2	32
11. Kg. Chegar Bedil	229	43	3	46
12. Kg. Pasir Dusun	527	98	5	103
13. Kg. Teluk Bayu	132	24	2	26
14. Kg. Belahat	381	68	8	76
15. Kg. Berdang	684	120	14	134
Total	10,037	1,860	132	1,992
B. Dabong Dam (Kuala Krai District)				
1. Kg. Biak	200	50	-	50
2. Kg. Kl pergau	120	30	-	30
3. Kg. Kandek	533	100	33	133
4. Kg. Jewang	240	50	10	60
5. Kg. Rambai	50	12	-	12
6. Kg. Stong	53	10	7	17
7. Kg. Kl Mahligai	84	21	-	21
8. Kg. Serasa	90	22	-	22
9. Kg. Pulai Layak	18	5	-	5
10. Kg. Sg. Suda	13	4	-	4
11. Kg. Dabong	2,000	350	150	500
12. Kg. Kemubu	1,017	200	55	255
Total	4,418	854	255	1,109

Source: Jeli Distric office, Kuala Krai District office and Orang Asli Department (JHEOA), Kelantan

Table 5.1 Flood Mitigation Effect of Storage Dams

(Unit : cms)

Case	Scheme	Peak Cut Ratio 1/	Peak Discharge at Guillemard Bridge	
			20-year	50-year
1	Without structures 2/	-	13,437	16,369
2	R/I 3/ 4/	-	14,350	17,420
3	Nenggiri + R/I	100	13,367	16,175
4	- do -	90	13,394	16,206
5	- do -	80	13,435	16,254
6	- do -	76 5/	13,456	16,299
7	Kemubu + R/I	40	11,609	13,936
8	- do -	30	11,689	14,136
9	- do -	20	12,118	14,719
10	- do -	15 5/	12,500	15,185
11	Lower Pergau + R/I	30	12,801	15,627
12	- do -	20	12,971	15,879
13	- do -	10	13,399	16,314
14	- do -	9 5/	13,433	16,348
15	Dabong + R/I	80	8,459	10,586
16	- do -	70	8,545	10,683
17	- do -	60	8,655	10,802
18	- do -	59 5/	8,988	11,079
19	Lebir + R/I	70	10,190	12,442
20	- do -	60	10,606	12,580
21	- do -	50	10,648	12,817
22	- do -	37 5/	10,661	13,213
23	Lebir + Nenggiri + R/I	70 100 6/	10,021	11,592
24	- do -	60 90	10,157	11,999
25	- do -	50 80	10,238	12,088
26	- do -	37 76	10,249	12,101
27	Lebir + Kemubu + R/I	70 40	8,429	9,948
28	- do -	60 30	8,456	10,063
29	- do -	50 20	8,789	10,732
30	- do -	37 15	8,896	11,334
31	Lebir + Dabong + R/I	70 80	4,936	6,066
32	- do -	60 70	5,224	6,429
33	- do -	50 60	5,486	6,745
34	- do -	37 59	6,000	7,466

Notes : 1/ Peak-cut ratio = Peak outflow from the spillway for flood mitigation / peak inflow

2/ Flood discharge in natural condition

3/ R/I means river improvement

4/ Inundated flow between Kuala Krai and Guillemard Bridge is confined in the river channel.

5/ An ordinary overflow weir for flood mitigation is not provided to the spillway for the case with the lowest peak-cut ratio of each dam scheme; that is, the flood mitigation to the downstream reaches is only expected with the overflow weir for PMF.

6/ The peak-cut ratio of the Lebir dam scheme is shown in the first column, while the second column for the Nenggiri dam scheme.

Table 5.2 Principal Features of Spillway

Scheme	50-yr peak discharge (cms)	Peak Cut Ratio (%)	Dam type	Dam Crest Elevation (El;m)	NHWL 1/ (El;m)	Spillway for flood mitigation, m			Spillway for DF, m 1/	
						SWL 1/	Width (a)	Height (b)	DFWL 1/	Width (c)
		100	Rockfill	169.0	150.7	158.6	-	7.9	166.0	75.0
Nenggiri	4,668	90	Rockfill	169.0	152.9	158.8	17.0	5.9	166.0	75.0
	(1984)	80	Rockfill	169.0	155.0	159.5	50.0	4.5	166.0	75.0
		76	Rockfill	169.0	157.0	-	-	-	166.0	75.0
					3/					
		40	Concrete Gravity	82.0	53.0	70.8	20.0	17.8	80.0	100.0
Kemubu	4,943	30	Concrete Gravity	82.0	58.4	71.4	37.0	13.0	80.0	100.0
2/	(1983)	20	Concrete Gravity	82.0	63.0	72.5	70.0	9.5	80.0	100.0
		15	Concrete Gravity	82.0	65.7	-	-	-	80.0	100.0
		80	Concrete Gravity	80.0	62.4	73.1	25.0	10.7	78.0	100.0
Dabong	8,431	70	Concrete Gravity	80.0	64.1	73.7	45.0	9.6	78.0	100.0
	(1983)	60	Concrete Gravity	80.0	65.6	74.2	70.0	8.6	78.0	100.0
		59	Concrete Gravity	80.0	66.7	-	-	-	78.0	100.0
		70	Rockfill	91.1	76.3	84.2	40.0	7.9	87.6	150.0
Lebir	5,561	60	Rockfill	91.1	77.9	84.5	70.0	6.6	87.6	150.0
	(1983)	50	Rockfill	91.1	79.6	84.7	120.0	5.1	87.6	150.0
		37	Rockfill	91.1	80.0	-	-	-	87.6	150.0

Note : 1/ DF : Spillway Design Flood, NHWL : Normal High Water Level
SWL : Surcharge Water Level, DFWL : Design Flood Water Level
2/ The Kemubu project is developed as a single purpose project of flood mitigation.
3/ The crest elevation of spillway for flood mitigation

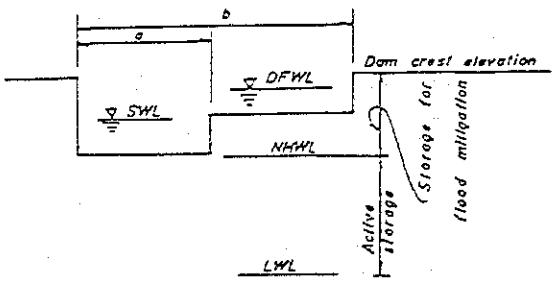

Table 5.3 Cost of Combination Plans including Water Resources Development (1/2)

Combination	Peak cut ratio	Cost, million M$							
		Dam Project 1/				River improvement			Grand Total
		Dam	Power	Relocation	Total	R/I	Compensation	Total	
1. R/I only	-	-	-	-	-	751	132	883	883.0
2. Nenggiri + R/I	100	353.6	278.0	49.5	647.1	707	125	832	1,479.1
	90	353.6	284.5	49.5	653.6	708	125	833	1,486.6
	80	353.6	290.8	49.5	659.9	710	125	835	1,494.9
	76	353.6	297.0	49.5	666.1	713	126	839	1,505.1
3. Kemubu + R/I	40	84.9	-	54.7	139.6	626	111	737	876.6
	30	84.9	-	54.7	139.6	634	112	746	885.6
	20	84.9	-	54.7	139.6	655	116	771	910.6
	15	84.9	-	54.7	139.6	671	119	790	929.6
4. Dabong + R/I	80	94.2	410.1	270.9	775.2	481	85	566	1,341.2
	70	94.2	419.3	270.9	784.4	485	86	571	1,355.4
	60	94.2	427.0	270.9	792.1	499	88	587	1,379.1
	59	94.2	431.7	270.9	796.8	510	90	600	1,396.8
5. Lebir + R/I	70	291.9	184.7	190.1	666.7	570	101	671	1,337.7
	60	291.9	193.1	190.1	675.1	576	102	678	1,353.1
	50	291.9	202.0	190.1	684.0	586	103	689	1,373.0
	37	291.9	204.1	190.1	686.1	599	106	705	1,391.1
6. Lebir + Nenggiri + R/I	70 100	645.5	462.7	205.6	1,313.8	530	93	623	1,936.8
	60 90	645.5	477.6	205.6	1,328.7	555	98	653	1,981.7
	50 80	645.5	492.8	205.6	1,343.9	557	98	655	1,998.9
	37 76	645.5	501.1	205.6	1,352.2	558	98	656	2,008.2

Table 5.3 Cost of Combination Plans including Water Resources Development (2/2)

Combination	Peak cut ratio		Cost, million M$							
			Dam Project 1/				River improvement			Grand Total
			Dam	Power	Relocation	Total	R/I	Compensation	Total	
7. Lebir + Kemubu + R/I	70	15	376.8	184.7	244.8	806.3	445	78	523	1,329.3
	60	20	376.8	193.1	244.8	814.7	450	80	530	1,344.7
	50	30	376.8	202.0	244.8	823.6	490	86	576	1,399.6
	37	40	376.8	204.1	244.8	825.7	521	92	613	1,438.7
8. Lebir + Dabong + R/I	70	80	386.1	594.8	461.0	1,441.9	156	28	184	1,625.9
	60	70	386.1	612.4	461.0	1,459.5	184	33	217	1,676.5
	50	60	386.1	629.0	461.0	1,476.1	210	37	247	1,723.1
	37	59	386.1	635.8	461.0	1,482.9	269	48	317	1,799.9

Note : 1/ The specific cost of flood mitigation is as follows:
M$ 132.0 million for Nenggiri
M$ 193.0 million for Dabong
M$ 191.0 million for Lebir

Table 5.4 Annual Financial Cost of Combination Plan

(Unit : million M$)

Combination Plan	Malaysia Plan																		
	5 th		6 th					7 th				8 th					9 th		
	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	2000	'01	'02	'03	'04	'05	'06	'07	'08
1. R/I only					45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8
2. Nenggiri + R/I				33.5	124.5	225.1	225.1	191.5	124.5	90.9	57.4	57.4	57.4	57.4	57.4	57.4	57.4			
3. Kemubu + R/I					83.9	129.1	99.0	53.8	53.8	53.8	53.8	53.8	53.8	53.8	53.8	53.8	53.8			
4. Dabong + R/I					94.1	136.9	265.5	265.5	222.6	136.9	94.1	51.2	51.2							
5. Lebir + R/I				36.7	117.2	227.3	227.3	190.6	117.2	80.5	43.8	43.8	43.8	43.8	43.8	43.8	43.8			
6. Lebir + Nenggiri + R/I				36.7	125.9	236.0	236.0	199.3	125.9	122.7	119.6	220.2	220.2	186.6	67.1	33.5				
7. Lebir + Kemubu + R/I				36.7	115.2	225.3	225.3	188.6	115.2	78.5	71.9	117.1	87.0	41.8						
8. Lebir + Dabong + R/I				36.7	103.1	213.2	213.2	176.5	103.1	109.3	115.4	214.3	214.3	171.4	85.7	42.9				

Table 5.5 Economic Comparison of Combination Plans

Case	Scheme	Peak-cut ratio, %		EIRR %
1.	R/I	-		5.34
2.	Nenggiri + R/I	100		9.91
3.	- do -	90		10.33
4.	- do -	80		10.53
5.	- do -	76		10.87
6.	Kemubu + R/I	40		4.44
7.	- do -	30		4.38
8.	- do -	20		4.22
9.	- do -	15		4.06
10.	Dabong + R/I	80		11.01
11.	- do -	70		11.31
12.	- do -	60		11.78
13.	- do -	59		11.93
14.	Lebir + R/I	70		6.11
15.	- do -	60		6.20
16.	- do -	50		6.29
17.	- do -	37		6.27
18.	Lebir + Nenggiri + R/I	70	100	9.24
19.	- do -	60	90	9.49
20.	- do -	50	80	9.66
21.	- do -	37	76	9.89
22.	Lebir + Kemubu + R/I	70	15	5.55
23.	- do -	60	20	6.06
24.	- do -	50	30	6.32
25.	- do -	37	40	6.34
26.	Lebir + Dabong + R/I	70	80	11.08
27.	- do -	60	70	11.19
28.	- do -	50	60	11.37
29.	- do -	37	59	11.19

Table 6.1 Variation of Scale of Storage Dam

Storage Dam	Catchment Area (sq.km)	Scale	Riverbed El. (m)	Spillway Width (m)	Dimension (El;m) NHWL	DFWL	Dam Crest	Dam Height (m)	Storage (MCM) at NHWL	at DFWL	Peak Discharge (cms) Inflow 1/	Outflow	Peakcut Ratio (%)
		Maximum		75	157.0	166.0	169.0	108.0	3,101	4,213	4,668	1,120	76
Nenggiri	3,690	Medium	61	75	126.0	141.0	144.0	83.0	899	1,686	4,668	2,087	55
		Minimum		75	95.0	115.0	119.0	58.0	152	532	4,668	3,552	24
		Maximum		100	65.7	80.0	82.0	46.0	726	2,163	4,943	4,184	15.4
Kemubu	5,630	Medium	36	100	59.6	75.7	77.7	41.7	352	1,461	4,943	4,215	14.7
		Minimum		100	55.0	71.4	73.4	37.4	250	1,139	4,943	4,389	11
		Maximum		100	66.7	78.0	80.0	58.0	3,707	6,631	8,431	3,457	59
Dabong	7,480	Medium	22	85	54.8	69.0	71.0	49.0	1,532	4,294	8,431	4,768	43
		Minimum		70	40.0	60.0	62.0	40.0	307	2,121	8,431	6,319	25
		Maximum		150	80.0	87.6	91.1	61.1	2,393	3,917	5,561	3,503	37
Lebir	2,480	Medium	30	150	63.3	73.2	76.7	46.7	726	1,563	5,561	4,942	11
		Minimum		150	47.0	58.8	62.3	32.3	102	463	5,561	5,322	4

Note : 1/ Peak discharge of 50-year probable flood.

Table 6.2 Flood Mitigation Effect of Storage Dam

Storage Dam	Catchment Area (km2)	Scale	Spillway Width (m)	Peak Discharge (cms) Inflow 1/	Peak Discharge (cms) Outflow	Peakcut Ratio (%)	Peak Discharge at Guillemard Bridge (cms)
Nenggiri	3,690	Maximum	75	4,668	1,120	76	16,299 (1,121)
		Medium	75	4,668	2,087	55	16,550 (870)
		Minimum	75	4,668	3,552	24	16,890 (530)
Kemubu	5,630	Maximum	100	4,943	4,184	15.4	15,185 (2,235)
		Medium	100	4,943	4,215	14.7	15,279 (2,141)
		Minimum	100	4,943	4,389	11	15,802 (1,618)
Dabong	7,480	Maximum	100	8,431	3,457	59	11,079 (6,341)
		Medium	85	8,431	4,768	43	12,334 (5,086)
		Minimum	70	8,431	6,319	25	13,602 (3,818)
Lebir	2,480	Maximum	150	5,561	3,503	37	13,213 (4,207)
		Medium	150	5,561	4,942	11	15,265 (2,155)
		Minimum	150	5,561	5,322	4	16,257 (1,163)

Note : 1/ Peak discharge of 50-year probable flood.
2/ Parenthesized figures are obtained by subtracting peak discharge at Guillemard Bridge from that of river improvement only. (17,420 cms)

Table 6.3 Peak Discharge at Guillemard Bridge by the Combination of Dam Plan

No.	Combination	Peak Discharge at Guillemard Bridge (cms)
1	R/I only	17,420
2	Ds	13,602
3	Dm	12,334
4	Dl	11,079
5	Ls	16,257
6	Lm	15,265
7	Ll	13,213
8	Ns	16,890
9	Nm	16,550
10	Nl	16,229
11	Ks	15,802
12	Km	15,279
13	Kl	15,185
14	Ds + Ls	13,033
15	Dm + Ls	11,765
16	Dl + Ls	10,510
17	Ds + Lm	12,014
18	Dm + Lm	10,746
19	Dl + Lm	9,491
20	Ds + Ll	9,989
21	Dm + Ll	8,721
22	Dl + Ll	7,466
23	Ds + Ls + Ns	11,928
24	Ds + Lm + Ns	11,648
25	Ds + Ll + Ns	11,327
26	Ds + Ls + Nm	10,926
27	Ds + Lm + Nm	10,656
28	Ds + Ll + Nm	10,335
29	Ds + Ls + Nl	8,874
30	Ds + Lm + Nl	8,604
31	Ds + Ll + Nl	8,283
32	Ks + Ls	13,768
33	Km + Ls	13,245
34	Kl + Ls	13,151
35	Ks + Lm	12,776
36	Km + Lm	12,253
37	Kl + Lm	12,159
38	Ks + Ll	10,724
39	Km + Ll	10,201
40	Kl + Ll	10,107
41	Ns + Ls	15,736
42	Nm + Ls	15,466
43	Nl + Ls	15,145
44	Ns + Lm	14,744
45	Nm + Lm	14,474
46	Nl + Lm	14,153
47	Ns + Ll	12,692
48	Nm + Ll	12,422
49	Nl + Ll	12,101

Remarks ; Dam scheme D : Dabong N : Nenggiri
L : Lebir K : Kemubu
Dam scale l : maximum m : medium
s : minimum

Table 6.4 Construction Cost ans Social Impact for Combination Plan

No.	Combination	CONSTRUCTION COST (million M$) Dam Dabong	Dam Lebir	Dam Nenggiri	Dam Kemubu	R/I	Total	SOCIAL IMPACT Dabong H(nos) (1)	Dabong P(ha)	Dabong OP(ha)	Dabong RP(ha)	Dabong F(ha)	Dabong R(km)	Dabong PR(km)
1	R/I only					883	883							
2	Ds + R/I	445				726	1,171	4,800	40	390	5,580	4,110	30	26
3	Dm + R/I	555				668	1,223	6,100	40	540	6,090	6,030	35	44
4	Dl + R/I	745				603	1,348	7,300	40	1,400	9,850	11,230	55	57
5	Ls + R/I		220			838	1,058							
6	Lm + R/I		351			798	1,149							
7	Ll + R/I		611			708	1,319							
8	Ns + R/I			106		862	968							
9	Nm + R/I			246		848	1,094							
10	Nl + R/I			403		835	1,238							
11	Ks + R/I				139	819	958							
12	Km + R/I				189	798	987							
13	Kl + R/I				246	793	1,039							
14	Ds + Ls + R/I	445	220			698	1,363	4,800	40	390	5,580	4,110	30	26
15	Dm + Ls + R/I	555	220			638	1,413	6,100	40	540	6,090	6,030	35	44
16	Dl + Ls + R/I	745	220			563	1,528	7,300	40	1,400	9,850	11,230	55	57
17	Ds + Lm + R/I	445	351			652	1,448	4,800	40	390	5,580	4,110	30	26
18	Dm + Lm + R/I	555	351			580	1,486	6,100	40	540	6,090	6,030	35	44
19	Dl + Lm + R/I	745	351			492	1,588	7,300	40	1,400	9,850	11,230	55	57
20	Ds + Ll + R/I	445	611			529	1,585	4,800	40	390	5,580	4,110	30	26
21	Dm + Ll + R/I	555	611			428	1,594	6,100	40	540	6,090	6,030	35	44
22	Dl + Ll + R/I	745	611			318	1,674	7,300	40	1,400	9,850	11,230	55	57
23	Ds + Ls + Ns + R/I	445	220	106		647	1,418	4,800	40	390	5,580	4,110	30	26
24	Ds + Lm + Ns + R/I	445	351	106		634	1,536	4,800	40	390	5,580	4,110	30	26
25	Ds + Ll + Ns + R/I	445	611	106		613	1,775	4,800	40	390	5,580	4,110	30	26
26	Ds + Ls + Nm + R/I	445	220	246		590	1,501	4,800	40	390	5,580	4,110	30	26
27	Ds + Lm + Nm + R/I	445	351	246		573	1,615	4,800	40	390	5,580	4,110	30	26
28	Ds + Ll + Nm + R/I	445	611	246		555	1,857	4,800	40	390	5,580	4,110	30	26
29	Ds + Ls + Nl + R/I	445	220	403		443	1,511	4,800	40	390	5,580	4,110	30	26
30	Ds + Lm + Nl + R/I	445	351	403		420	1,619	4,800	40	390	5,580	4,110	30	26
31	Ds + Ll + Nl + R/I	445	611	403		393	1,852	4,800	40	390	5,580	4,110	30	26
32	Ks + Ls + R/I		220		139	732	1,091							
33	Km + Ls + R/I		220		189	710	1,119							
34	Kl + Ls + R/I		220		246	705	1,171							
35	Ks + Lm + R/I		351		139	688	1,178							
36	Km + Lm + R/I		351		189	665	1,205							
37	Kl + Lm + R/I		351		246	658	1,255							
38	Ks + Ll + R/I		611		139	577	1,327							
39	Km + Ll + R/I		611		189	540	1,340							
40	Kl + Ll + R/I		611		246	537	1,394							
41	Ns + Ls + R/I		220	106		816	1,142							
42	Nm + Ls + R/I		220	246		805	1,271							
43	Nl + Ls + R/I		220	403		792	1,415							
44	Ns + Lm + R/I		351	106		775	1,232							
45	Nm + Lm + R/I		351	246		764	1,361							
46	Nl + Lm + R/I		351	403		748	1,502							
47	Ns + Ll + R/I		611	106		684	1,401							
48	Nm + Ll + R/I		611	246		670	1,527							
49	Nl + Ll + R/I		611	403		655	1,669							

No.	Lebir H(nos) (2)	Lebir OP(ha)	Lebir RP(ha)	Lebir F(ha)	Lebir PR(km)	Nenggiri H(nos) (3)	Nenggiri F(ha)	Kemubu H(nos) (4)	Kemubu OP(ha)	Kemubu RP(ha)	Kemubu F(ha)	Kemubu R(km)	R/I H(nos) (5)	R/I B(nos)	(A) Total for H (nos) (1)-(4)	(B) Total for H (nos) (1)-(5)	Total for Plant. (ha)	(C Cons Co
1													800	3	0	800		
2													800	2	4,800	5600	5,970	
3													800	2	6,100	6900	6,630	
4													770	1	7,300	8070	11,250	
5	90	2,100	1,200	2,300									800	3	90	890	3,300	
6	140	5,400	2,900	4,600									800	3	140	940	8,300	
7	165	11,800	5,300	8,600	5								800	2	165	955	17,100	
8						320	1,600						800	3	320	1120		
9						510	6,100						800	3	510	1310		
10						640	13,900						800	3	640	1440		
11								1,000	180	790	1,910	16	800	3	1,000	1800	970	
12								1,200	560	1,660	3,780	23	800	3	1,200	2000	2,220	
13								1,295	1,160	2,990	6,600	28	800	3	1,295	2095	4,150	
14	90	2,100	1,200	2,300									800	2	4,890	5690	9,270	
15	90	2,100	1,200	2,300									780	1	6,190	6970	9,930	
16	90	2,100	1,200	2,300									770	1	7,390	8160	14,550	
17	140	5,400	2,900	4,600									800	2	4,940	5740	14,270	
18	140	5,400	2,900	4,600									770	1	6,240	7010	14,930	
19	140	5,400	2,900	4,600									750	1	7,440	8190	19,550	
20	165	11,800	5,300	8,600	5								760	1	4,965	5725	23,070	
21	165	11,800	5,300	8,600	5								740	1	6,265	7005	23,730	
22	165	11,800	5,300	8,600	5								670	1	7,465	8135	28,350	
23	90	2,100	1,200	2,300		320	1,600						800	1	5,210	6010	9,270	
24	140	5,400	2,900	4,600		320	1,600						790	1	5,260	6050	14,270	
25	165	11,800	5,300	8,600	5	320	1,600						780	1	5,285	6065	23,070	
26	90	2,100	1,200	2,300		510	6,100						770	1	5,400	6170	9,270	
27	140	5,400	2,900	4,600		510	6,100						770	1	5,450	6220	14,270	
28	165	11,800	5,300	8,600	5	510	6,100						760	1	5,475	6235	23,070	
29	90	2,100	1,200	2,300		640	13,900						740	1	5,530	6270	9,270	
30	140	5,400	2,900	4,600		640	13,900						730	1	5,580	6310	14,270	
31	165	11,800	5,300	8,600	5	640	13,900						720	1	5,605	6325	23,070	
32	90	2,100	1,200	2,300				1,000	180	790	1,910	16	800	2	1,090	1890	4,270	
33	90	2,100	1,200	2,300				1,200	560	1,660	3,780	23	800	2	1,290	2090	5,520	
34	90	2,100	1,200	2,300				1,295	1,160	2,990	6,600	28	800	2	1,385	2185	7,450	
35	140	5,400	2,900	4,600				1,000	180	790	1,910	16	800	2	1,140	1940	9,270	
36	140	5,400	2,900	4,600				1,200	560	1,660	3,780	23	800	2	1,340	2140	10,520	
37	140	5,400	2,900	4,600				1,295	1,160	2,990	6,600	28	800	2	1,435	2235	12,450	
38	165	11,800	5,300	8,600	5			1,000	180	790	1,910	16	770	1	1,165	1935	18,070	
39	165	11,800	5,300	8,600	5			1,200	560	1,660	3,780	23	760	1	1,365	2125	19,320	
40	165	11,800	5,300	8,600	5			1,295	1,160	2,990	6,600	28	760	1	1,460	2220	21,250	
41	90	2,100	1,200	2,300		320	1,600						800	3	410	1210	3,300	
42	90	2,100	1,200	2,300		510	6,100						800	3	600	1400	3,300	
43	90	2,100	1,200	2,300		640	13,900						800	3	730	1530	3,300	
44	140	5,400	2,900	4,600		320	1,600						800	3	460	1260	8,300	
45	140	5,400	2,900	4,600		510	6,100						800	3	650	1450	8,300	
46	140	5,400	2,900	4,600		640	13,900						800	3	780	1580	8,300	
47	165	11,800	5,300	8,600	5	320	1,600						800	2	485	1285	17,100	
48	165	11,800	5,300	8,600	5	510	6,100						800	2	675	1475	17,100	
49	165	11,800	5,300	8,600	5	640	13,900						800	2	805	1605	17,100	

Remarks ; Dam Scheme D : Dabong L : Lebir N : Nenggiri K : Kemubu
Dam Scale s : small m : medium l : large
Compensation H : houses P : Paddy OP : Oil palm RP : Rubber R : Railway PR : Public road F : Forest B : Bridge
EIRR F.M. : Flood mitigation P.G. : Power generation

Table 6.4 Construction Cost ans Social Impact for Combination Plan

CONSTRUCTION COST (million M$)					SOCIAL IMPACT																								ORDER				EIRR	
Dam			R/I	Total	Dabong							Lebir					Nenggiri		Kemubu					R/I		(A) Total for H (nos) (1)-(4)	(B) Total for H (nos) (1)-(5)	Total for Plant. (ha)	(C) Const. Cost	(D) Social Impact for(A)	(E) Social Impact for(B)	Total (C)+(E)	F.M. (%)	F.M. & P.G. (%)
Lebir	Nenggiri	Kemubu			H(nos) (1)	P(ha)	OP(ha)	RP(ha)	F(ha)	R(km)	PR(km)	H(nos) (2)	OP(ha)	RP(ha)	F(ha)	PR(km)	H(nos) (3)	F(ha)	H(nos) (4)	OP(ha)	RP(ha)	F(ha)	R(km)	H(nos) (5)	B(nos)									
			883	883																			800	3	0	800		1		1	2	4.5	
			726	1,171	4,800	40	390	5,580	4,110	30	26												800	2	4,800	5600	5,970	13	28	29	42	2.6	
			668	1,223	6,100	40	540	6,090	6,030	35	44												800	2	6,100	6900	6,630	16	41	42	58	2.3	4.8
			603	1,348	7,300	40	1,400	9,850	11,230	55	57												770	1	7,300	8070	11,250	24	45	46	70	1.9	9.1
220			838	1,058								90	2,100	1,200	2,300								800	3	90	890	3,300	6	1	2	8	3.2	
351			798	1,149								140	5,400	2,900	4,600								800	3	140	940	8,300	11	2	3	14	2.8	3.7
611			708	1,319								165	11,800	5,300	8,600	5							800	2	165	965	17,100	21	3	4	25	2.0	5.6
	106		862	968													320	1,600					800	3	320	1120		3	4	5	8	3.8	
	246		848	1,094													510	6,100					800	3	510	1310		8	8	9	17	3.1	6.1
	403		835	1,238													640	13,900					800	3	640	1440		18	10	11	29	2.2	10.2
		139	819	958															1,000	180	790	1,910	16	800	3	1,000	1800	970	2	16	17	19	3.8	
		189	798	987															1,200	560	1,660	3,780	23	800	3	1,200	2000	2,220	4	20	21	25	3.6	
		246	793	1,039															1,295	1,160	2,990	6,600	28	800	3	1,295	2095	4,150	5	22	23	28	3.3	
220			698	1,363	4,800	40	390	5,580	4,110	30	26	90	2,100	1,200	2,300								800	2	4,890	5690	9,270	26	29	30	56	1.8	
220			638	1,413	6,100	40	540	6,090	6,030	35	44	90	2,100	1,200	2,300								780	1	6,190	6970	9,930	29	42	43	72	1.7	3.5
220			563	1,528	7,300	40	1,400	9,850	11,230	55	57	90	2,100	1,200	2,300								770	1	7,390	8160	14,550	38	47	48	86	1.4	7.9
351			652	1,448	4,800	40	390	5,580	4,110	30	26	140	5,400	2,900	4,600								800	2	4,940	5740	14,270	32	31	31	63	1.8	2.6
351			580	1,486	6,100	40	540	6,090	6,030	35	44	140	5,400	2,900	4,600								770	1	6,240	7010	14,930	33	44	45	78	1.7	4.0
351			492	1,588	7,300	40	1,400	9,850	11,230	55	57	140	5,400	2,900	4,600								750	1	7,440	8190	19,550	41	48	49	90	1.4	8.0
611			529	1,585	4,800	40	390	5,580	4,110	30	26	165	11,800	5,300	8,600	5							760	1	4,965	5725	23,070	40	30	32	72	1.7	4.4
611			428	1,594	6,100	40	540	6,090	6,030	35	44	165	11,800	5,300	8,600	5							740	1	6,265	7005	23,730	42	43	44	86	1.3	5.7
611			318	1,674	7,300	40	1,400	9,850	11,230	55	57	165	11,800	5,300	8,600	5							670	1	7,465	8135	28,350	46	46	47	93	1.1	9.0
220	106		647	1,418	4,800	40	390	5,580	4,110	30	26	90	2,100	1,200	2,300		320	1,600					800	1	5,210	6010	9,270	31	32	33	64	1.7	
351	106		634	1,536	4,800	40	390	5,580	4,110	30	26	140	5,400	2,900	4,600		320	1,600					790	1	5,260	6050	14,270	39	33	34	73	1.6	2.1
611	106		613	1,775	4,800	40	390	5,580	4,110	30	26	165	11,800	5,300	8,600	5	320	1,600					780	1	5,285	6065	23,070	47	34	35	82	0.7	3.8
220	246		590	1,501	4,800	40	390	5,580	4,110	30	26	90	2,100	1,200	2,300		510	6,100					770	1	5,400	6170	9,270	34	35	36	70	1.6	3.9
351	246		573	1,615	4,800	40	390	5,580	4,110	30	26	140	5,400	2,900	4,600		510	6,100					770	1	5,450	6220	14,270	43	36	37	80	1.4	4.0
611	246		555	1,857	4,800	40	390	5,580	4,110	30	26	165	11,800	5,300	8,600	5	510	6,100					760	1	5,475	6235	23,070	49	37	38	87	0.6	5.1
220	403		443	1,511	4,800	40	390	5,580	4,110	30	26	90	2,100	1,200	2,300		640	13,900					740	1	5,530	6270	9,270	36	38	39	75	1.6	6.8
351	403		420	1,619	4,800	40	390	5,580	4,110	30	26	140	5,400	2,900	4,600		640	13,900					730	1	5,580	6310	14,270	44	39	40	84	1.4	7.4
611	403		393	1,852	4,800	40	390	5,580	4,110	30	26	165	11,800	5,300	8,600	5	640	13,900					720	1	5,605	6325	23,070	48	40	41	89	0.6	7.8
220		139	732	1,091								90	2,100	1,200	2,300				1,000	180	790	1,910	16	800	2	1,090	1890	4,270	7	17	18	25	3.0	
220		189	710	1,119								90	2,100	1,200	2,300				1,200	560	1,660	3,780	23	800	2	1,290	2090	5,520	9	21	22	31	2.9	
220		246	705	1,171								90	2,100	1,200	2,300				1,295	1,160	2,990	6,600	28	800	2	1,385	2185	7,450	12	25	26	38	2.7	
351		139	688	1,178								140	5,400	2,900	4,600				1,000	180	790	1,910	16	800	2	1,140	1940	9,270	14	19	20	34	2.8	3.6
351		189	665	1,205								140	5,400	2,900	4,600				1,200	560	1,660	3,780	23	800	2	1,340	2140	10,520	15	24	25	40	2.7	3.3
351		246	658	1,255								140	5,400	2,900	4,600				1,295	1,160	2,990	6,600	28	800	2	1,435	2235	12,450	19	27	28	47	2.5	3.3
611		139	577	1,327								165	11,800	5,300	8,600	5			1,000	180	790	1,910	16	770	1	1,165	1935	18,070	22	18	19	41	2.1	5.7
611		189	540	1,340								165	11,800	5,300	8,600	5			1,200	560	1,660	3,780	23	760	1	1,365	2125	19,320	23	23	24	47	1.9	5.5
611		246	537	1,394								165	11,800	5,300	8,600	5			1,295	1,160	2,990	6,600	28	760	1	1,460	2220	21,250	27	26	27	54	1.9	5.6
220	106		816	1,142								90	2,100	1,200	2,300		320	1,600					800	3	410	1210	3,300	10	5	6	16	2.7	
220	246		805	1,271								90	2,100	1,200	2,300		510	6,100					800	3	600	1400	3,300	20	9	10	30	2.2	5.1
220	403		792	1,415								90	2,100	1,200	2,300		640	13,900					800	3	730	1530	3,300	30	13	14	44	1.6	9.2
351	106		775	1,232								140	5,400	2,900	4,600		320	1,600					800	3	460	1260	8,300	17	6	7	24	2.5	3.4
351	246		764	1,361								140	5,400	2,900	4,600		510	6,100					800	3	650	1450	8,300	25	11	12	37	2.0	5.1
351	403		748	1,502								140	5,400	2,900	4,600		640	13,900					800	3	780	1580	8,300	35	14	15	50	1.5	8.3
611	106		684	1,401								165	11,800	5,300	8,600	5	320	1,600					800	2	485	1285	17,100	28	7	8	36	1.8	5.3
611	246		670	1,527								165	11,800	5,300	8,600	5	510	6,100					800	2	675	1475	17,100	37	12	13	50	1.4	6.4
611	403		655	1,669								165	11,800	5,300	8,600	5	640	13,900					800	2	805	1605	17,100	45	15	16	61	0.9	8.9

Dabong L : Lebir N : Nenggiri K : Kemubu
small m : medium l : large
houses P : Paddy OP : Oil palm RP : Rubber R : Railway PR : Public road F : Forest B : Bridge
. : Flood mitigation P.G. : Power generation

Table 6.5 Combinations to Meet the Basic Concept on Peak Discharge at Guillemard Bridge

No.	Combination	Peak discharge at Guillemard Bridge, m^3/sec	Households to be submerged, nos
1	Dl + Ls	10,510	6,190
2	Dm + Lm	10,746	6,240
3	Dl + Lm	9,491	7,440
4	Ds + Ll	9,989	4,965
5	Dm + Ll	8,721	6,265
6	Dl + Ll	7,466	7,465
7	Ds + Ls + Nm	10,926	5,400
8	Ds + Lm + Nm	10,656	5,450
9	Ds + Ll + Nm	10,335	5,475
10	Ds + Ls + Nl	8,874	5,530
11	Ds + Lm + Nl	8,604	5,580
12	Ds + Ll + Nl	8,283	5,605
13	Ks + Ll	10,724	1,165
14	Km + Ll	10,201	1,365
15	Kl + Ll	10,107	1,460

Remarks : Dam scheme D : Dabong L : Lebir
K : Kemubu N : Nenggiri
Dam scale l : maximum m : medium s : minimum

Table 6.6 Flood Mitigation Effect at Guillemard Bridge

(Unit : m^3/sec)

Case	Combination	Probability				
		1/5	1/10	1/20	1/30	1/50
1.	Natural condition	8,680	11,430	13,470	14,770	16,370
2.	R/I only 1/	9,190	12,100	14,350	15,760	17,420
3.	Lebir + R/I	6,860	8,840	10,520	11,530	12,910
4.	Kemubu + R/I	8,630	11,440	13,180	14,290	15,800
5.	Lebir + Kemubu + R/I	6,260	8,060	9,270	9,940	10,650

Note : 1/ Flood discharge inundated at the reaches between Kuala Krai and Guillemard Bridge is confined in the river channel by river improvement.

Table 6.7 River Division for Implementation

River stretches	Urban/ Rural	Distance, km (A)	Area, km^2	Population, persons	Population density, persons/km^2	Annual potential damage (50-year flood), 10^6 M$ (B)	(B)/(A) (10^6MS$/km)
Left bank							
DL1	Rural	25.0	239.1	130,084	544	8.70	0.348
DL2	Urban	5.0	62.8 (19.9)	38,217 (23,145)	609 (1,166)	3.81 (0.80)	0.762
DL3	Rural	18.0	69.8	18,590	266	1.38	0.077
DL4	Rural	11.0	19.6	5,665	290	0.95	0.086
DL5	Urban	9.0	34.2	31,206	912	1.53	0.170
DL6	Rural	33.0	31.5	6,508	207	1.34	0.041
Right bank							
DR1	Rural	6.5	25.3	20,965	829	0.33	0.051
DR2	Urban	9.5	163.5 (10.9)	237,317 (41,869)	1,451 (3,852)	12.38 (9.54)	1.303
DR3	Rural	19.0	174.2	94,681	544	5.06	0.266
DR4	Rural	11.0	124.8	67,806	543	2.47	0.225
DR5	Rural	52.0	141.2	43,943	311	3.51	0.068
DR6	Urban	3.0	17.2	38,750	2,252	1.11	0.370

Note: Figures in parentheses show the information in the township area excluding the out-skirts.

Table 6.8 Disbursement Schedule for the Flood Mitigation Plan of the Kelantan River Basin

Unit : Million M$

	Malaysia Plan																		
	6th					7th					8th						9th		
emes	'91	'92	'93	'94	'95	'96	'97	'98	'99	2000	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10
er Improvement																				
an area			31.7	23.5	23.5	23.5	16.2	16.2	15.2	15.2										
al area			39.4	11.5	11.5	11.5	18.9	18.9	19.9	19.9	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
Schemes																				
ir			117.3	57.5	71.1	84.7	112.0	57.5												
ubu																	69.6	51.2	52.7	52.0
			188.4	92.5	106.1	119.7	147.1	92.6	35.1	35.1	26.0	26.0	26.0	26.0	26.0	26.0	95.6	77.2	78.7	78.0
each Malaysian Plan				387.0				429.6					130.0					355.6		

FIGURES

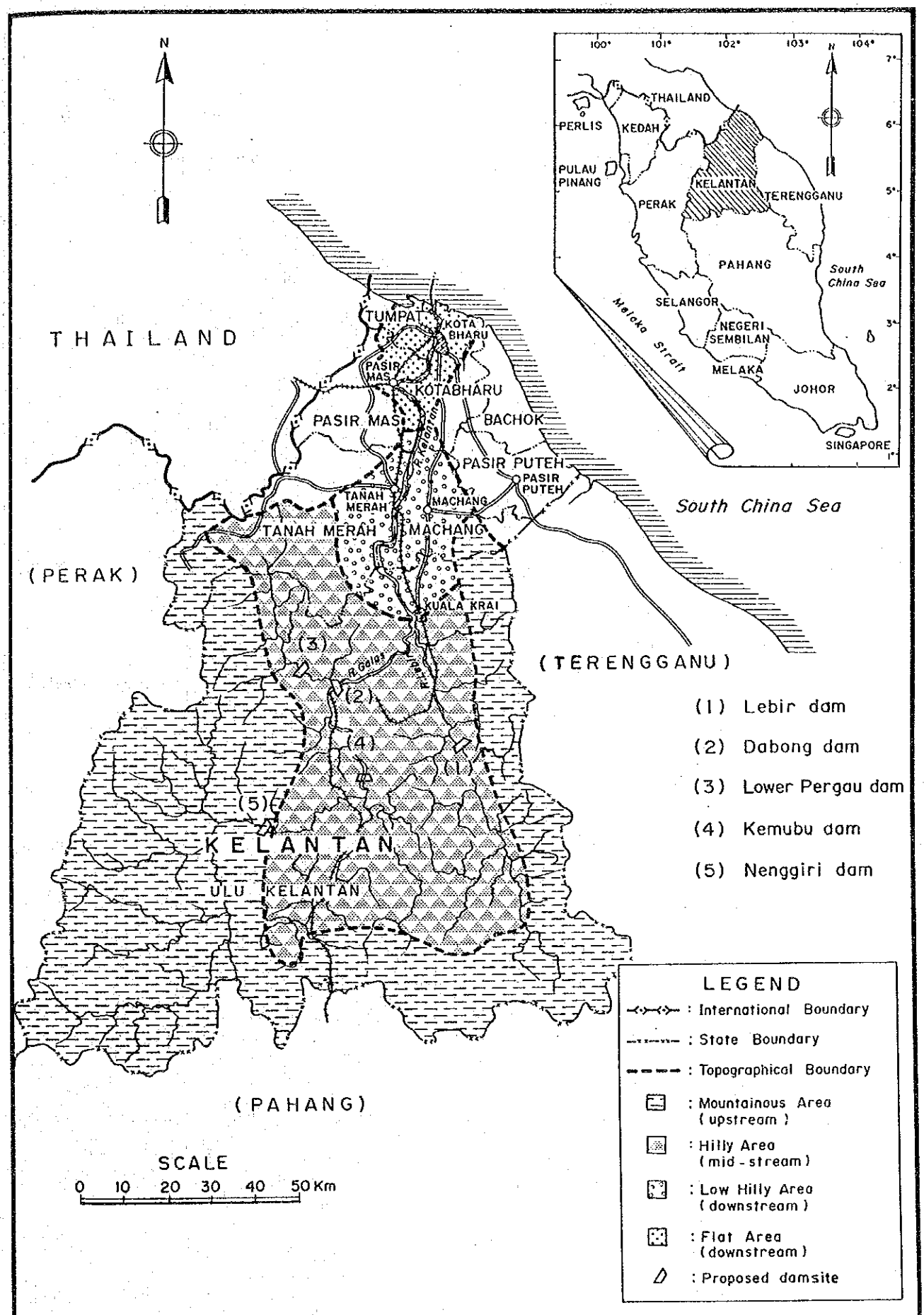

Fig.2.1

Topographic Map of the Kelantan River Basin

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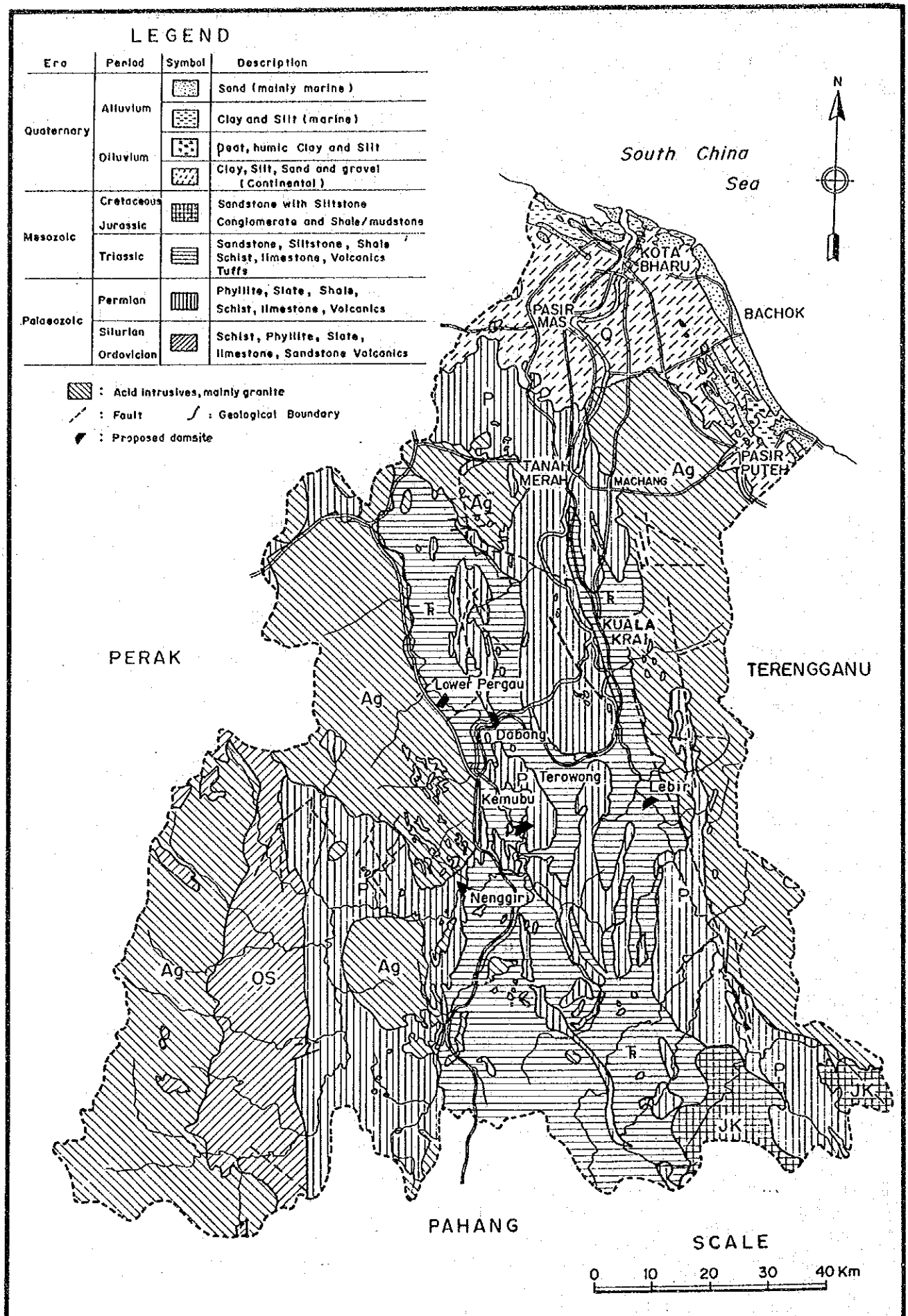

Fig.2.2

Geological Map of the Kelantan River Basin

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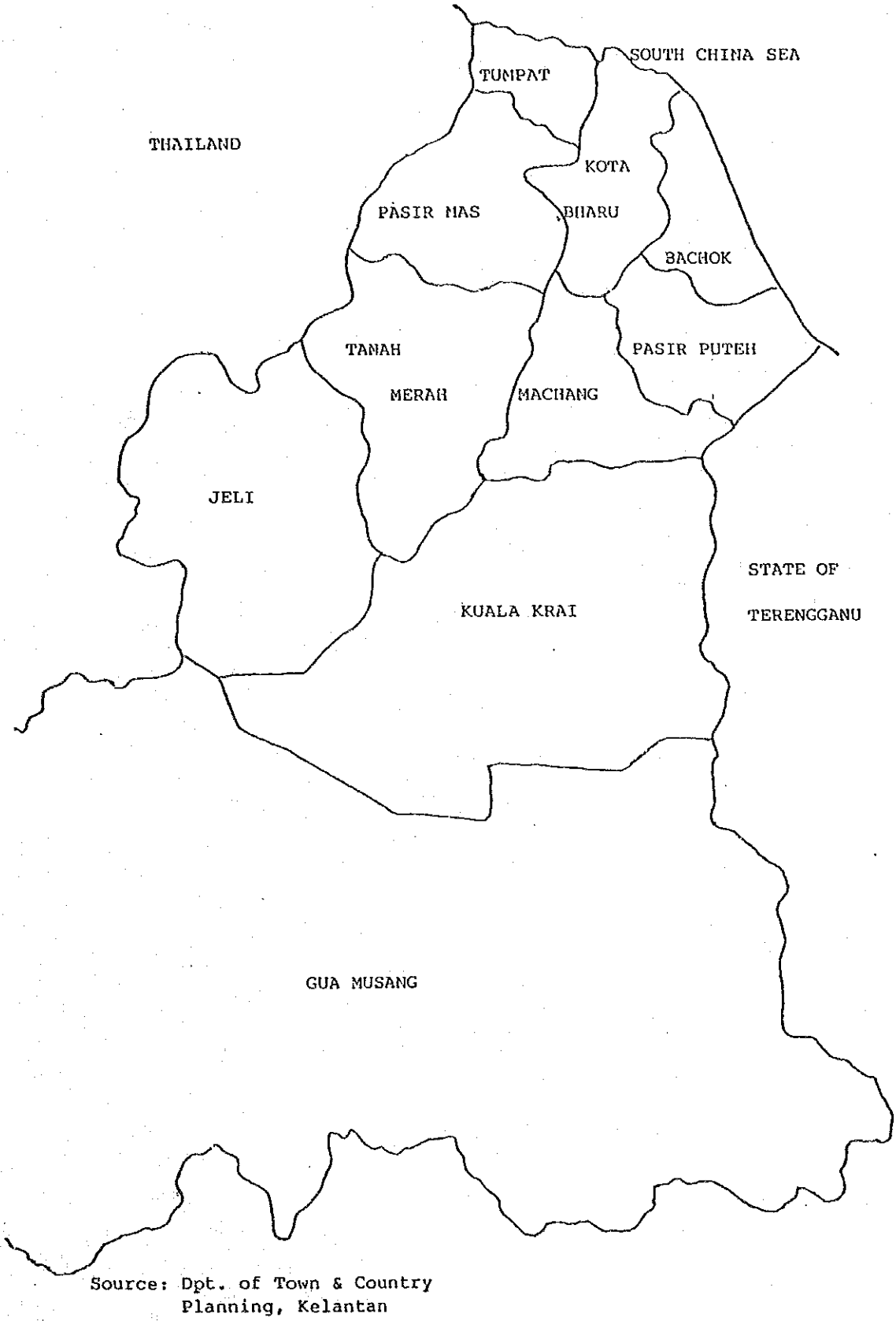

Source: Dpt. of Town & Country Planning, Kelantan

Fig.2.3

Districts of Kelantan

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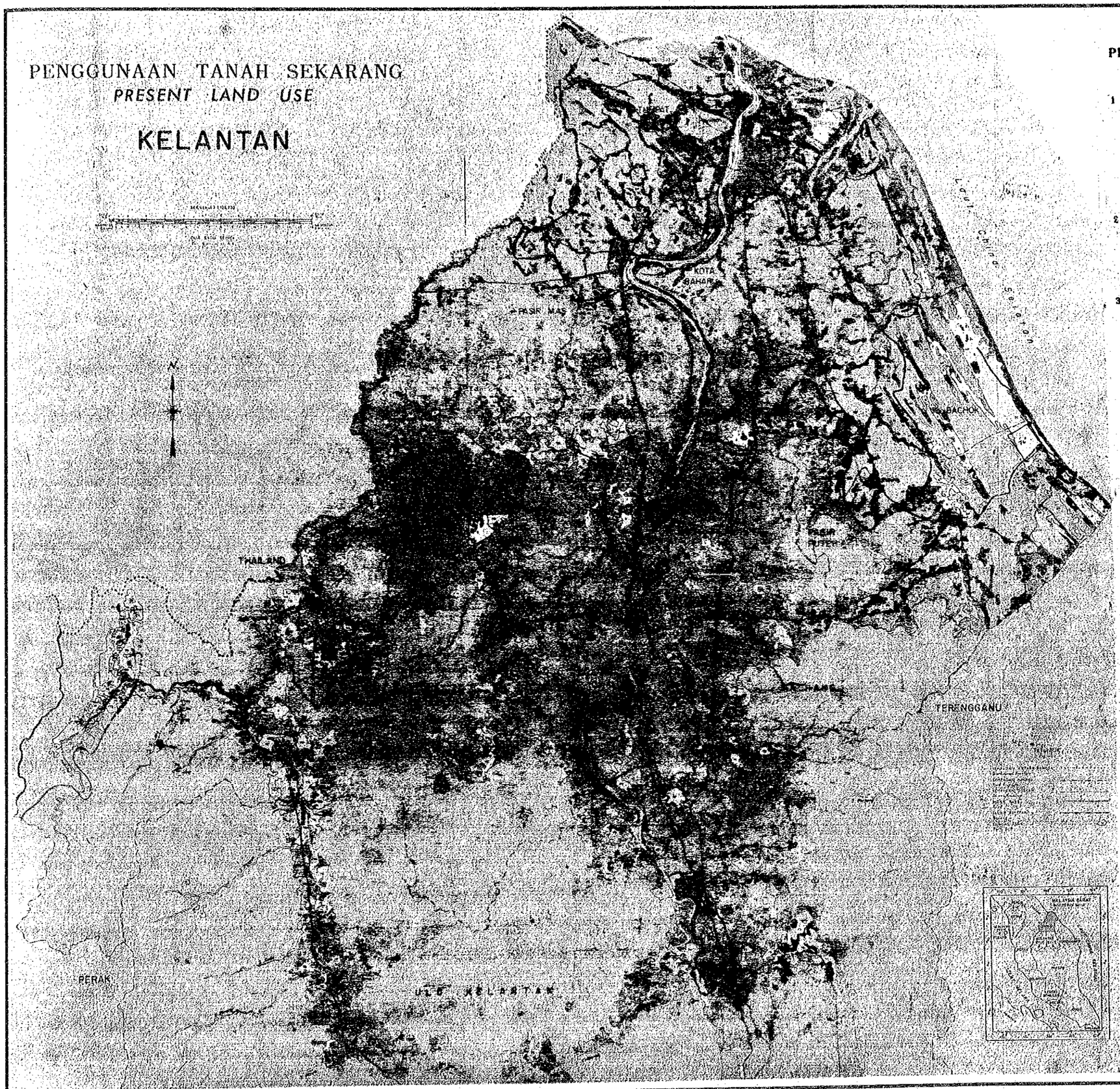
PENGGUNAAN TANAH SEKARANG
PRESENT LAND USE

KELANTAN



PETUNJUK PENGELASAN PENGGUNAAN TANAH
LAND USE CLASSIFICATION LEGEND

1 KAWASAN TEMPAT TINGGAL DAN KAWASAN BERKAITAN BUKAN PERTANIAN
Settlements and Associated Non-Agricultural Areas
- KAWASAN BANDARAN DAN YANG BERKAITAN
- KAWASAN BANGUNAN LADANG DAN YANG BERKAITAN
- KAWASAN LOMBONG BIJIH TIMAH
- KAWASAN LOMBONG LAIN-LAIN GALIAN
- HAK LALU TALIAN LETRIK

2 KAWASAN PERKEBUNAN
Horticultural Lands
- PERKEBUNAN CAMPUR
- PERKEBUNAN SAYUR-SAYUR DAN BENDA-BENDA MAKANAN
- PUSAT PERCUBAAN PERTANIAN

3 POKOK, PALMA DAN LAIN-LAIN TANAMAN KEKAL
Tree, Palm and Other Permanent Crops
- GETAH
- KELAPA SAWIT
- KELAPA
- NENAS
- TEH
- KOPI
- KOKO
- LADA HITAM
- TEBU
- DUSUN-RAMBUTAN/DURIAN/LIMAU/CENGKIH/PALA/DLL
- BEMBAN
- PISANG
- KOLAM IKAN DAN KEMBANGAN (KANGKANG ATAU KELADI BUNTING)
- PINANG

4 KAWASAN TANAMAN
Cropland
- PADI
- PELBAGAI TANAMAN
- PENANAMAN BERPINDAH-PINDAH

5 PADANG TERNAK KEKAL YANG DIPERBAIKI
Improved Permanent Pasture
- PADANG TERNAK KEKAL YANG DIPERBAIKI

6 PADANG RUMPUT
Grasslands
- LALANG, PADANG TERNAK YANG TERSEBAR DAN/ATAU PADANG RUMPUT SEMAK
- TAPAK-TAPAK HARIMAU BERUMPUT DAN TANAH-TANAH RUNTUH

7 KAWASAN HUTAN
Forest Land
- HUTAN
- SEMAK
- CERANG BAWAKU

8 HUTAN-HUTAN PAYA DAN BUYAU
Swamps, Marshlands and Wetland Forests
- TERMASUK BAKAU, NIPAH, GELAM DAN LAIN-LAIN KUMPULAN HUTAN BUYAU

9 KAWASAN YANG TIDAK DIUSAHAKAN
Unused Land
- KAWASAN YANG TIDAK DIUSAHAKAN

Fig.2.4

Present Land Use (1/2)

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PERAK

K E L A N T A N

PAHANG

TERENGGANU

N

Fig.2.4

Present Land Use (2/2)

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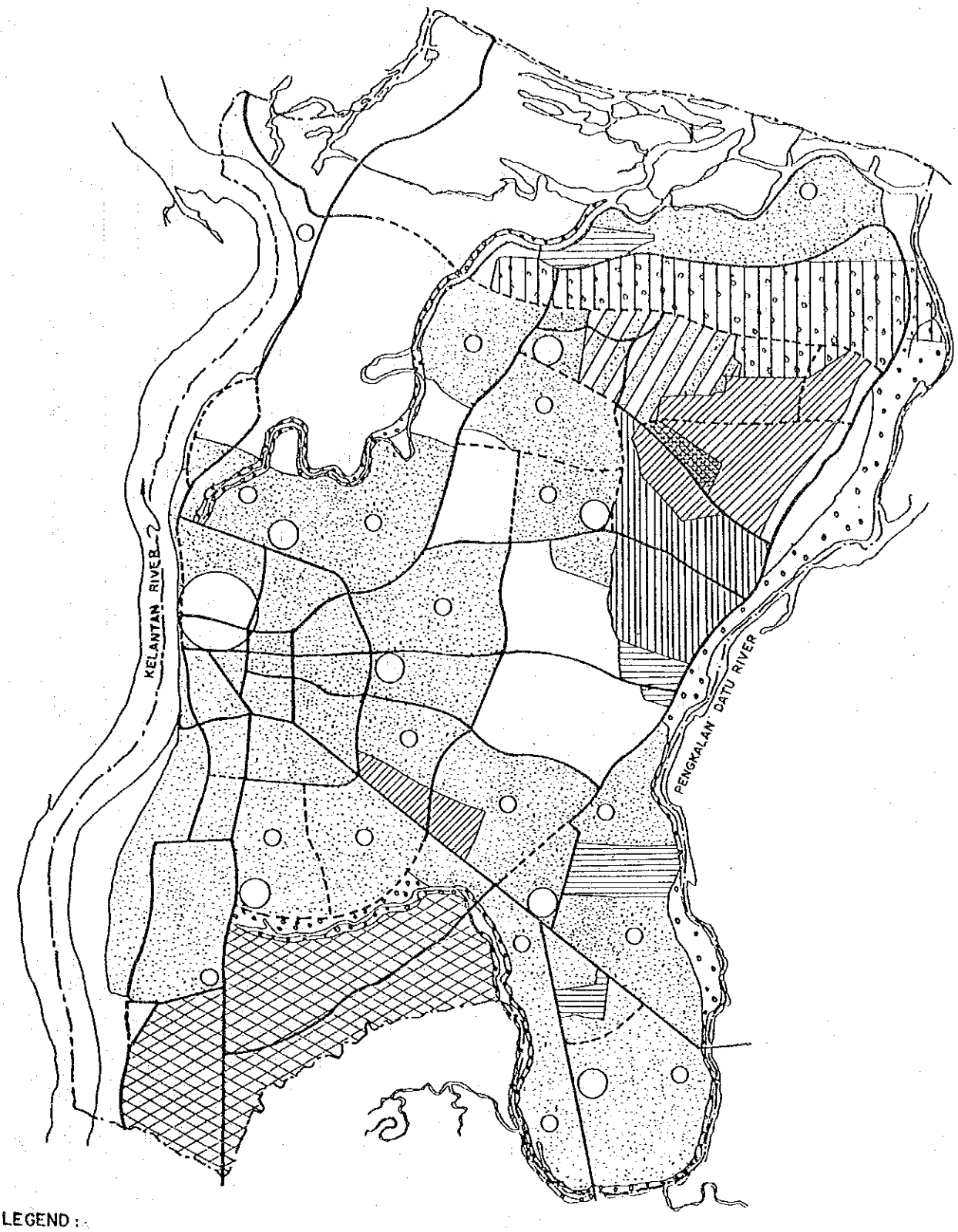

LEGEND :

- CENTRAL AREA
- DISTRICT CENTRE
- COMMUNITY CENTRE
- RESIDENTAL AREA
- INDUSTRIAL AREA
- FUTURE URBAN AREA
- INDUSTRIAL ESTATE WORKER ACCOMODATION
- OPEN SPACE/AGRICULTURAL AREA
- FLOODWAY
- IRRIGATION SCHEME AREA
- AIRPORT
- SPECIAL USE AREA
- RESIDENTIAL/INSTITUTIONAL AREA
- ROAD (- - - PROPOSED)
- BOUNDARY OF MPKB (KOTA BHARU MUNICIPAL COUNCIL)

Fig.2.5

Development Plan of Majilis Perbandaran Kota Bharu

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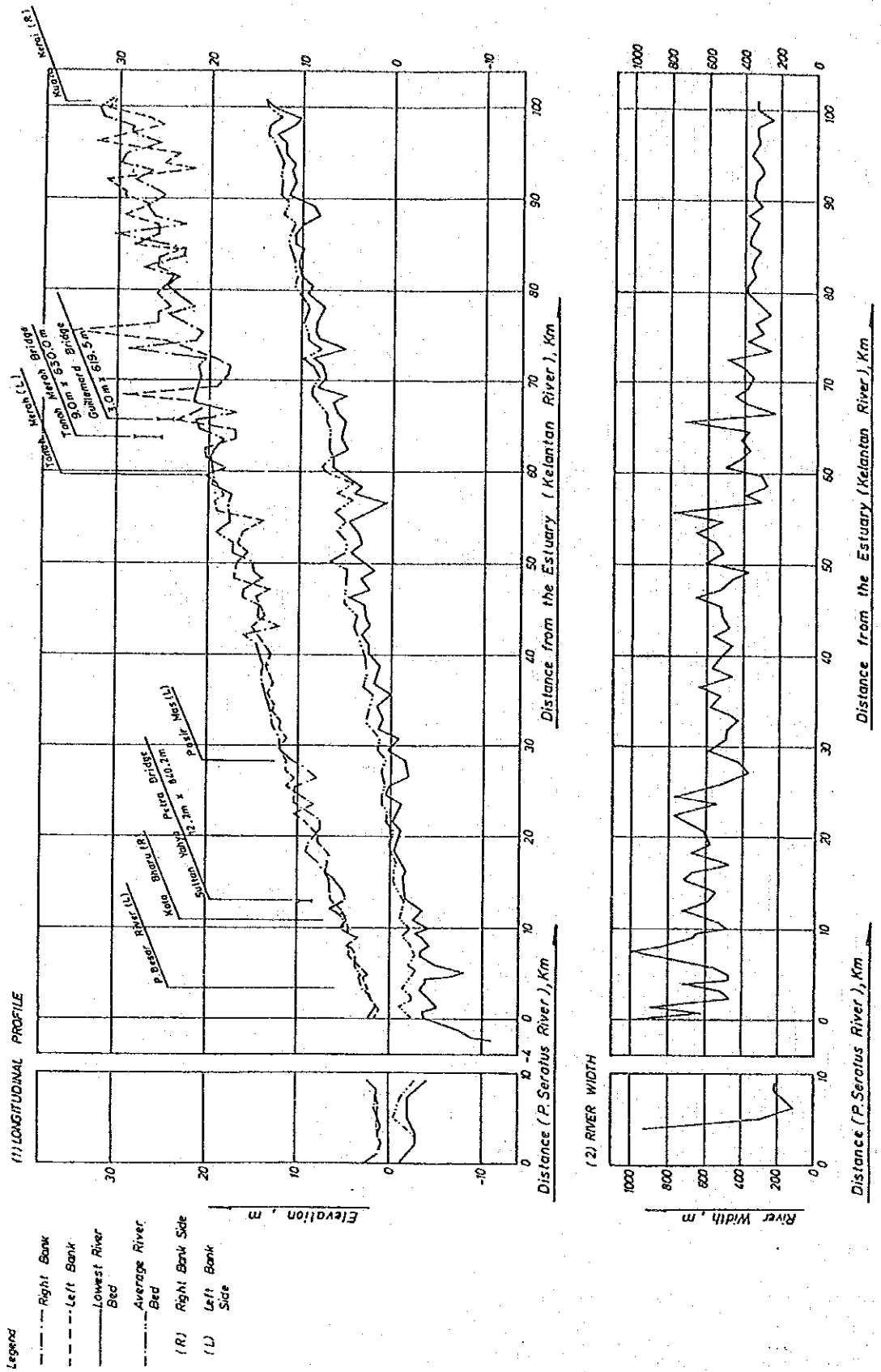

Fig.2.6

Characteristics of the Kelantan River

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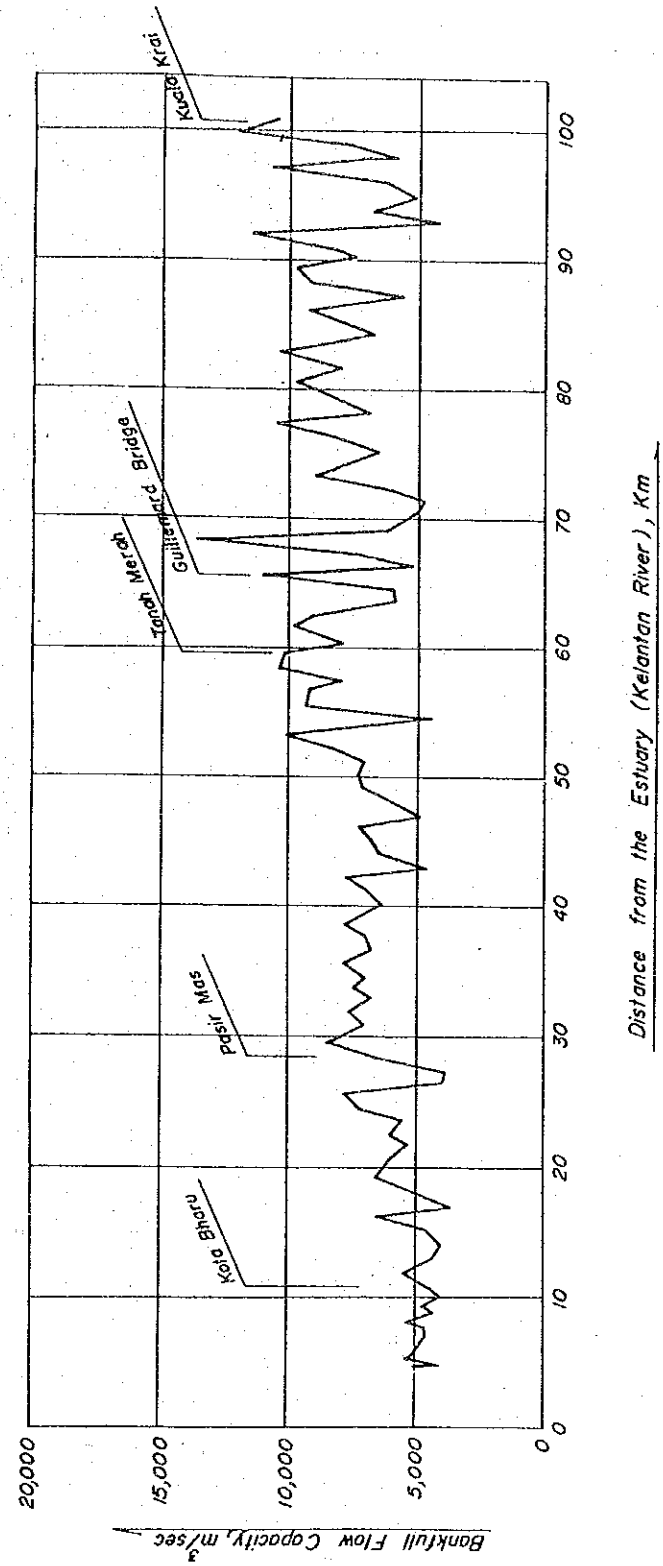

Fig.2.7

Bankful Flow Capacity of the Kelantan River

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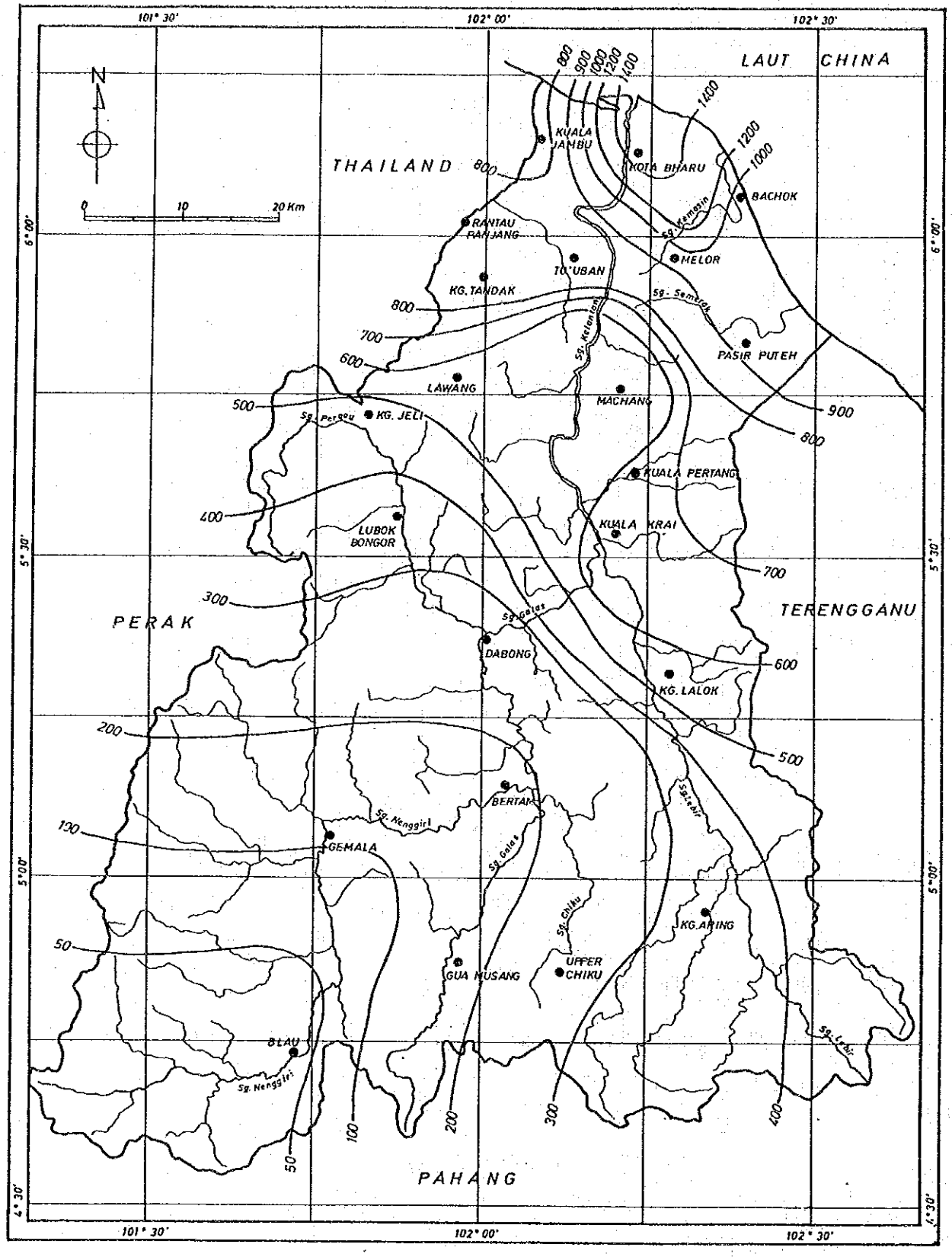

Fig.2.8

Isohyetal Map of Monsoon Rainfall (Nov.26 to Dec.1, 1986)

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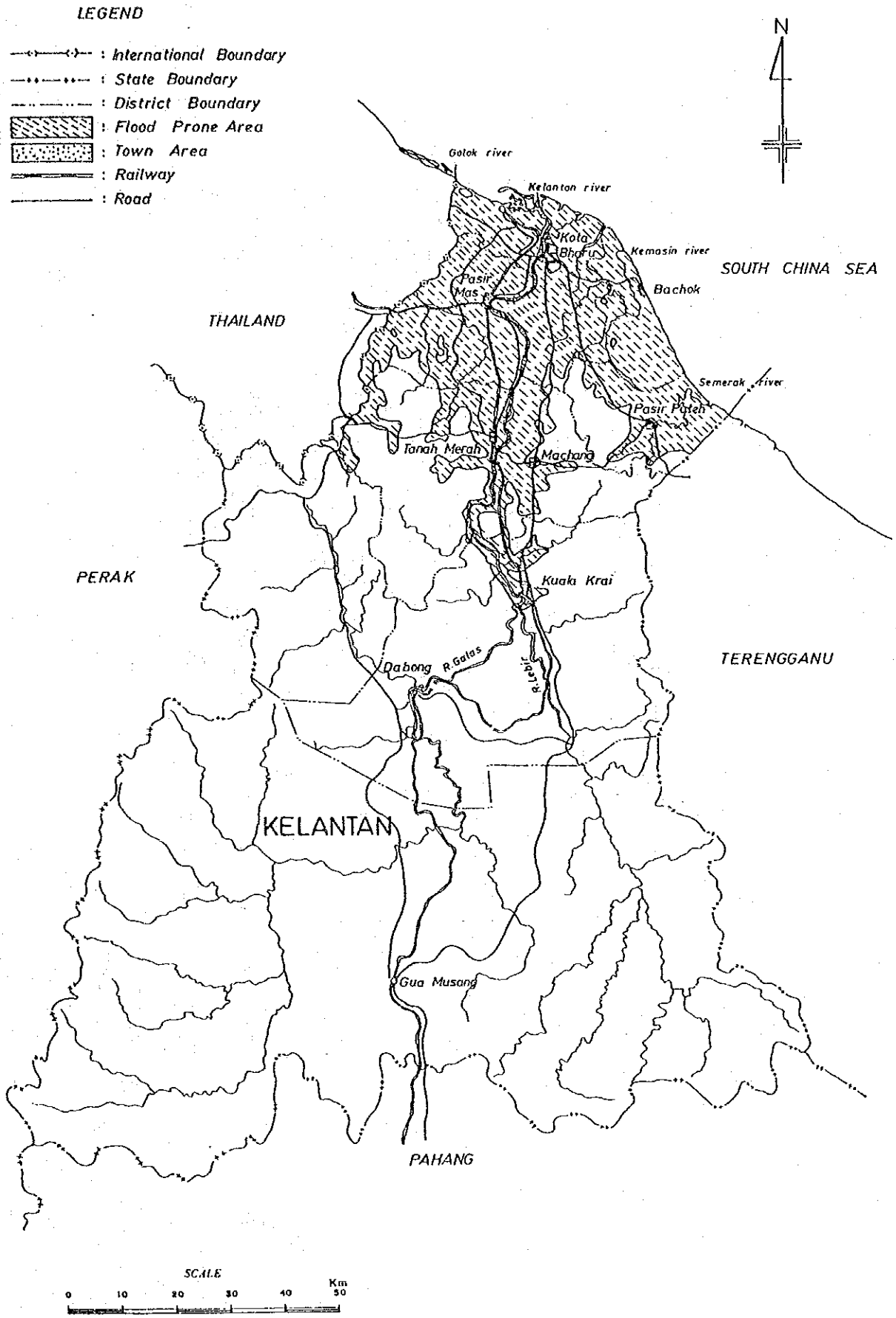

Fig.2.9

Flooded Area by January 1967 Flood

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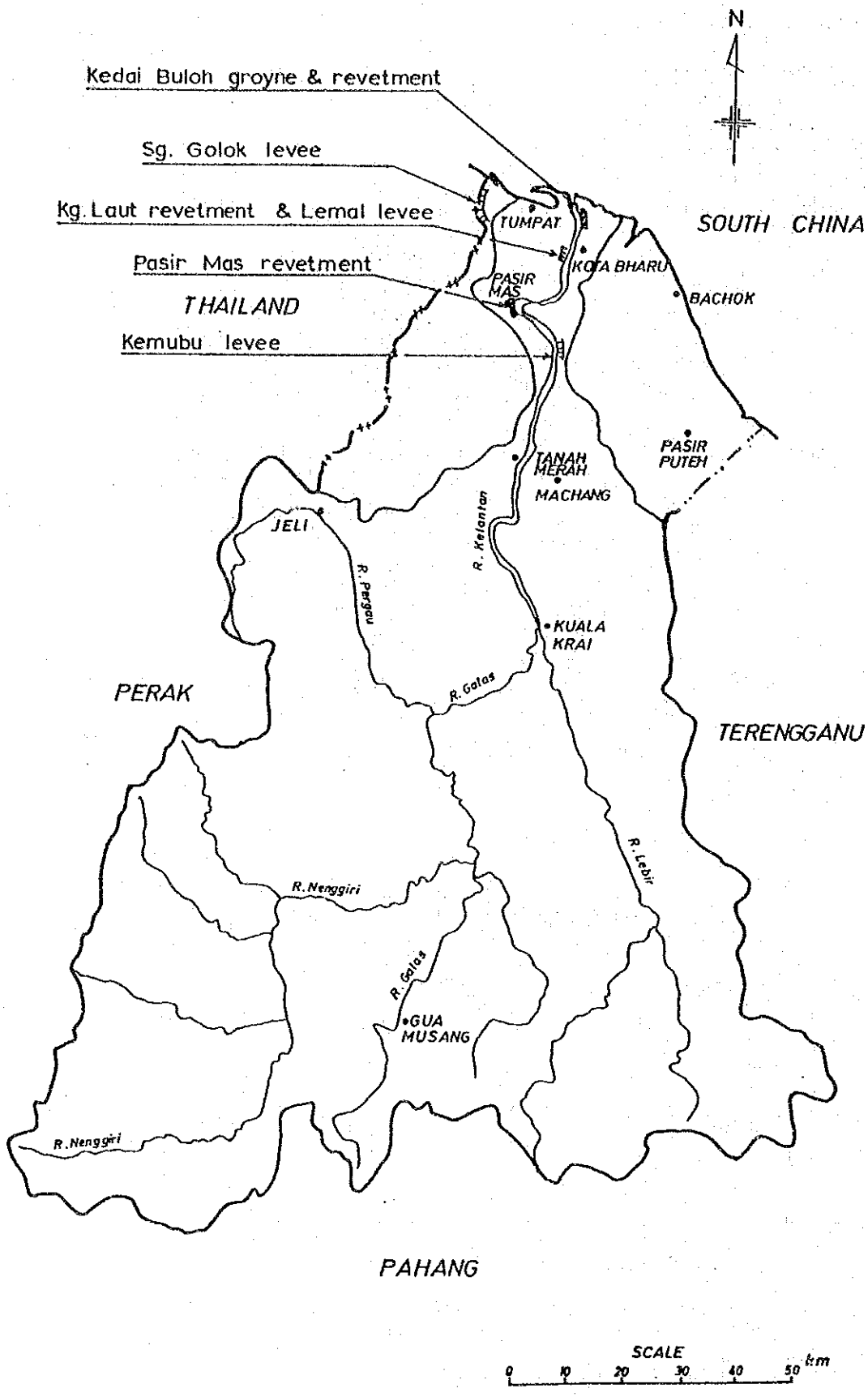

Fig.2.10

Existing Flood Mitigation Facilities

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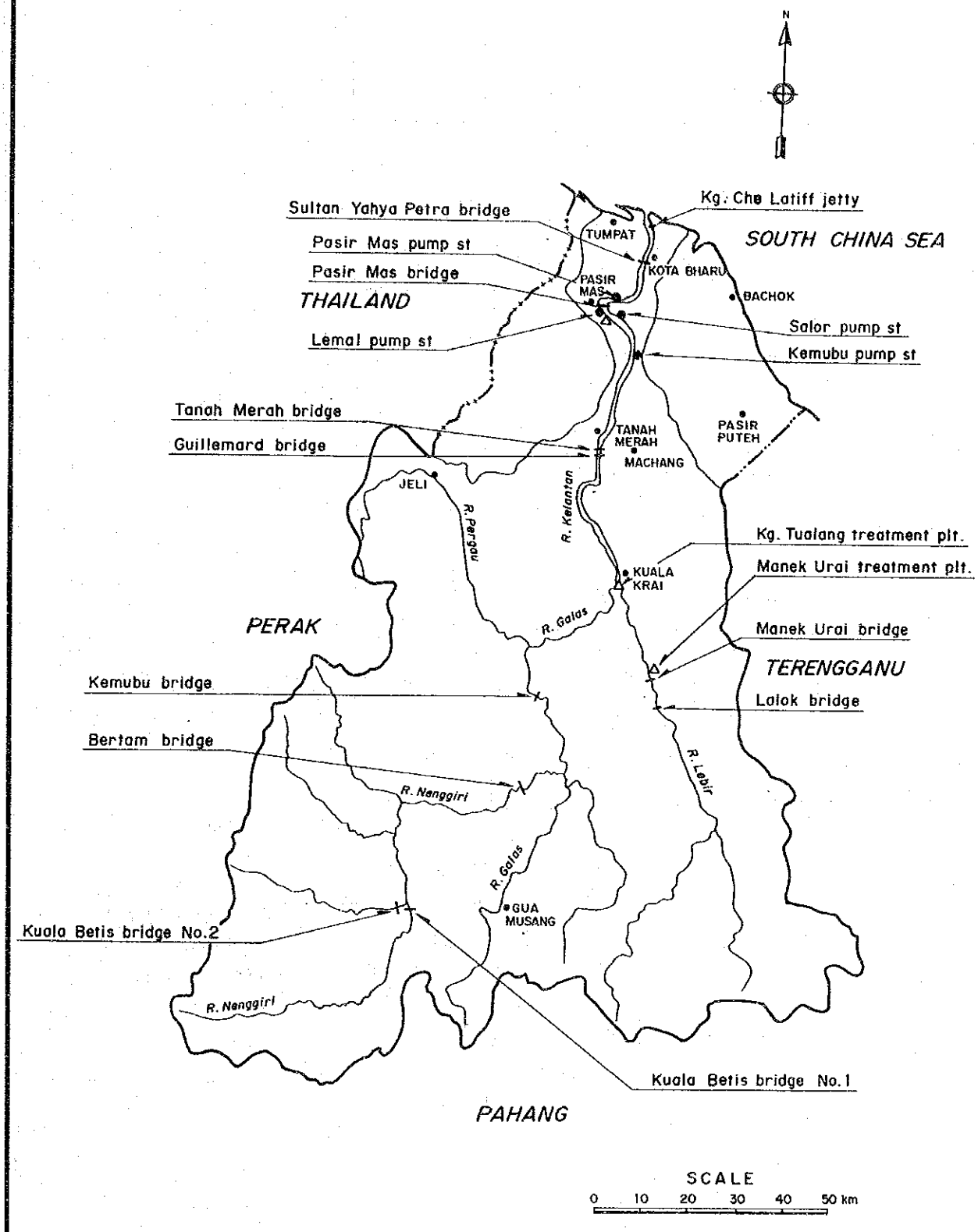

Fig.2.11

Existing Structures along the Kelantan River

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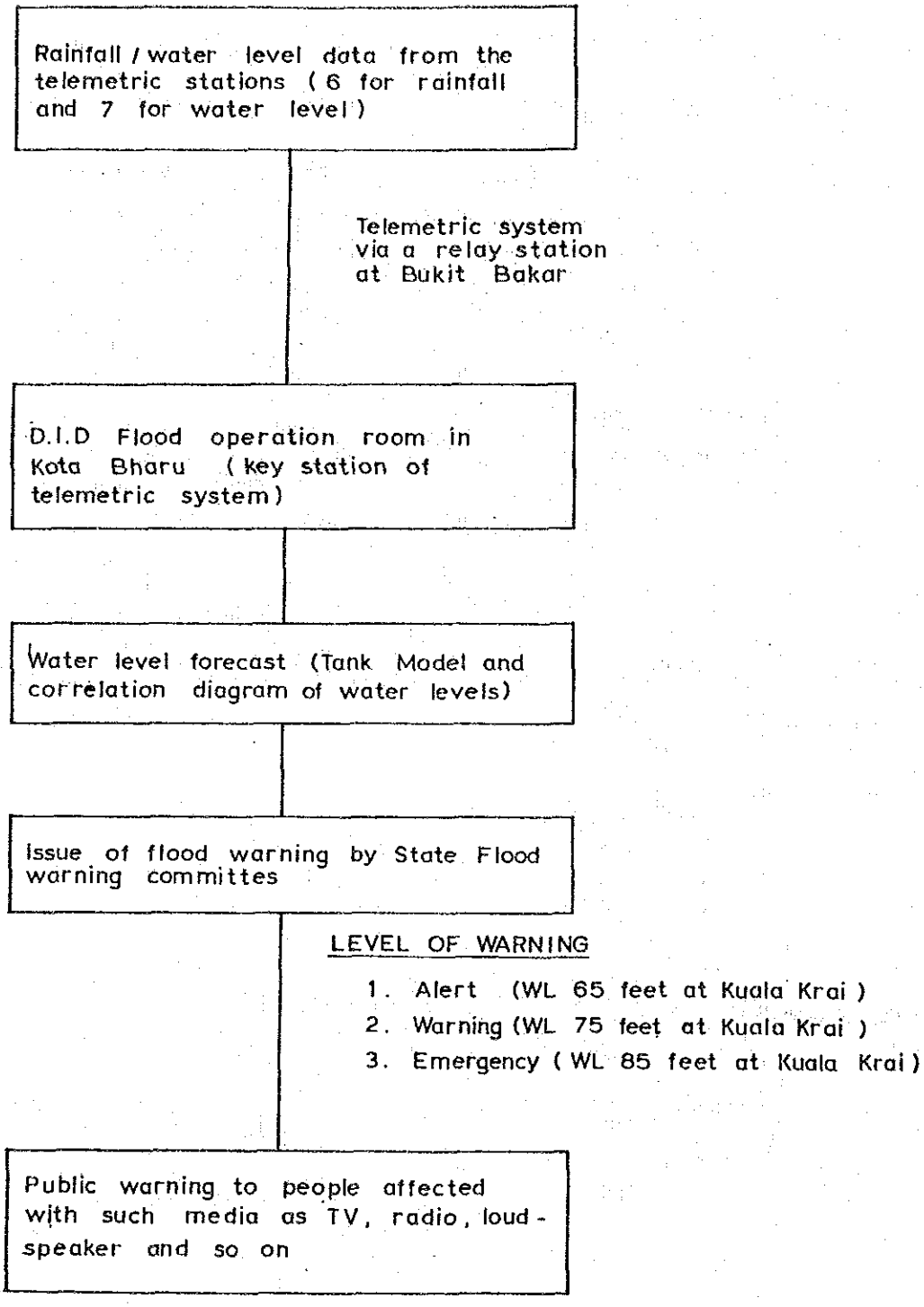

Fig.2.12

Flood Forecasting and Warning System in the Entire Kelantan River Basin

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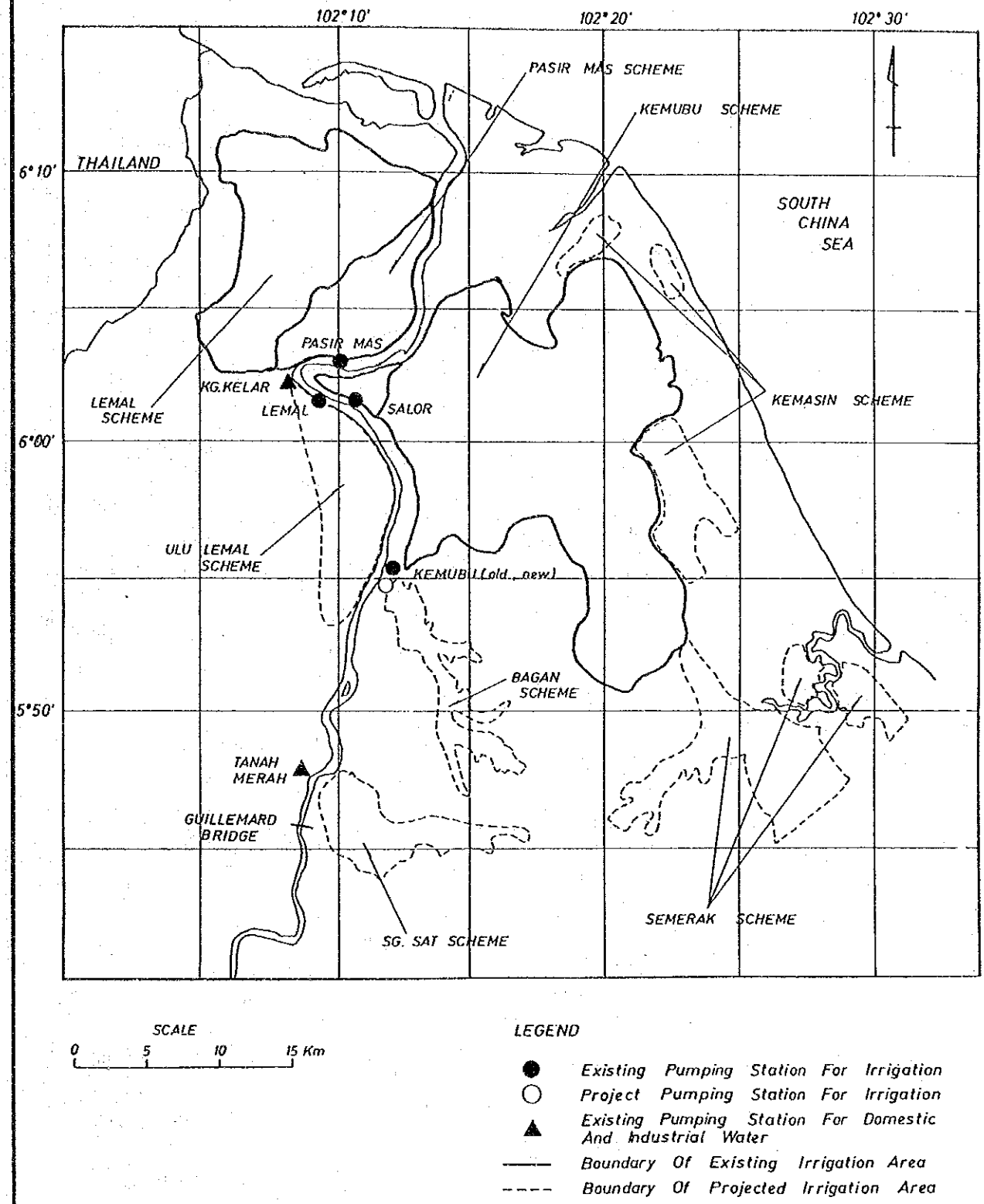

Fig.3.1

Location of Pumping Station and Irrigation Area

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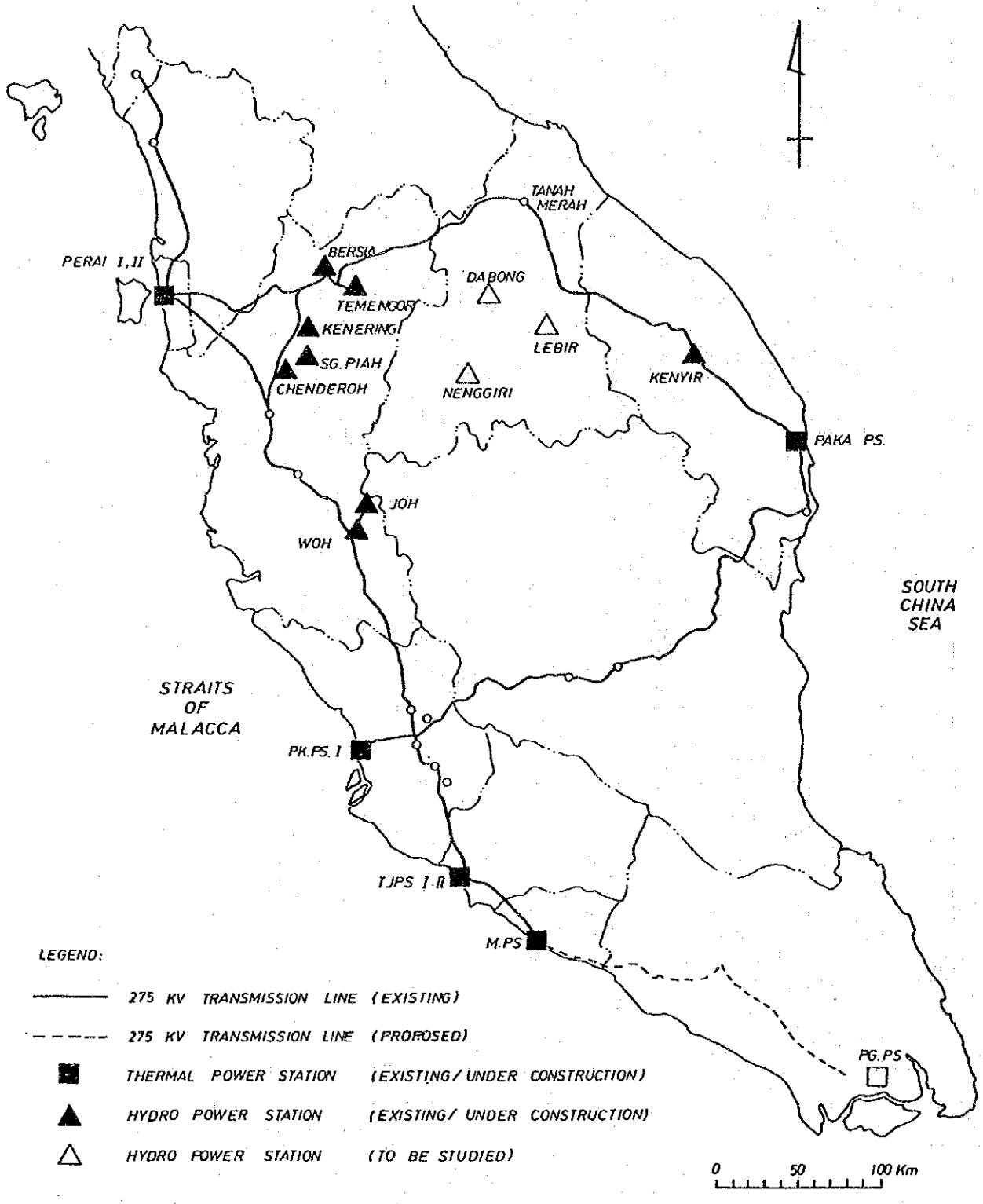

Fig.3.2

National Grid Network of Power Supply

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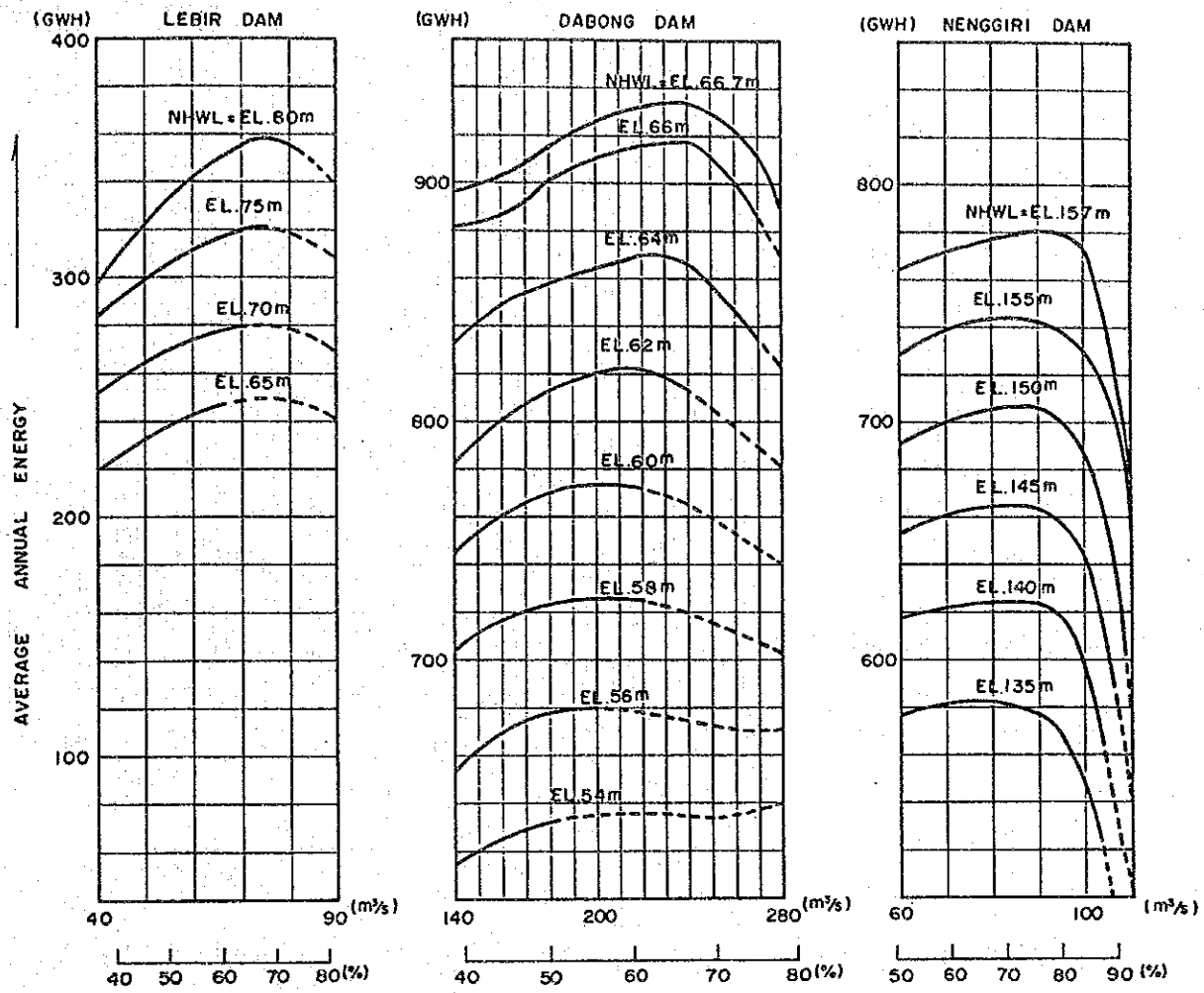

Note

------ : Firm Discharge is not insured

Fig.3.3

Average Annual Energy Generated by Alternative Normal High Water Level

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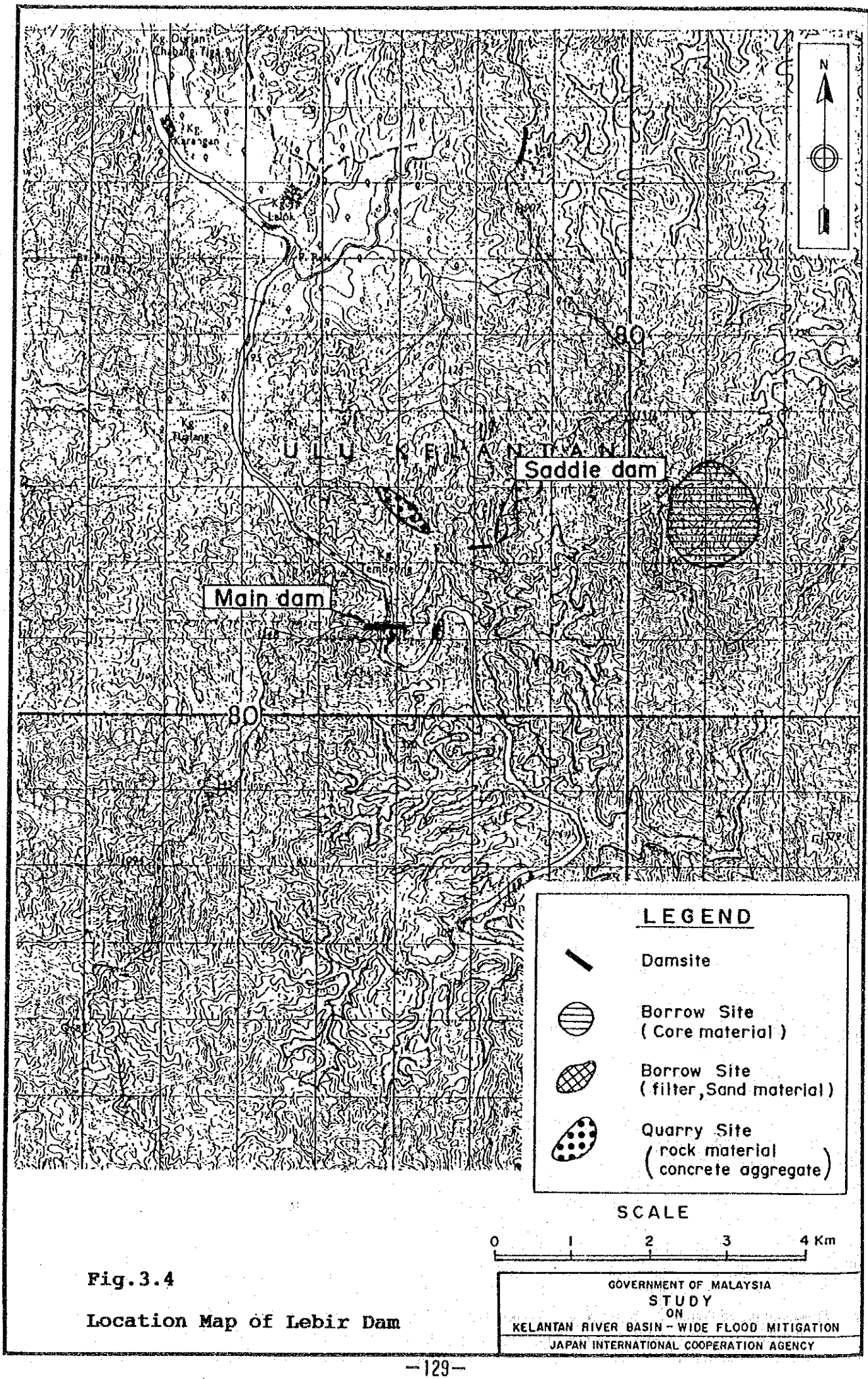

Fig.3.4

Location Map of Lebir Dam

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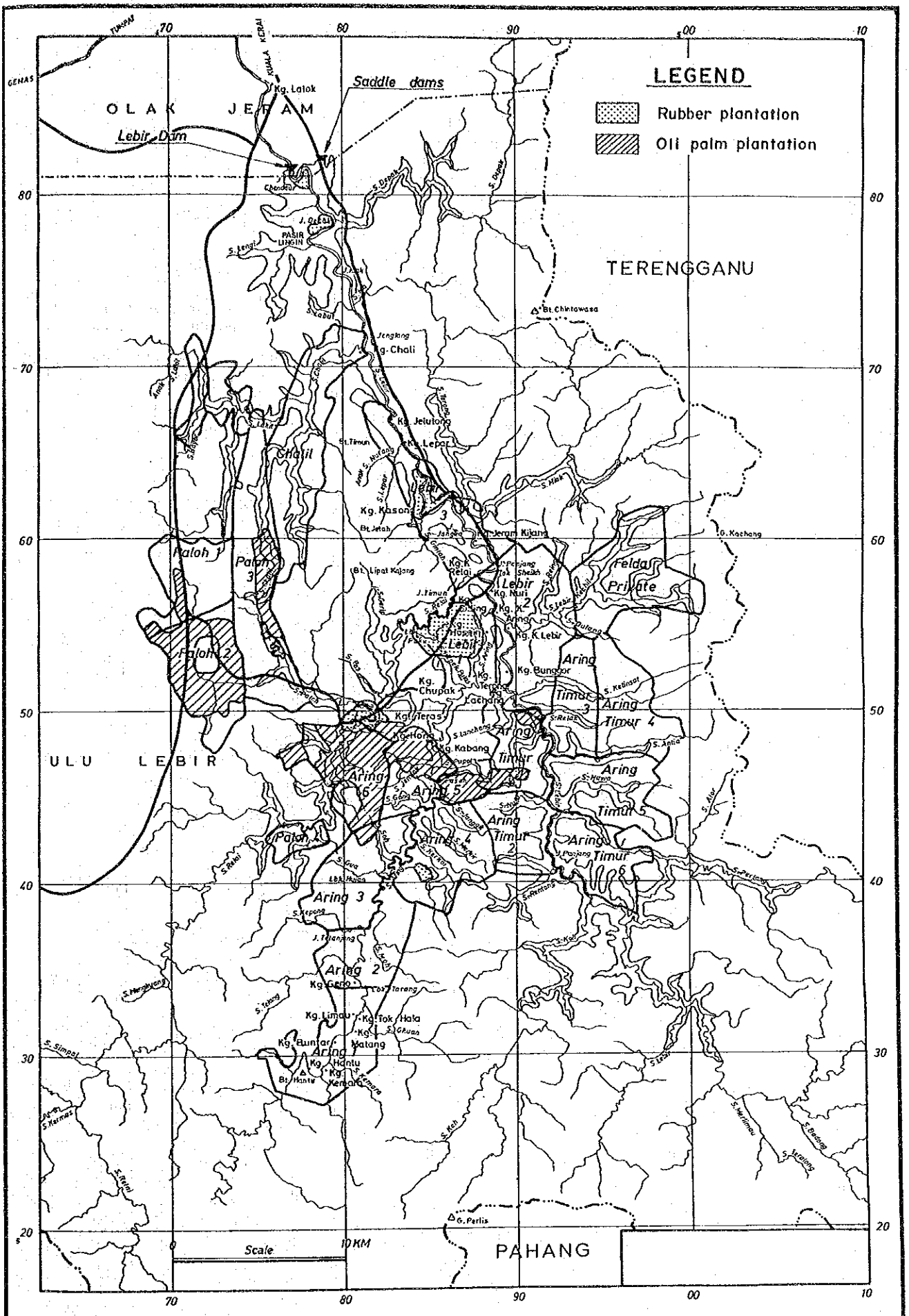

Fig.3.5

Reservoir Area, Lebir Dam

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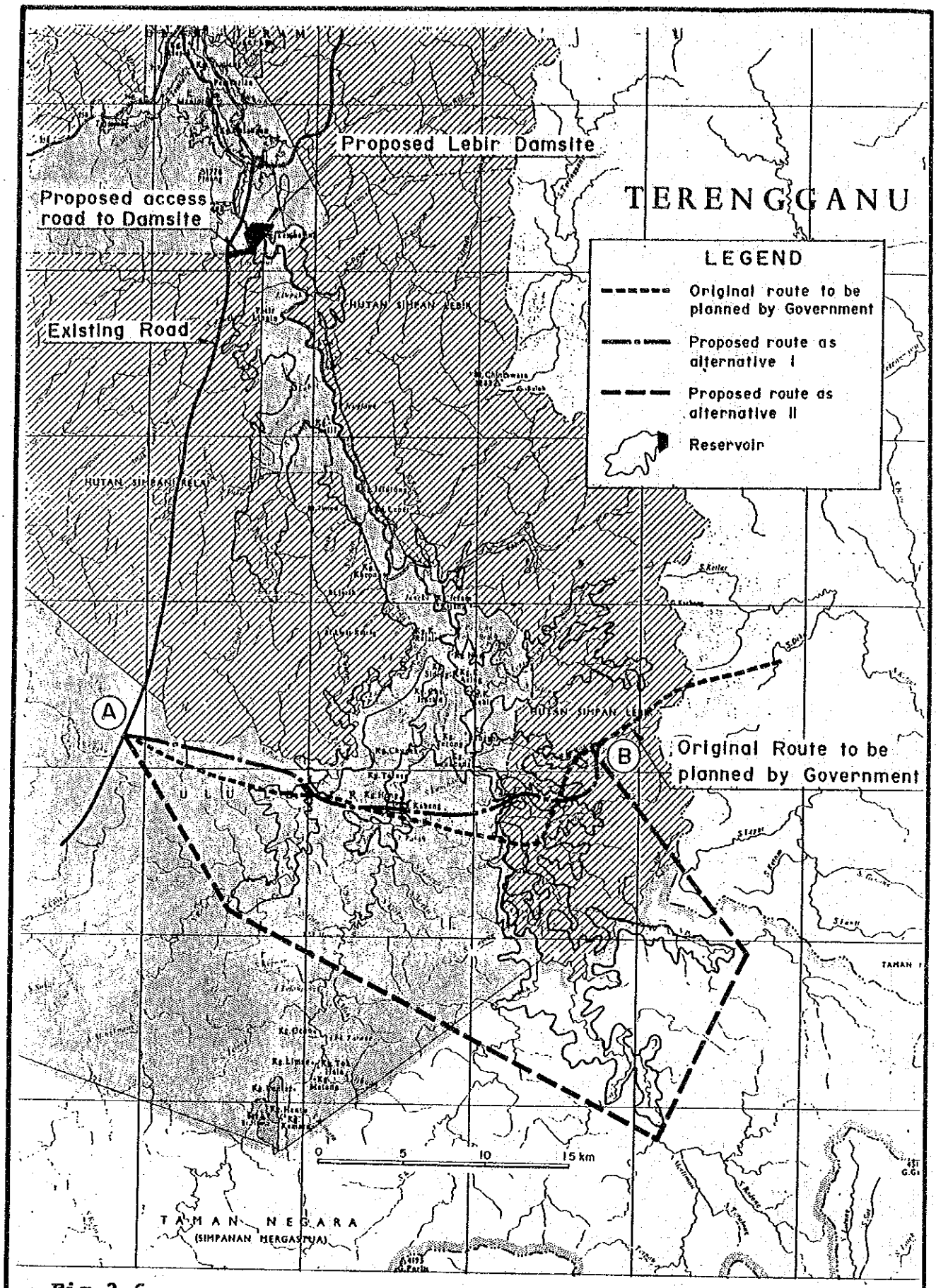

Fig.3.6

Re-planned Highway Route between Chiku and Kuala Brang

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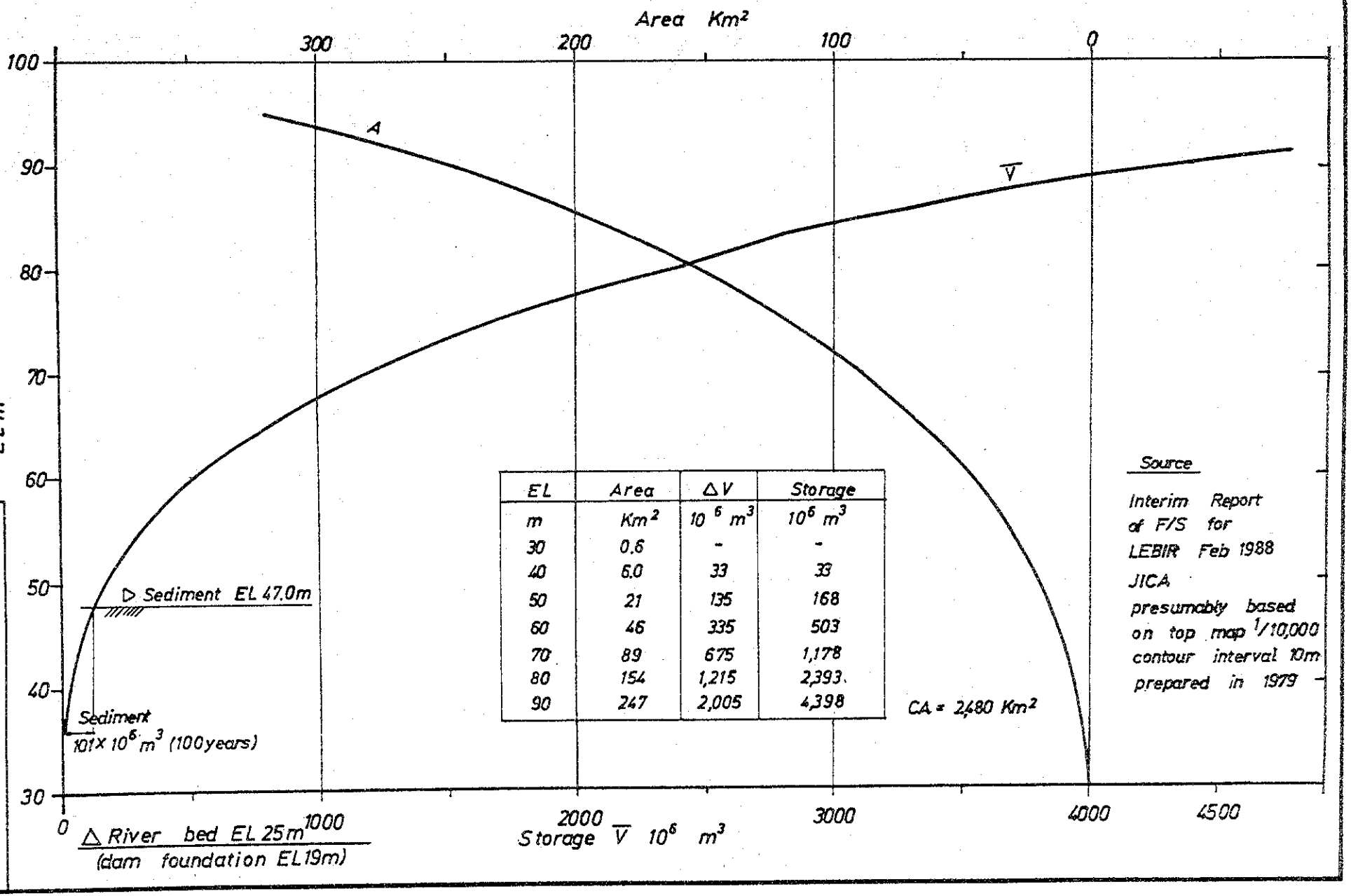
Fig. 3.7

Storage Capacity, Lebir Dam



EL	Area	ΔV	Storage
m	Km²	10⁶ m³	10⁶ m³
30	0.6	-	-
40	6.0	33	33
50	21	135	168
60	46	335	503
70	89	675	1,178
80	154	1,215	2,393
90	247	2,005	4,398

Source

Interim Report of F/S for LEBIR Feb 1988 JICA presumably based on top map 1/10,000 contour interval 10m prepared in 1979

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