

Table 7.4 Summary of Construction Cost

(Unit : 10<sup>3</sup> M\$)

Scheme	Lebir dam		Kemubu dam		River improvement in urban		River improvement in rural		Total amount
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	
1. Direct cost	134,547	117,153	44,986	51,538	27,111	56,362	82,542	164,521	289,186
2. Indirect cost Compensation, administration and engineering service	30,204	172,616	11,583	97,013	15,641	50,780	38,998	87,670	96,426
3. Physical contingency	16,475	28,977	5,657	14,855	4,275	10,714	12,154	25,219	38,561
4. Total cost (1+2+3)	181,226	318,746	62,226	163,406	47,027	117,856	133,694	277,410	424,173
									877,418

Item No.	Description	Total		1993		1994		1995		1996		1997		1998		1999		L.C. (M\$)	
		L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)		
1.	DIRECT COST																		
	(1) PREPARATORY WORKS																		
	(a) Package-1	19,525,418	22,424,478	19,525,418	22,424,478														
	(b) Package-2	4,657,990	2,240,600	4,657,990	2,240,600														
	(c) Package-3	8,589,738	7,497,647																
	(d) Package-4	13,596,792	6,821,668	13,596,792	6,821,668														
	Subtotal (i)	46,369,938	38,984,393	37,780,200	31,486,746														
	(2) MAIN CONSTRUCTION WORKS																		
	(a) Package-1	97,627,092	112,122,391	14,644,064	16,818,359	9,762,709	11,212,239	14,644,064	16,818,359	19,525,418	22,424,478	29,288,128	33,636,717	9,762,709	11,212,239				
	(b) Package-2	51,703,689	24,870,660	8,858,622	4,261,200	8,858,622	4,261,200	8,858,622	4,261,200	8,858,622	4,261,200	4,386,722	2,110,114	4,386,722	2,110,114	3,747,879	1,802,816	3,747,879	
	(c) Package-3	42,948,689	37,488,234																
	(d) Package-4	150,924,391	75,720,515	2,398,494	1,327,199	2,398,494	1,327,199	2,398,494	1,327,199	2,398,494	1,327,199	6,870,394	3,478,285	6,870,394	3,478,285	7,509,237	3,785,583	7,509,237	
	Subtotal (ii)	343,203,861	250,201,800	25,901,180	22,406,758	21,019,825	16,800,638	25,901,180	22,406,758	30,782,534	28,012,877	40,545,244	39,225,116	21,019,825	16,800,638	11,257,116	5,588,399	11,257,116	
	Subtotal (1)-(i)+(ii)	389,573,799	289,186,193	63,681,380	53,893,504	21,019,825	16,800,638	25,901,180	22,406,758	30,782,534	28,012,877	40,545,244	39,225,116	21,019,825	16,800,638	11,257,116	5,588,399	11,257,116	
2.	RELOCATION COST																		
	(a) Package-1	165,065,000		27,510,833		27,510,833		27,510,833		27,510,833		27,510,833		27,510,833					
	(b) Package-2	46,870,000		5,858,750		5,858,750		5,858,750		5,858,750		5,858,750		5,858,750		5,858,750		5,858,750	
	(c) Package-3	94,117,000																	
	(d) Package-4	77,920,000		4,328,889		4,328,889		4,328,889		4,328,889		4,328,889		4,328,889		4,328,889		4,328,889	
	Subtotal (2)	383,972,000		37,698,472		37,698,472		37,698,472		37,698,472		37,698,472		37,698,472		10,187,639		10,187,639	
3.	ENGINEERING SERVICES COST																		
	(a) Package-1	7,550,981	30,203,926	1,132,647	4,530,589	755,098	3,020,393	1,132,647	4,530,589	1,510,196	6,040,785	2,265,294	9,061,178	755,098	3,020,393				
	(b) Package-2	3,910,288	15,641,153	586,543	2,346,173	469,235	1,876,938	469,235	1,876,938	469,235	1,876,938	469,235	1,876,938	469,235	1,876,938	469,235	1,876,938	508,337	
	(c) Package-3	2,895,729	11,582,917																
	(d) Package-4	9,749,501	38,998,004	1,462,425	5,849,701	487,475	1,949,900	487,475	1,949,900	487,475	1,949,900	487,475	1,949,900	487,475	1,949,900	487,475	1,949,900	487,475	
	Subtotal (3)	24,106,499	96,426,000	3,181,615	12,726,463	1,711,808	6,847,231	2,089,357	8,357,427	2,466,906	9,867,623	3,222,004	12,888,016	1,711,808	6,847,231	956,710	3,826,838	995,812	
	Total (1+2+3)	797,652,298	385,612,193	104,561,467	66,619,967	60,430,105	23,647,869	65,689,009	30,764,185	70,947,912	37,880,500	81,465,720	52,113,132	60,430,105	23,647,869	22,401,465	9,415,237	22,440,567	
4.	PHYSICAL CONTINGENCY (10% of Items 1,2 & 3 for L.C.& F.C.)																		
	(a) Package-1	20,976,849	16,475,080	6,281,296	4,377,343	3,802,864	1,423,263	4,328,754	2,134,895	4,854,645	2,846,526	5,906,426	4,269,790	3,802,864	1,423,263				
	(b) Package-2	10,714,199	4,275,241	1,996,191	884,797	1,518,661	613,814	1,518,661	613,814	1,518,661	613,814	1,071,471	398,705	1,071,471	398,705	1,007,586	367,975	1,011,497	
	(c) Package-3	14,855,115	5,656,880																
	(d) Package-4	25,219,070	12,154,021	2,178,660	1,399,857	721,486	327,710	721,486	327,710	721,486	327,710	1,168,676	542,819	1,168,676	542,819	1,232,560	573,548	1,232,560	
	Subtotal (4)	79,765,233	38,561,222	10,456,147	6,661,997	6,043,011	2,364,787	6,568,901	3,076,419	7,094,792	3,788,050	8,146,573	5,211,314	6,043,011	2,364,787	2,240,146	941,523	2,244,057	
5.	PROJECT COST																		
	(a) Package-1	318,745,340	181,225,875	69,094,238	48,150,769	41,831,504	15,655,895	47,616,298	23,483,843	53,401,092	31,311,789	64,970,681	46,967,685	41,831,504	15,655,895	0	0	0	
	(b) Package-2	117,856,166	47,027,654	21,958,096	9,732,770	16,705,268	6,751,952	16,705,268	6,751,952	16,705,268	6,751,952	11,786,178	4,385,757	11,786,178	4,385,757	11,083,450	4,047,729	11,126,463	
	(c) Package-3	163,406,271	62,225,678	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	(d) Package-4	277,409,754	133,694,208	23,965,260	15,398,425	7,936,344	3,604,809	7,936,344	3,604,809	7,936,344	3,604,809	12,855,434	5,971,004	12,855,434	5,971,004	13,558,161	6,309,031	13,558,161	
	Total (1 to 4)	877,417,531	424,173,415	115,017,614	73,281,964	66,473,116	26,012,656	72,257,910	33,840,604	78,042,704	41,668,550	89,612,293	57,324,446	66,473,116	26,012,656	24,641,611	10,356,760	24,684,624	
	Equivalent to US\$		157,101,265		27,141,468		9,634,317		12,533,557		15,432,796		21,231,276		9,634,317		3,835,837		

Remarks : L.C. and F.C. mean local currency and foreign currency.



Schedule of Project Cost

01	2002		2003		2004		2005		2006		2007		2008		2009		2010		
F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)	F.C. (M\$)	L.C. (M\$)		
												8,589,738	7,497,647						
												8,589,738	7,497,647						
5,588,399	11,257,116	5,588,399	11,257,116	5,588,399	11,257,116	5,588,399	11,257,116	5,588,399	11,257,116	5,588,399	11,257,116	10,737,172	9,372,059	10,737,172	9,372,059	10,737,172	9,372,059	10,737,172	9,372,059
5,588,399	11,257,116	5,588,399	11,257,116	5,588,399	11,257,116	5,588,399	11,257,116	5,588,399	11,257,116	5,588,399	11,257,116	21,994,288	14,960,458	21,994,288	14,960,458	21,994,288	14,960,458	21,994,288	14,960,458
5,588,399	11,257,116	5,588,399	11,257,116	5,588,399	11,257,116	5,588,399	11,257,116	5,588,399	11,257,116	5,588,399	11,257,116	30,584,026	22,458,105	21,994,288	14,960,458	21,994,288	14,960,458	21,994,288	14,960,458
												23,529,250		23,529,250		23,529,250		23,529,250	
	4,328,889		4,328,889		4,328,889		4,328,889		4,328,889		4,328,889	4,328,889		4,328,889		4,328,889		4,328,889	
	4,328,889		4,328,889		4,328,889		4,328,889		4,328,889		4,328,889	27,858,139		27,858,139		27,858,139		27,858,139	
1,949,900	487,475	1,949,900	487,475	1,949,900	487,475	1,949,900	487,475	1,949,900	487,475	1,949,900	487,475	723,932	2,895,729	579,146	2,316,583	868,719	3,474,875	723,932	2,895,729
1,949,900	487,475	1,949,900	487,475	1,949,900	487,475	1,949,900	487,475	1,949,900	487,475	1,949,900	487,475	1,211,407	4,845,629	1,066,621	4,266,483	1,356,194	5,424,775	1,211,407	4,845,629
7,538,299	16,073,480	7,538,299	16,073,480	7,538,299	16,073,480	7,538,299	16,073,480	7,538,299	16,073,480	7,538,299	16,073,480	59,653,572	27,303,734	50,919,048	19,226,941	51,208,621	20,385,233	51,063,834	19,806,087
753,830	1,607,348	753,830	1,607,348	753,830	1,607,348	753,830	1,607,348	753,830	1,607,348	753,830	1,607,348	4,358,009	1,976,544	3,484,557	1,168,864	3,513,514	1,284,693	3,499,035	1,226,779
753,830	1,607,348	753,830	1,607,348	753,830	1,607,348	753,830	1,607,348	753,830	1,607,348	753,830	1,607,348	5,965,357	2,730,374	5,091,905	1,922,694	5,120,862	2,038,523	5,106,383	1,980,609
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	47,938,101	21,741,979	38,330,125	12,857,506	38,648,655	14,131,627	38,489,389	13,494,567
8,292,129	17,680,828	8,292,129	17,680,828	8,292,129	17,680,828	8,292,129	17,680,828	8,292,129	17,680,828	8,292,129	17,680,828	8,292,129	8,292,129	17,680,828	8,292,129	17,680,828	8,292,129	17,680,828	8,292,129
8,292,129	17,680,828	8,292,129	17,680,828	8,292,129	17,680,828	8,292,129	17,680,828	8,292,129	17,680,828	8,292,129	17,680,828	65,618,929	30,034,108	56,010,953	21,149,635	56,329,483	22,423,756	56,170,217	21,786,696
3,071,159		3,071,159		3,071,159		3,071,159		3,071,159		3,071,159		3,071,159	11,123,744	7,833,198		8,305,095		8,069,147	



Table 8.1 Annual Mean Flood Damage

(Unit: million M\$)

River stretch	50-year flood		20-year flood	
	Urban	Rural	Urban	Rural
KL 1	0	0.04	0	0.03
KL 2	0	0.49	0	0.38
KL 3	12.38	5.87	10.85	5.01
KL 4	0	6.48	0	5.36
KL 5	3.81	0.09	3.27	0.06
KL 6	0	5.42	0	4.41
KL 7	0	2.00	0	1.68
KL 8	1.53	0.77	1.30	0.68
KL 9	0	1.26	0	1.09
KL 10	0	1.00	0	0.85
KL 11	0	0.32	0	0.25
KL 12	1.11	0.00	0.88	0.00
Sub Total	18.83	23.74	16.30	19.80
Total	42.57		36.10	

Table 8.2 Annual Mean Flood Damage in 2010

(Unit: million M\$)

River stretch	50-year flood		20-year flood	
	Urban	Rural	Urban	Rural
KL 1	0	0.07	0	0.05
KL 2	0	1.16	0	0.88
KL 3	37.93	11.34	32.96	9.70
KL 4	0	14.21	0	11.67
KL 5	7.20	0.10	6.10	0.09
KL 6	0	11.00	0	8.96
KL 7	0	3.87	0	3.24
KL 8	2.98	1.33	2.51	1.14
KL 9	0	2.70	0	2.31
KL 10	0	1.81	0	1.54
KL 11	0	0.39	0	0.30
KL 12	3.24	0.04	2.46	0.04
Sub Total	52.81	46.56	44.03	39.92
Total	99.37		83.95	

Table 9.1 Impacts of Project Cost on Development Budget

(Unit : M\$ million)

Item	Malaysia Plan				Total
	6th(1991-1995)	7th(1996-2000)	8th(2001-2005)	9th(2006-2010)	
1. Project Cost	387	430	130	356	1,302
2. Development budget					
1) Malaysia	31,884	40,693	51,936	66,285	190,798
2) Kelantan	2,072	2,645	3,376	4,309	12,402
3) Energy and public utilities	3,826	4,883	6,232	7,954	22,895
3. 1. / 2.1)	1.2%	1.1%	0.3%	0.6%	0.7%
4. 1. / 2.2)	18.7%	16.2%	3.9%	8.8%	10.5%
5. 1. / 2.3)	10.1%	8.8%	2.1%	4.8%	5.7%

Note : Development budget of the whole of Malaysia is assumed to increase by 5% per annum. Also, it is assumed that the shares of the State of Kelantan and the "energy and public utilities" sector in the national development budget are 6.5% and 12.0%, respectively. These assumptions are based on 5th Malaysia Plan (1986-1990).



Table 9.2 Villages and Population to be Affected by  
Lebir Reservoir Development <sup>1/</sup>

Name of village	Population	Number of households
1. Jeram Panjang	96	19
2. Senawar	25	4
3. Kluang	30	6
4. Depak	75	15
5. Pasir Linggi	5	1
6. Susu Dara	55	11
7. Labut	15	3
8. Lepar	25	5
9. Laka	5	1
10. Pandan	70	14
11. Miak	20	4
12. Kijang	80	16
13. Kuala Aring	15	3
14. Betong	55	11
15. Bonggor	5	1
16. Landak	5	1
17. Chalil	75	15
18. Paloh 3	101	20
19. Lebir 1	75	15
Total	832	165 <sup>2/</sup>

Note : <sup>1/</sup> Households to be submerged for the dam crest elevation of 91.1m

<sup>2/</sup> Submerged households are 156 for the water level of 78.0m (refer to Section 4.2.3).

Table 9.3 Villages and Population to be Affected by  
Kemubu Reservoir Development 1/

Name of village	Population	Number of households
1. Binjai	216	43
2. Bau	40	8
3. Letong	111	22
4. Lulut	106	21
5. Jerok	629	125
6. Kerak	1,127	224
7. Bertam Bharu	2,470	491
8. Pasir Tumbuh	397	79
9. Pulau Layak	25	5
10. Meranto	191	38
11. Piek	136	27
12. Perak	75	15
13. Chegar	201	40
14. Tool	448	89
15. Star	171	34
16. Pasir Mayat	75	15
17. Pulat	96	19
Total	6,514	1,295 <u>2/</u>

Note : 1/ Households to be submerged for the dam crest elevation of 82.0m

2/ Submerged households are 1,000 for the water level of 63.1m (refer to Section 4.2.3).

Table 9.4 Negative Socio-economic Impacts  
from the Perspective of Districts

I. Lebir Dam

Item	Extent of impacts (A)	Existing status of Gua Musang District in 1988 (B)	A/B (%)
1. Oil palm (ha) <u>1/</u>	5,650	45,699	12.4
2. Rubber (ha) <u>1/</u>	3,050	10,982	27.8
3. Total-1 (1. + 2.)	8,700	56,681	15.3
4. Forest (ha) <u>1/</u>	5,300	752,633	0.7
5. Total-2 (3. + 4.)	14,000	809,314	1.7
6. Houses (nos) <u>2/</u>	156	5,609	2.8
7. Population <u>2/</u>	785	28,198	2.8

II. Kemubu Dam

Item	Extent of impacts (A)	Existing status of Kuara Krai and Jeli Districts in 1988 (B)	A/B (%)
1. Oil palm (ha) <u>3/</u>	0	3,788	0
2. Rubber (ha) <u>3/</u>	450	47,164	1.0
3. Total-1 (1. + 2.)	450	50,952	1.0
4. Forest (ha) <u>3/</u>	790	298,057	0.3
5. Total-2 (3. + 4.)	1,240	349,009	0.4
6. Houses (nos) <u>4/</u>	1,000	24,714	4.0
7. Population <u>4/</u>	5,030	124,247	4.0

Sources: Gua Musang, Kuala Krai and Jeli District Offices

Notes : 1/ Value corresponding to SWL 78.0m  
2/ Value corresponding to dam crest elevation 84.9m  
3/ Value corresponding to SWL 63.1m  
4/ Value corresponding to dam crest elevation 73.4m

Table 9.5 Negative Socio-economic Impacts from Regional Perspective

Item	Extent of impacts (A)	Existing status in 1988		A/B1 (%)	A/B2 (%)
		South Kelantan (B1)	Kelantan (B2)		
1. Oil Palm (ha)	5,650	59,357	61,261	9.5	9.2
2. Rubber (ha)	3,500	84,148	129,413	4.2	2.7
3. Total-1 (1. + 2.)	9,150	143,505	190,674	6.4	4.8
4. Forest (ha)	6,090	1,086,088	1,135,522	0.6	0.5
5. Total-2 (3. + 4.)	15,240	1,229,593	1,326,196	1.2	1.1
6. Houses (nos)	1,156	46,224	203,057	2.5	0.6
7. Population	5,815	232,387	1,091,756	2.5	0.5
8. Railway (km)	16	n.a.	207	-	7.7
9. Public Road (km)	14	n.a.	2,004	-	0.7

Sources : Gua Musang, Kuala Krai and Jeli District Offices  
and JICA

Table 9.6 Negative Socio-economic Impact

Dam Scheme	Assumed Dam Crest Elevation (m)	Agricultural land (ha)				Non-agricultural items				Road (km)	
		Paddy	Oil Palm	Rubber	Forest	Houses	Population	Railway	Tarmac		Rough Feeder
Lebir	84.9	-	5,650	3,050	5,300	156	785	-	5	-	86
Kemubu	73.4	-	0	450	790	1,000	5,030	16	-	9	5
Total		-	5,650	3,500	6,090	1,156	5,815	16	5	9	91

Note : 1/ Shifting the railway track to the higher elevation

Sources : Gua Musang, Kuala Krai and Jeli District Offices.

## ***FIGURES***



# LEGEND

Era	Period	Symbol	Description
Quaternary	Alluvium		Sand (mainly marine)
			Clay and Silt (marine)
	Olluvium		Peat, humic Clay and Silt
			Clay, Silt, Sand and gravel (Continental)
Mesozoic	Cretaceous		Sandstone with Siltstone
	Jurassic		Conglomerate and Shale/mudstone
	Triassic		Sandstone, Siltstone, Shale Schist, limestone, Volcanics Tuffs
Palaeozoic	Permian		Phyllite, Slate, Shale, Schist, limestone, Volcanics
	Silurian		Schist, Phyllite, Slate, Ilimestone, Sandstone Volcanics
	Ordovician		Schist, Phyllite, Slate, Ilimestone, Sandstone Volcanics

- : Acid intrusives, mainly granite
- : Fault      : Geological Boundary
- : Proposed damsite

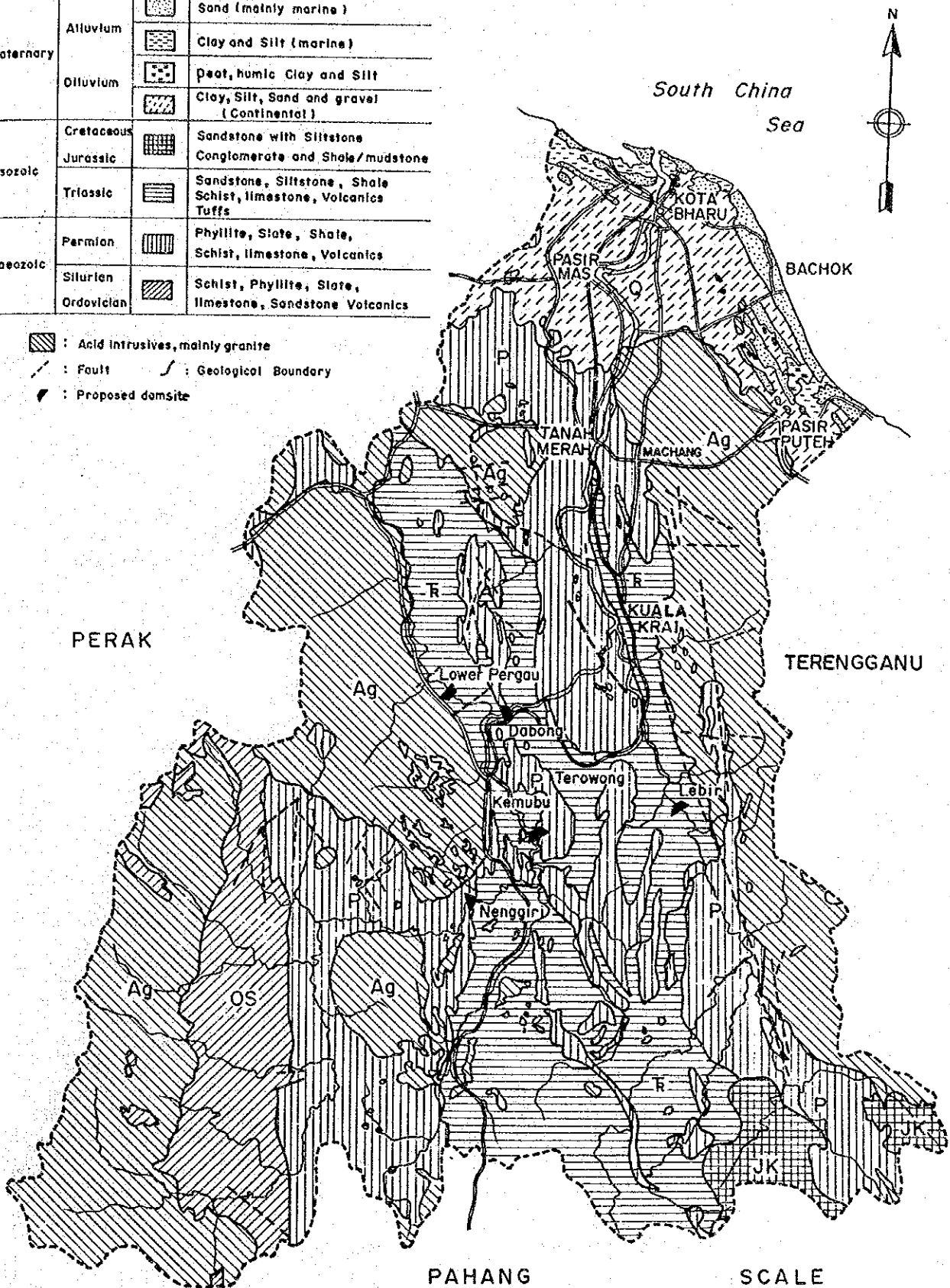
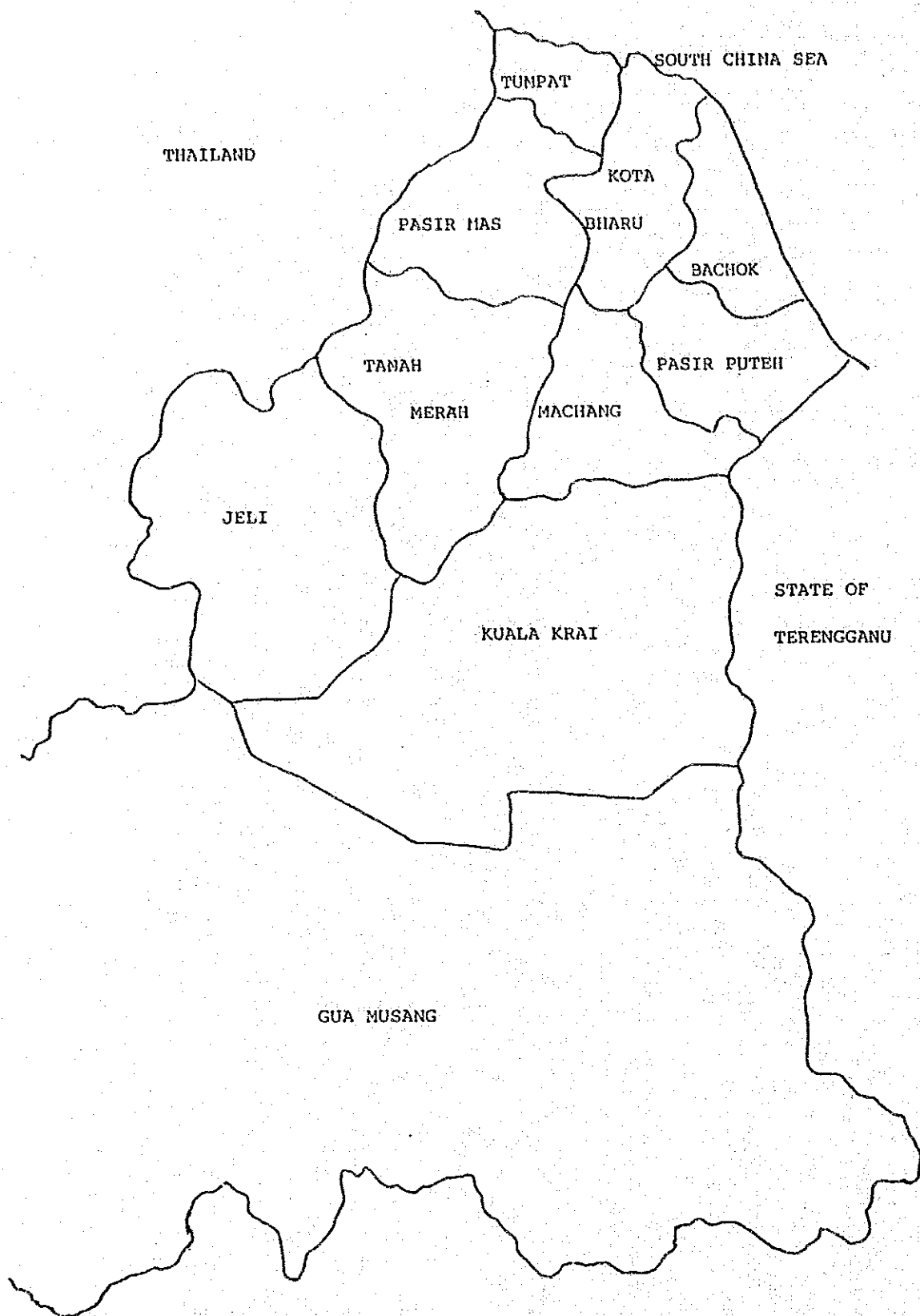


Fig.2.1

**Geological Map of the Kelantan River Basin**

GOVERNMENT OF MALAYSIA  
**STUDY**  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY





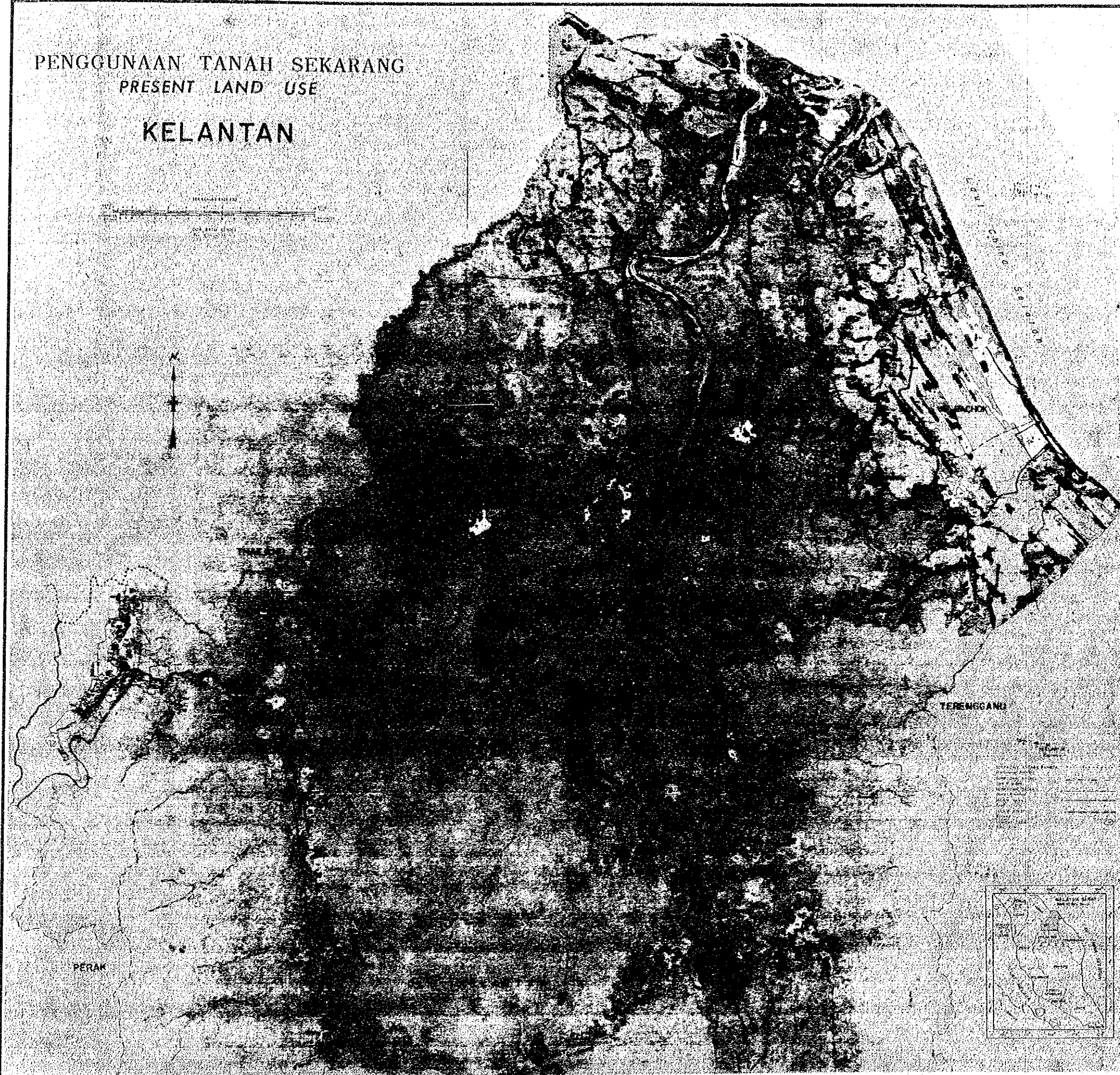
Source: Dpt. of Town & Country Planning, Kelantan

**Fig.2.2**  
**Districts of Kelantan**

GOVERNMENT OF MALAYSIA  
**STUDY**  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY

PENGGUNAAN TANAH SEKARANG  
PRESENT LAND USE

KELANTAN



PETUNJUK PENGELASAN PENGGUNAAN TANAH  
LAND USE CLASSIFICATION LEGEND

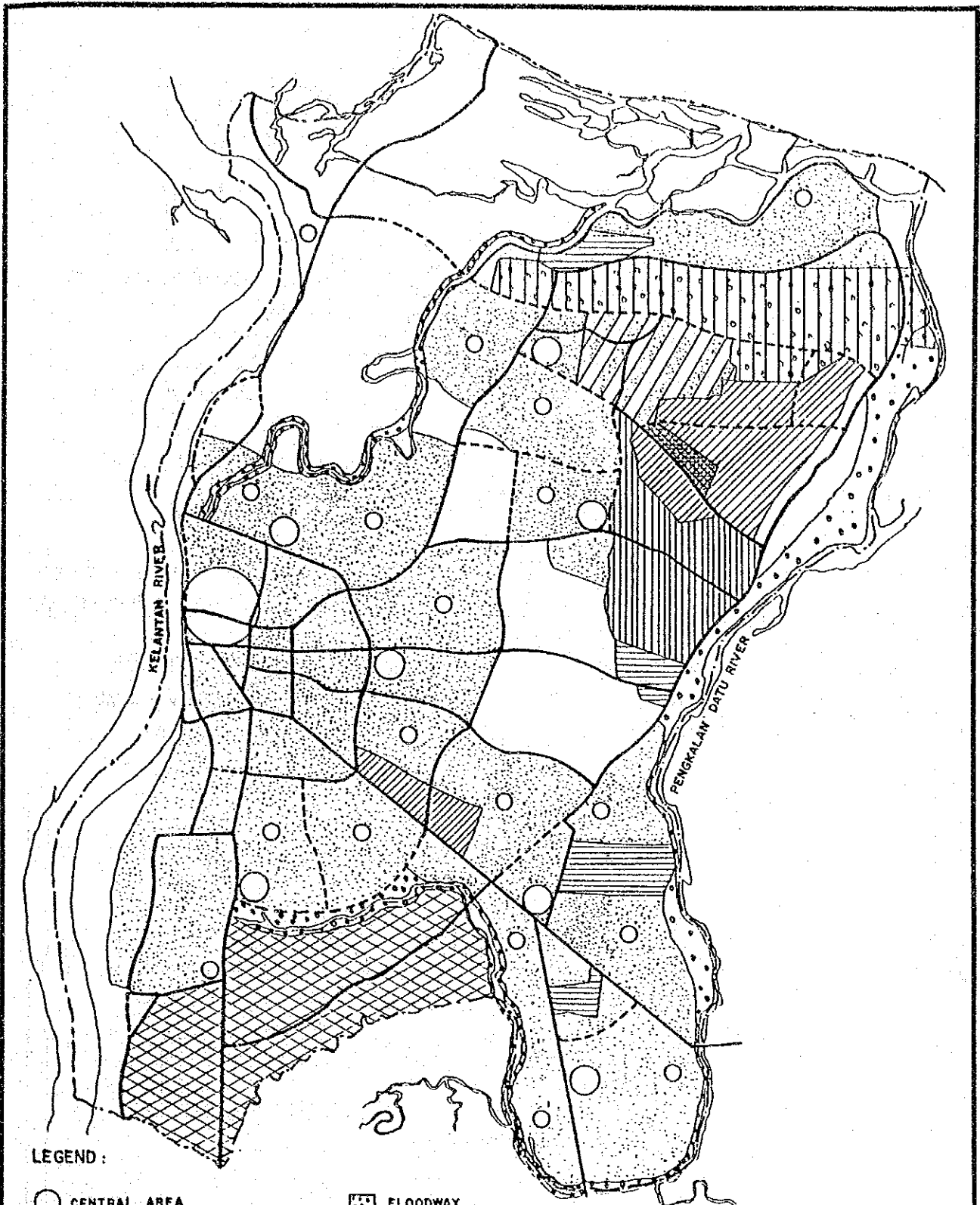
1. KAWASAN TEMPAT TINGGAL DAN KAWASAN BERKAITAN BUKAN PERTANIAN  
Settlements and Associated Non-Agricultural Areas
  - 11 KAWASAN BANGUNAN DAN YANG BERKAITAN  
Urban and Associated Area
  - 12 KAWASAN BANGUNAN LADANG DAN YANG BERKAITAN  
Rural Building and Associated Area
  - 13 KAWASAN LOPOKONG BESI TRIAH  
Timber Mill Area
  - 14 KAWASAN LOPOKONG LAIN-LAIN GALIAN  
Other Mining Area
  - 15 MUKA LALU TALLAN LESTAK  
Power Line Right of Way
2. KAWASAN PERKEBUNAN  
Horticultural Lands
  - 21 PEMEBUNAN CAMPUR  
Mixed Horticulture
  - 22 PERKEBUNAN SAYUR-SAYUR DAN BENDA-BENDA MAKANAN  
Vegetable and Food Crops
  - 23 HILAK PENGUBALAN PERTANIAN  
Agricultural Waste
3. POKOK, PALMA DAN LAIN-LAIN TANAMAN KEKAL  
Tree, Palm and Other Perennial Crops
  - 31 GETAH  
Rubber
  - 32 KELAPA SAWIT  
Oil Palm
  - 33 KELAPA  
Coconut
  - 34 NENAS  
Pineapple
  - 35 TEH  
Tea
  - 36 KOPI  
Coffee
  - 37 KORO  
Cashew
  - 38 LADA HITAM  
Pepper
  - 39 TERBUK  
Tapioca
  - 40 DUSUN BAMBUTAN DURIAN (MIAU, CENGKHE, PALA, BIL)  
Durian/Bambutan, Pomegranate, Cashew, Cacao, Yam, etc.
  - 41 KEMPA  
Sago
  - 42 PANGK  
Pandan
  - 43 KOLAK BUAH DAN LEMBAYUNG BUNYANG ATAU KELADI MUNTIRU  
Fruit and Yam, etc.
  - 44 PANGK  
Pandan
4. KAWASAN TANAMAN  
Cropland
  - 41 PADI  
Paddy
  - 42 PELBAGAI TANAMAN  
Diversified Crop
  - 43 PENANAMAN BELINGGAH PRIDAN  
Shifting Cultivation
5. PADANG TERNAK KEKAL YANG DIPERBAIKI  
Improved Permanent Pasture
  - 51 PADANG TERNAK KEKAL YANG DIPERBAIKI  
Improved Permanent Pasture
6. PADANG RUMPUT  
Grasslands
  - 61 LAJANG, PADANG TERNAK YANG TERSEK DAN JATAU PADANG RUMPUT SEHAL  
Lalang, Unimproved Pasture and Jatau Padang Rumpit Sehal
  - 62 TAPAK-TAPAK HALIMAN BERUMPUT DAN TANAH-TANAH BUNYAN  
Clear Cut Grassland and Land
7. KAWASAN HUTAN  
Forest Land
  - 71 HUTAN  
Forest
  - 72 SEMAK  
Shrub
  - 73 CERANG BAKAU  
Sandy Coastal Land
8. HUTAN, HUTAN PAYA DAN BUYAU  
Swamps, Marshlands and Wetland Forests
  - 81 TERMASUK BAKAU, KEMAN, CELAN DAN LAIN-LAIN KUMPULAN HUTAN BUYAU  
Including Mangrove, Palm, Cacao and Other Wetland Forest Association
9. KAWASAN YANG TIDAK DRUSAHAKAN  
Unused Land
  - 91 KAWASAN YANG TIDAK DRUSAHAKAN  
Unused Land

Fig. IV.2.2  
Present Land Use (1/2)

GOVERNMENT OF MALAYSIA  
STUDY  
ON  
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
JAPAN INTERNATIONAL COOPERATION AGENCY







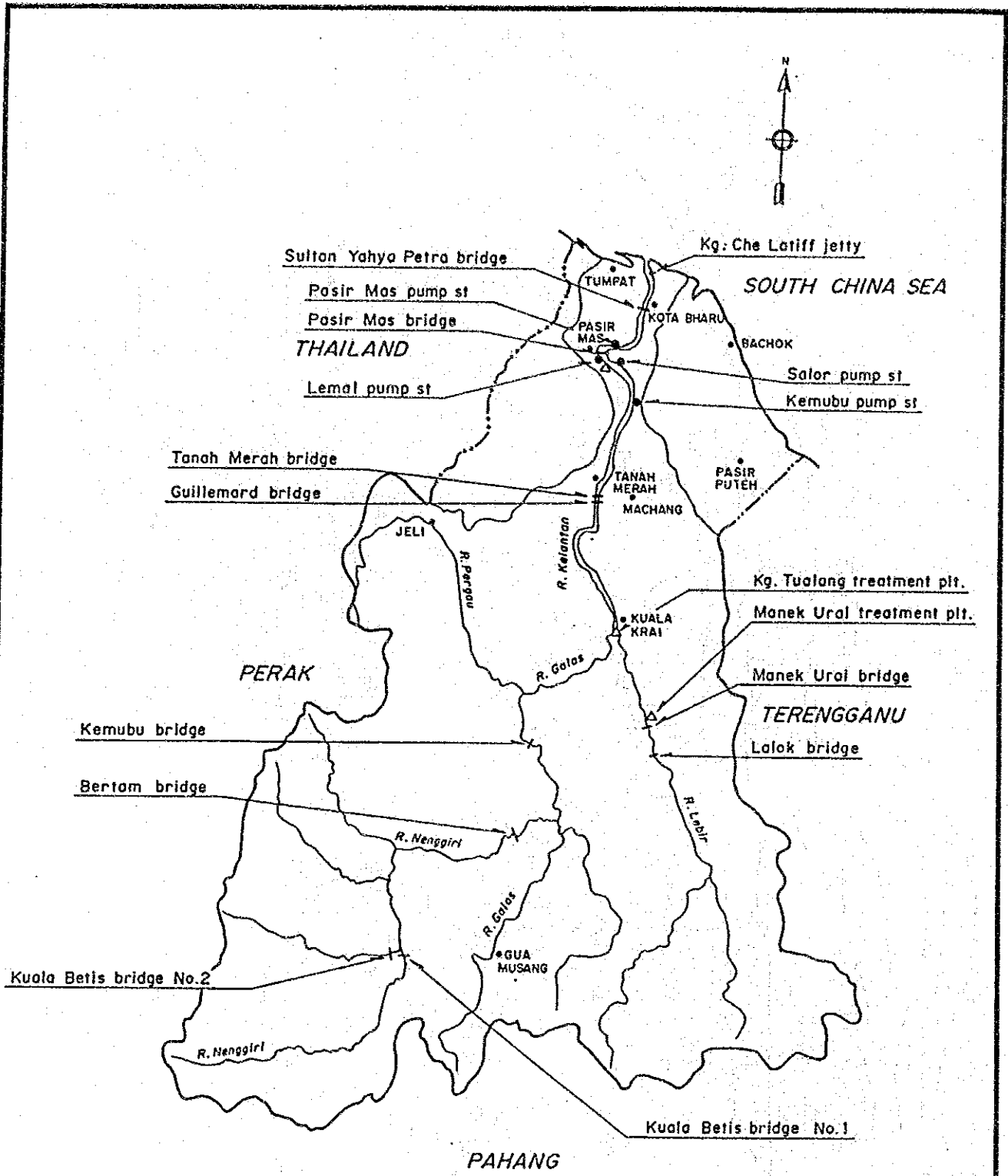
**LEGEND :**

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

**Fig. 2.4**

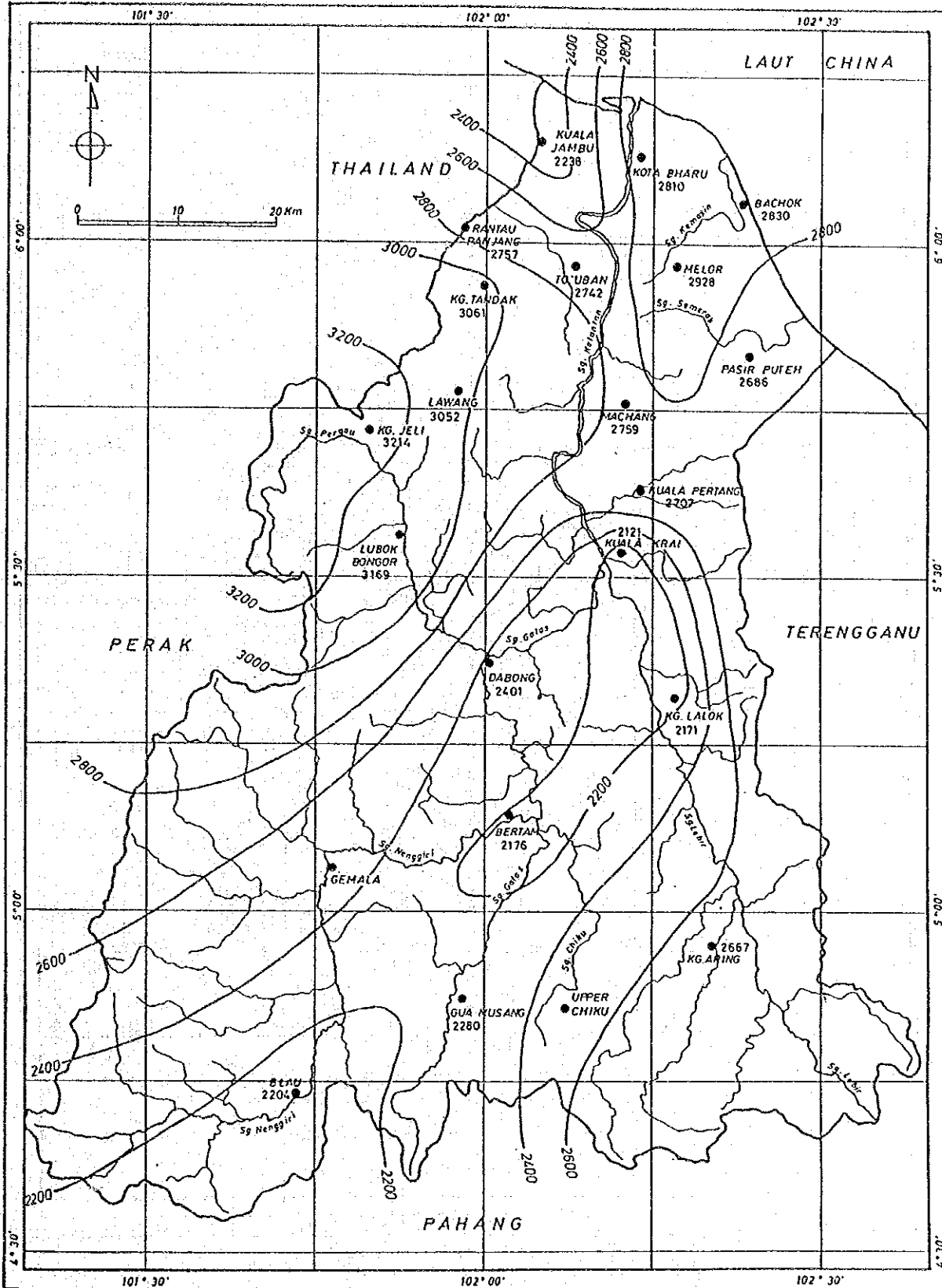
**Development Plan of Majlis  
Perbandaran Kota Bharu**

GOVERNMENT OF MALAYSIA  
**STUDY**  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY



**Fig.2.5**  
**Existing Structures along the Kelantan River**

GOVERNMENT OF MALAYSIA  
**STUDY**  
 ON  
**KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION**  
 JAPAN INTERNATIONAL COOPERATION AGENCY

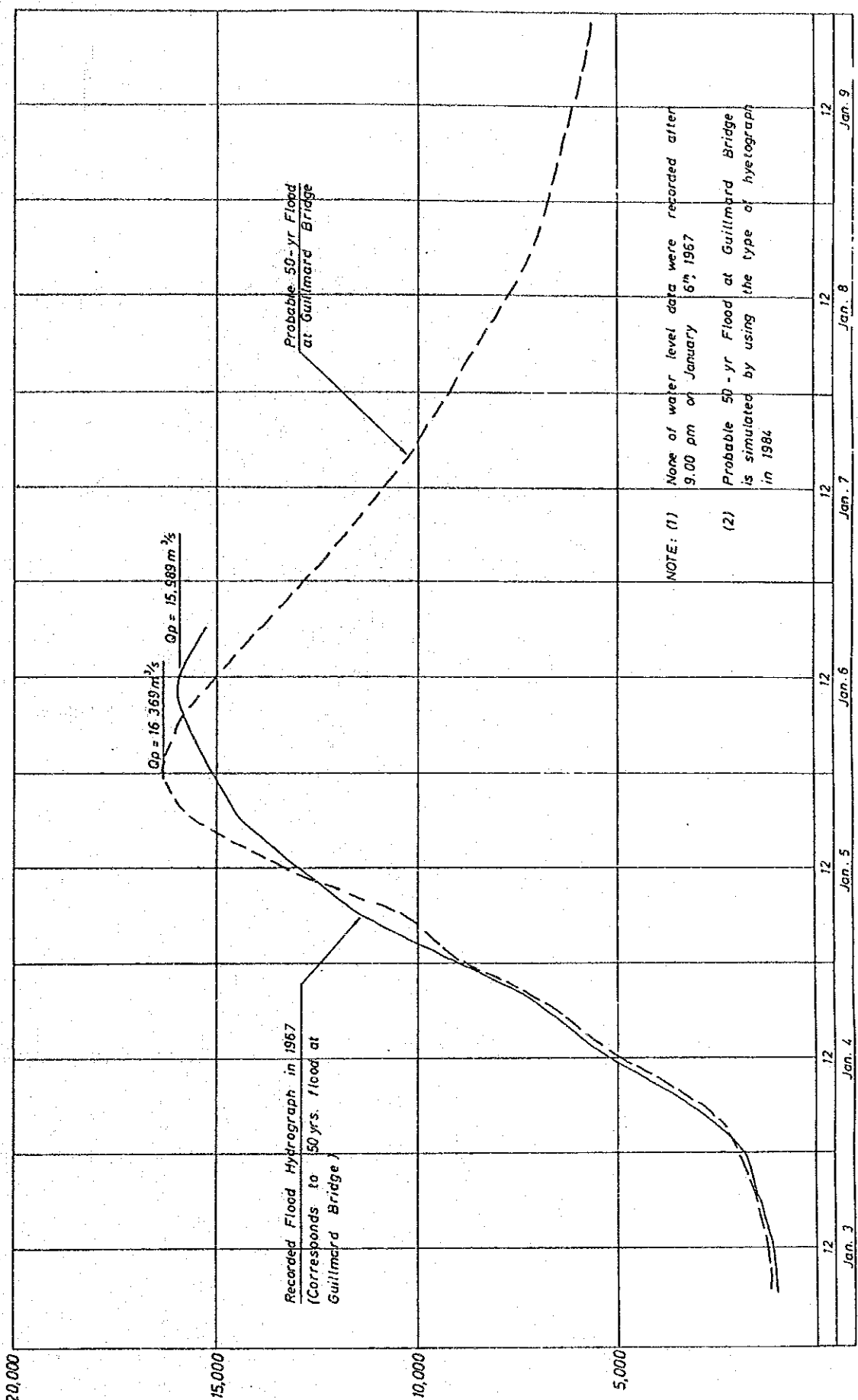


**Fig. 2.6**  
**Isohyetal Map of Annual Mean**  
**Rainfall Depth**

GOVERNMENT OF MALAYSIA  
 STUDY  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY



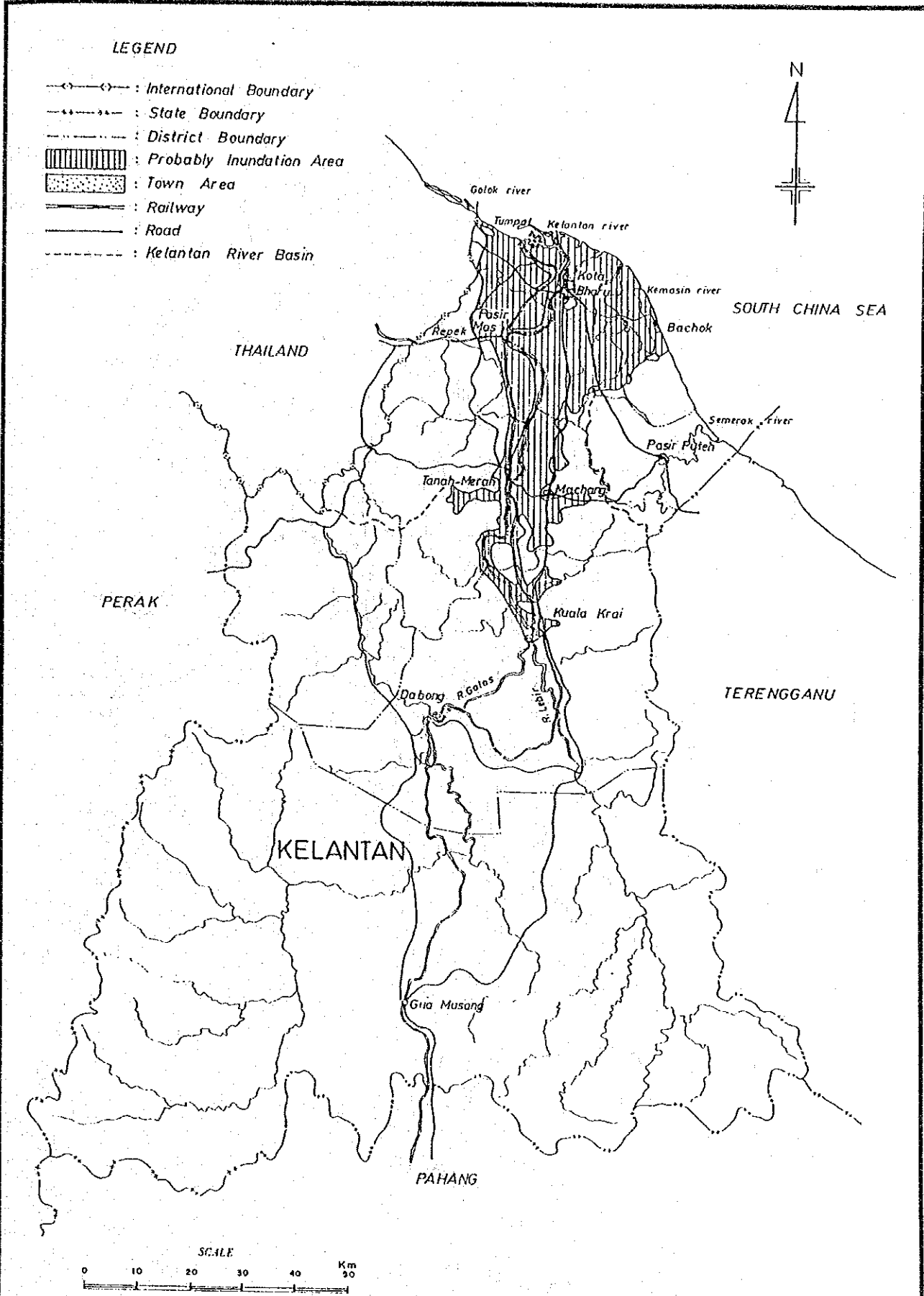




**Fig. 2.8**  
**Comparison between 50-year Probable Flood and Recorded Flood Hydrograph in 1967**

GOVERNMENT OF MALAYSIA  
**STUDY**  
 ON  
**KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION**  
 JAPAN INTERNATIONAL COOPERATION AGENCY



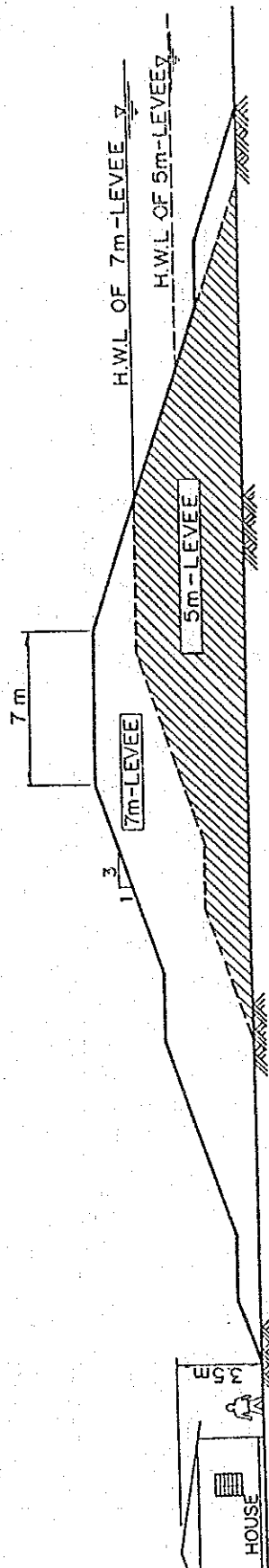


**Fig.3.2**

**Probable Inundation Area  
(Study Area for Flood Damage Study)  
(50-year Return Period)**

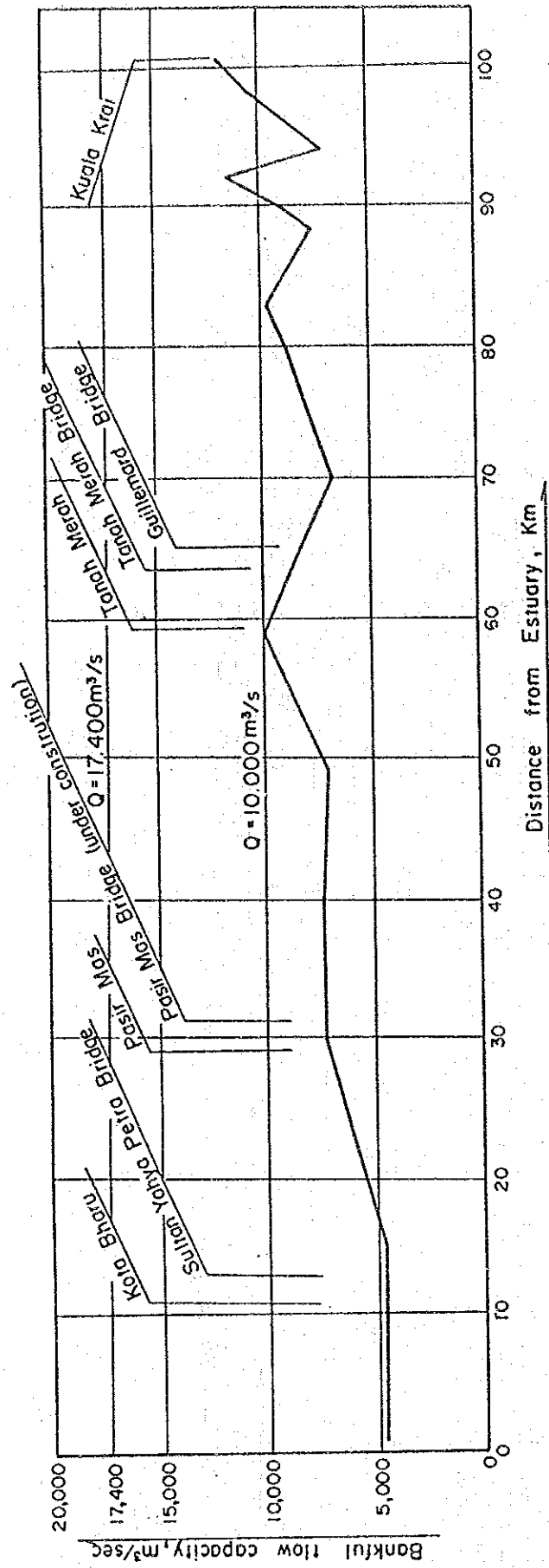
GOVERNMENT OF MALAYSIA  
STUDY  
ON  
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
JAPAN INTERNATIONAL COOPERATION AGENCY





**Fig. 3.4**  
**Comparison between 5m and 7m High Levee**

GOVERNMENT OF MALAYSIA  
 STUDY  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY



**Fig. 3.5**  
**Flow Capacity of the Kelantan River**

GOVERNMENT OF MALAYSIA  
 STUDY  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY

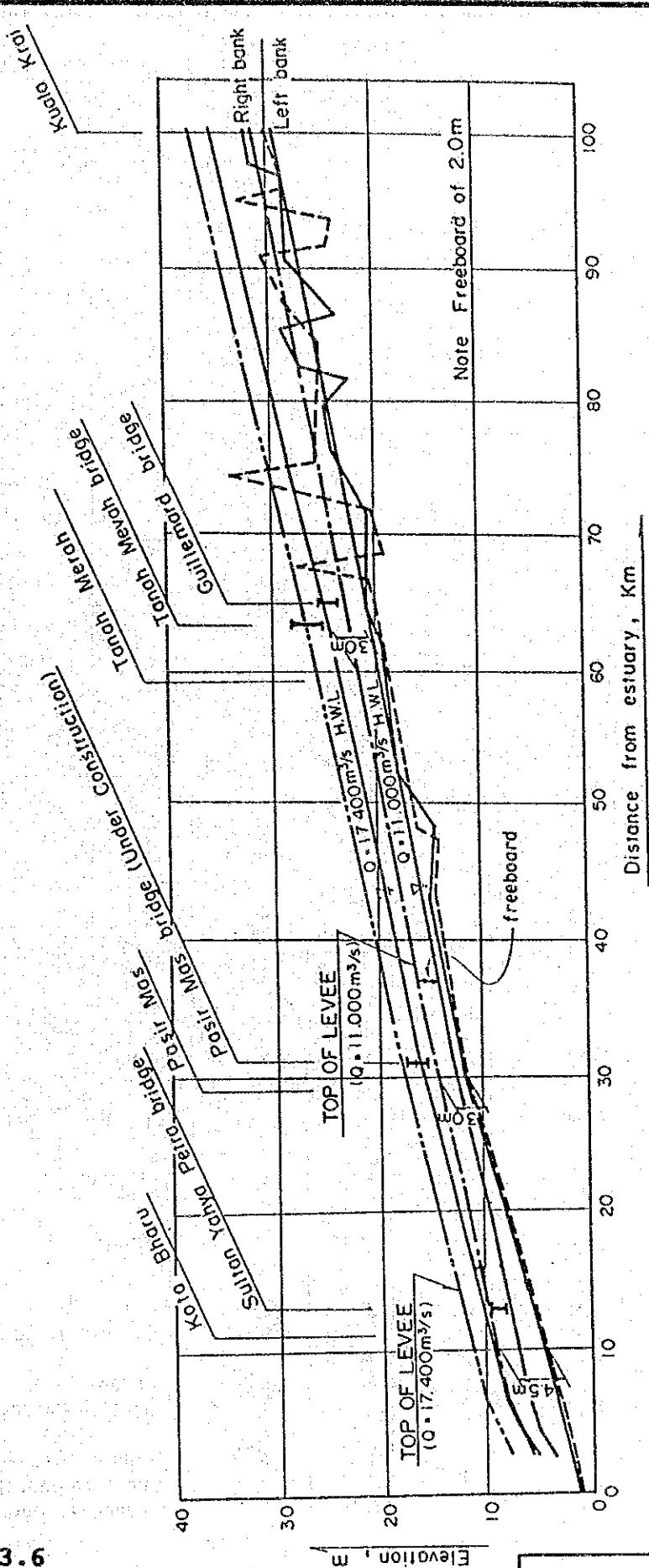
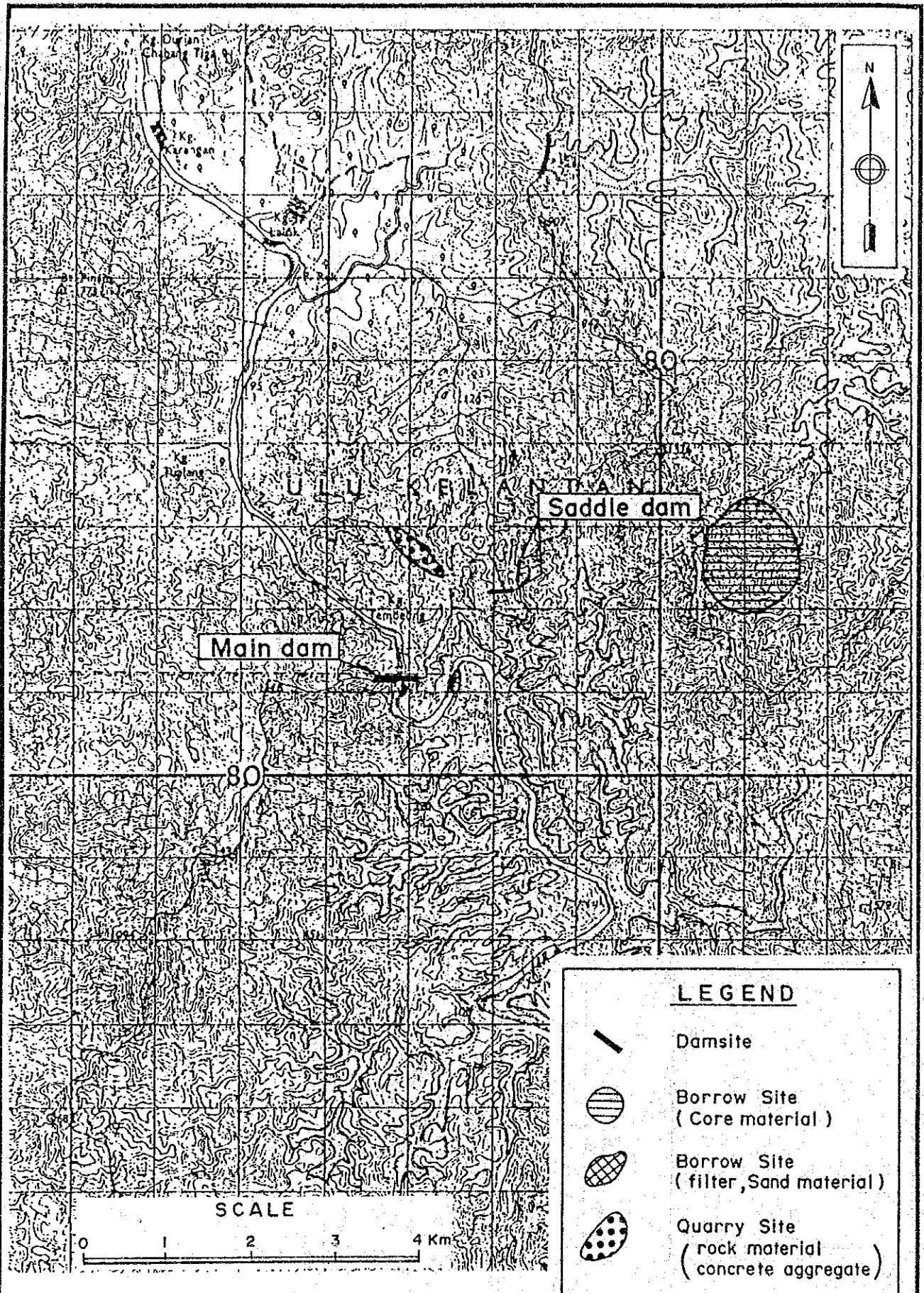


Fig.3.6

Relationship between High Water Level and Levee Height

GOVERNMENT OF MALAYSIA  
 STUDY  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY



**Fig.4.1**  
**Location Map of Lebir Dam**

GOVERNMENT OF MALAYSIA  
 STUDY  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY



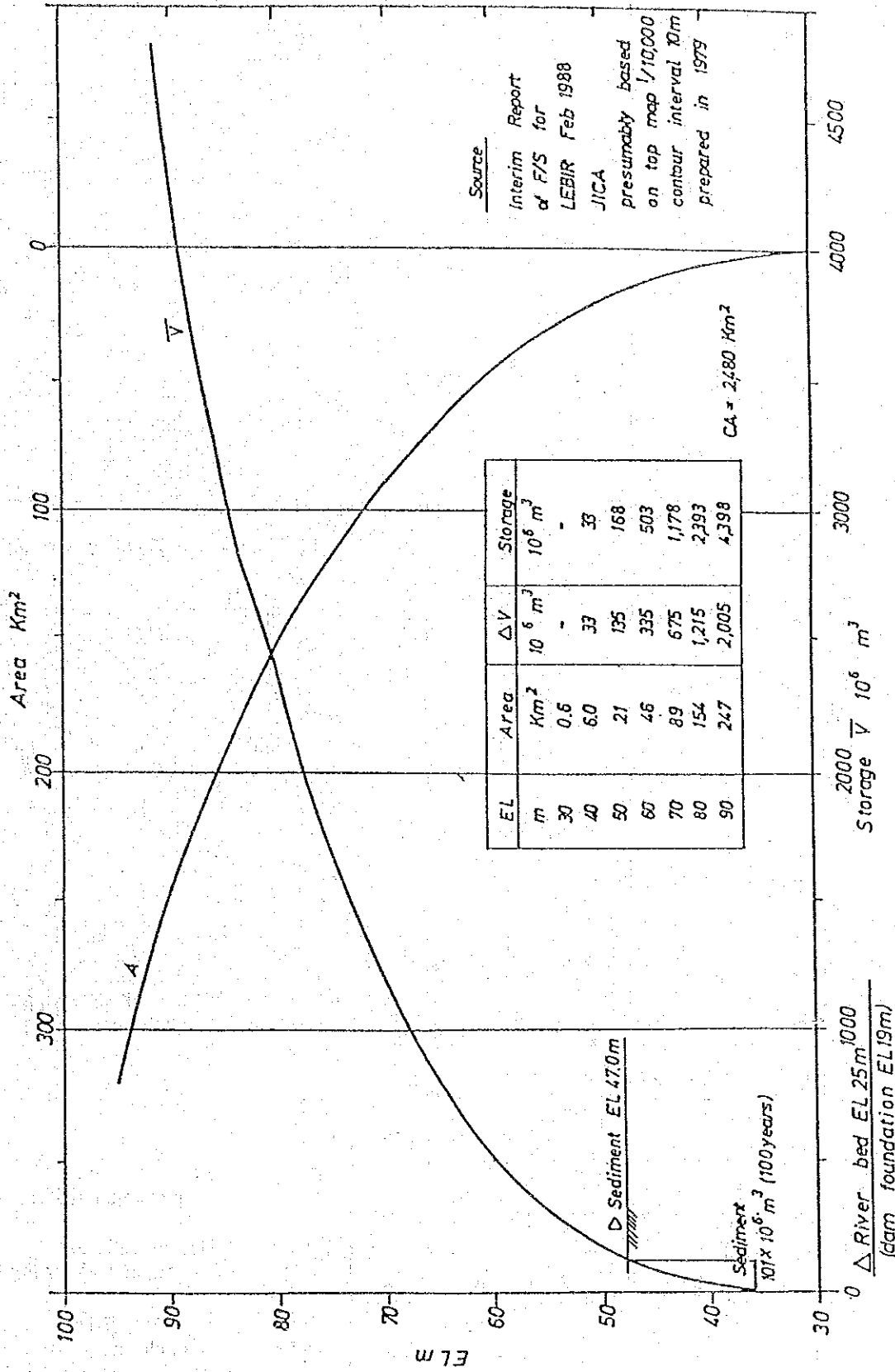


Fig.4.2  
Storage Capacity, Lebir Dam

GOVERNMENT OF MALAYSIA  
STUDY  
ON  
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
JAPAN INTERNATIONAL COOPERATION AGENCY

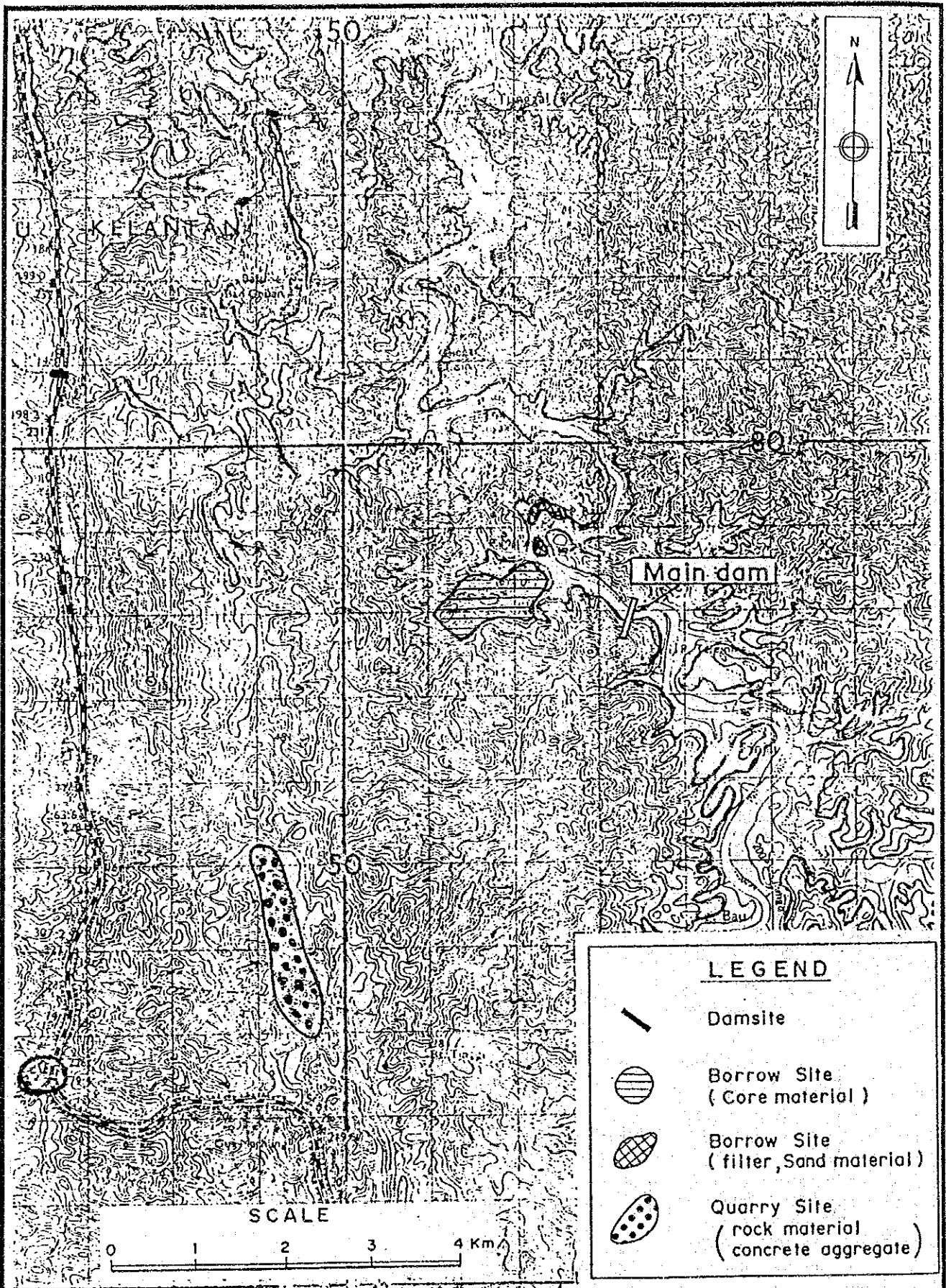
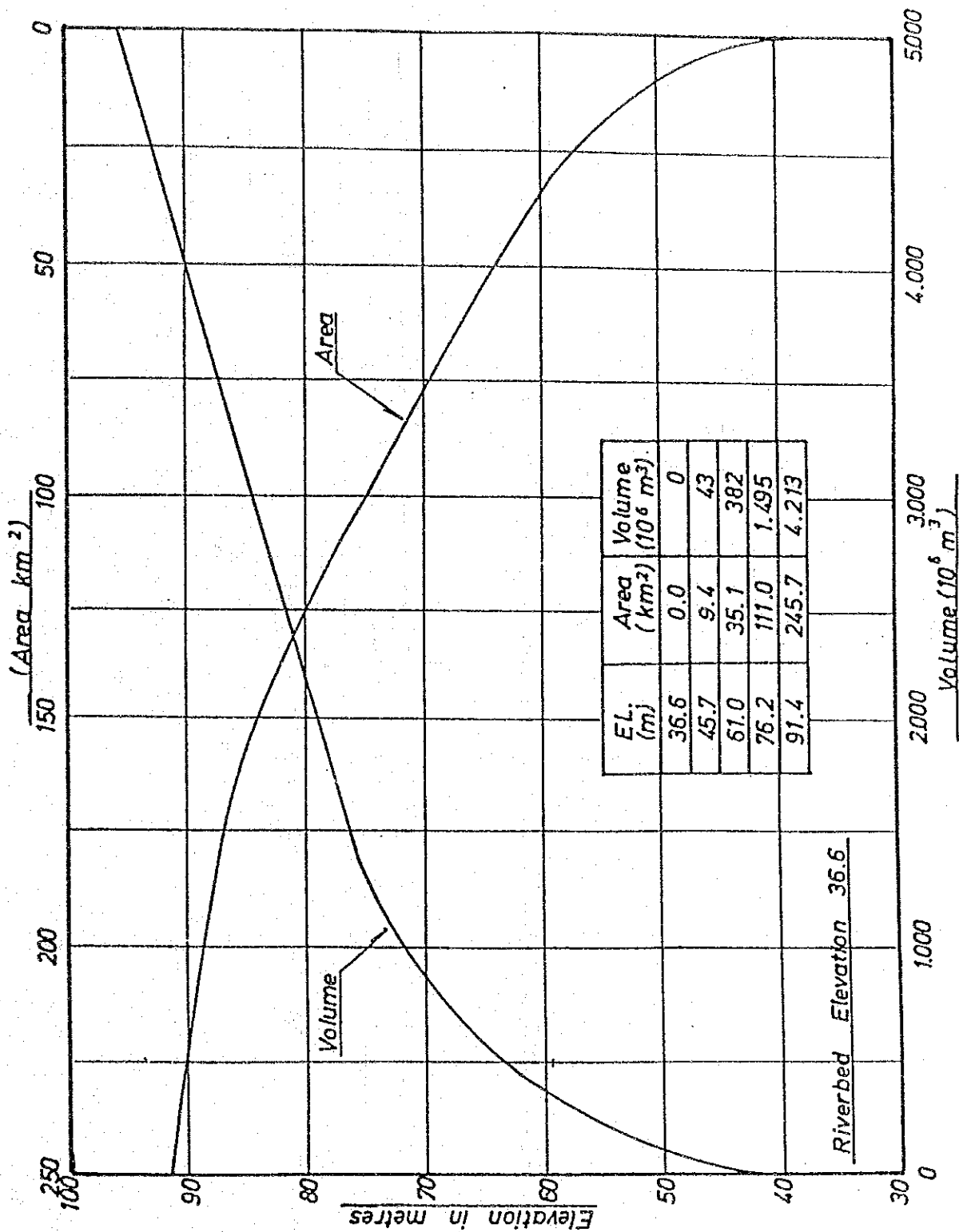


Fig.4.3

Location Map of Kemubu Dam

GOVERNMENT OF MALAYSIA  
 STUDY  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY



**Fig.4.4**  
**Storage Capacity, Kemubu Dam**

GOVERNMENT OF MALAYSIA  
 STUDY  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY

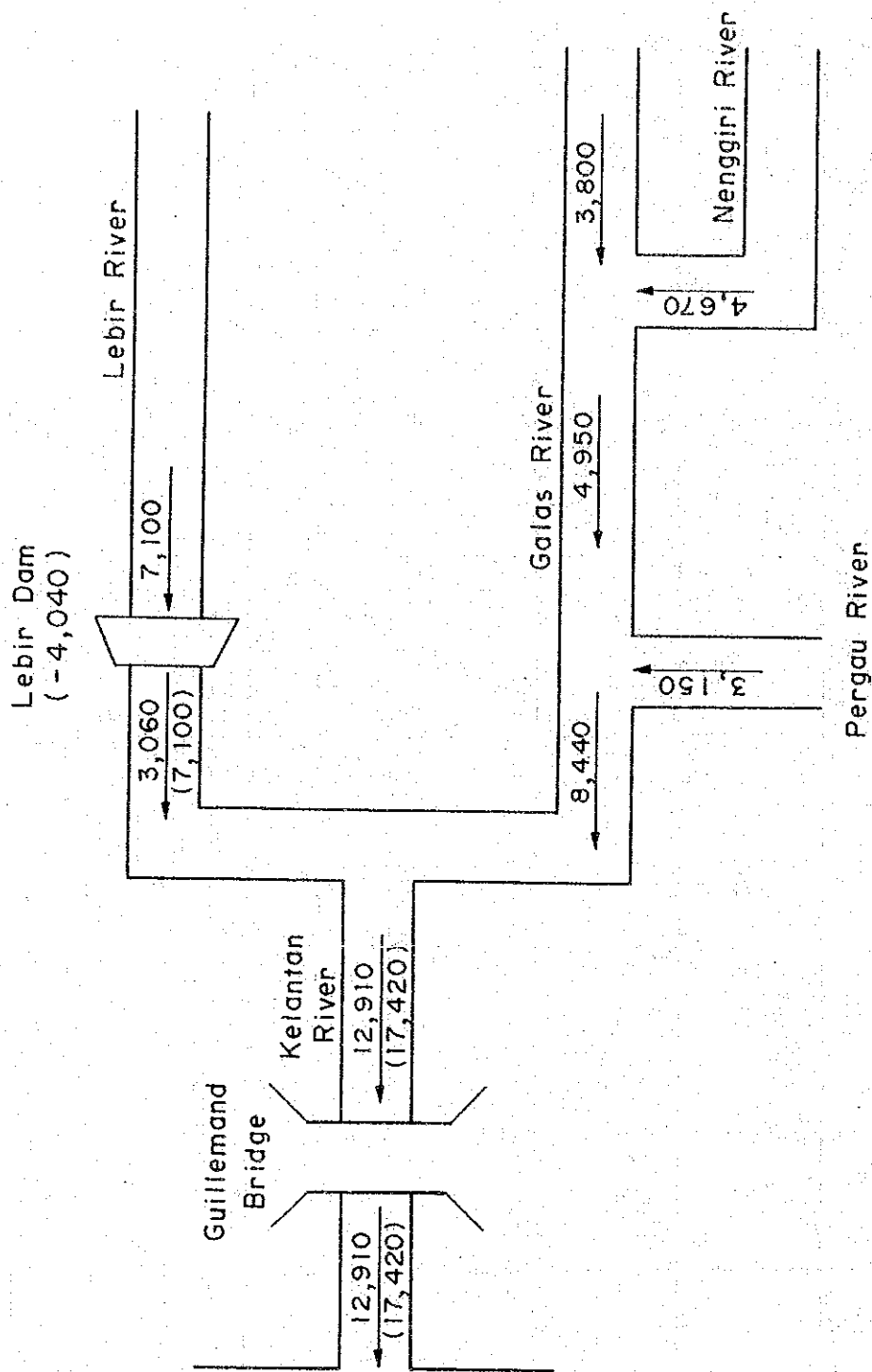


Fig.4.5

50-year Flood Peak Discharges  
with Lebir Dam Scheme

GOVERNMENT OF MALAYSIA  
STUDY  
ON  
KELANTAN RIVER BASIN WIDE FLOOD MITIGATION  
JAPAN INTERNATIONAL COOPERATION AGENCY

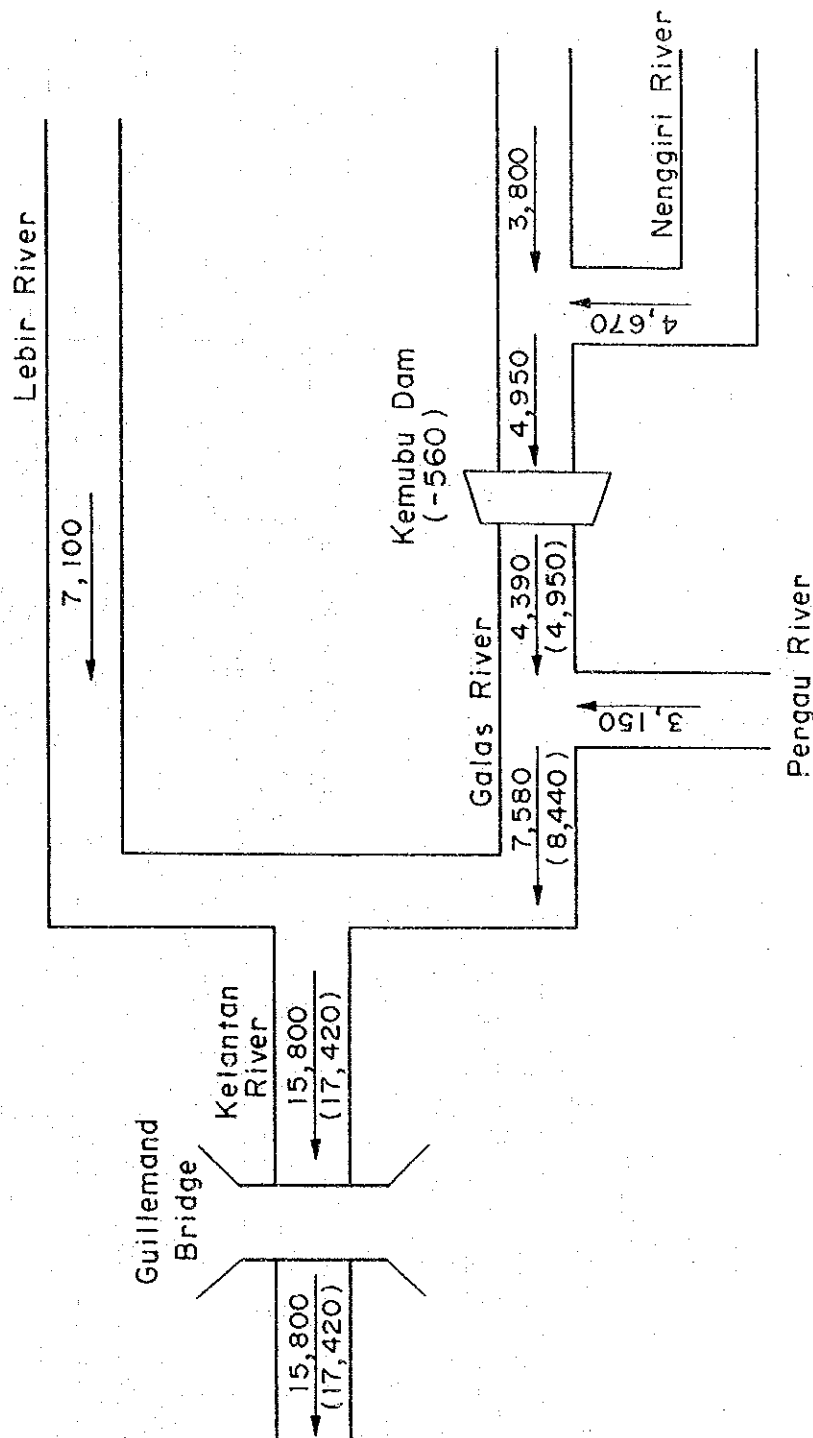


Fig.4.6

50-year Flood Peak Discharges  
with Kemubu Dam Scheme

GOVERNMENT OF MALAYSIA  
STUDY  
ON  
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
JAPAN INTERNATIONAL COOPERATION AGENCY

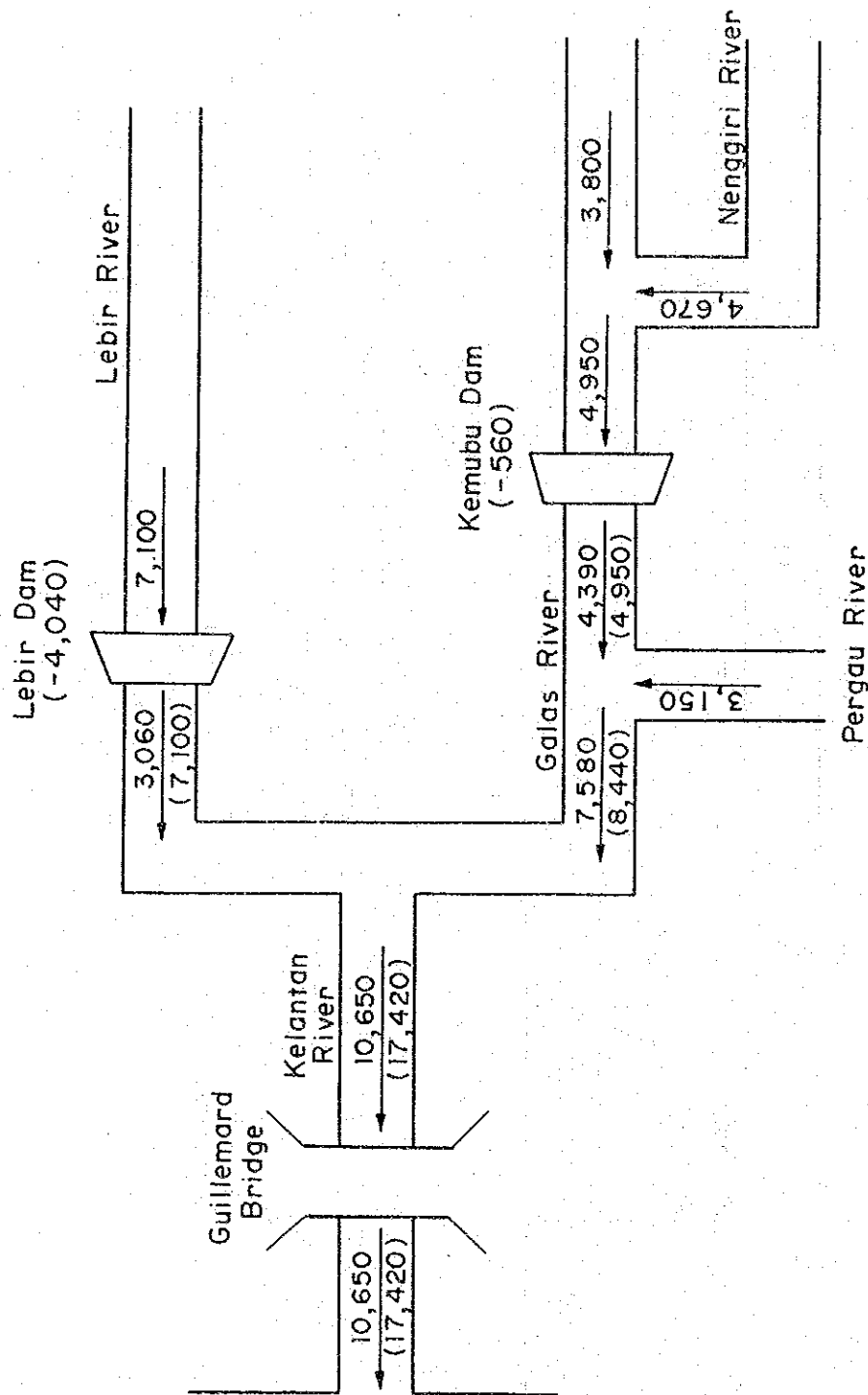


Fig.4.7

50-year Flood Peak Discharges  
with Lebir and Kemubu Schemes

GOVERNMENT OF MALAYSIA  
STUDY  
ON  
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
JAPAN INTERNATIONAL COOPERATION AGENCY

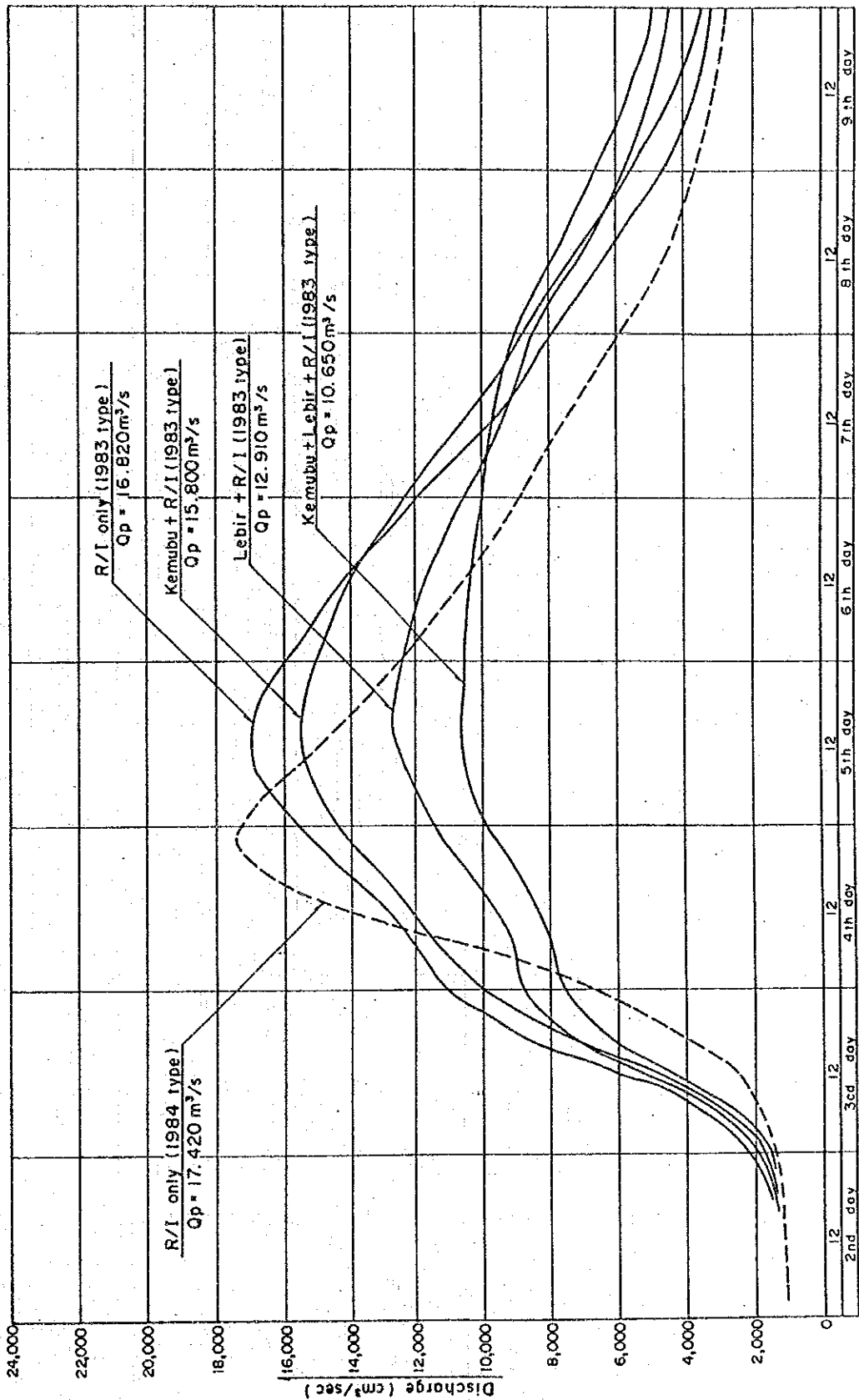
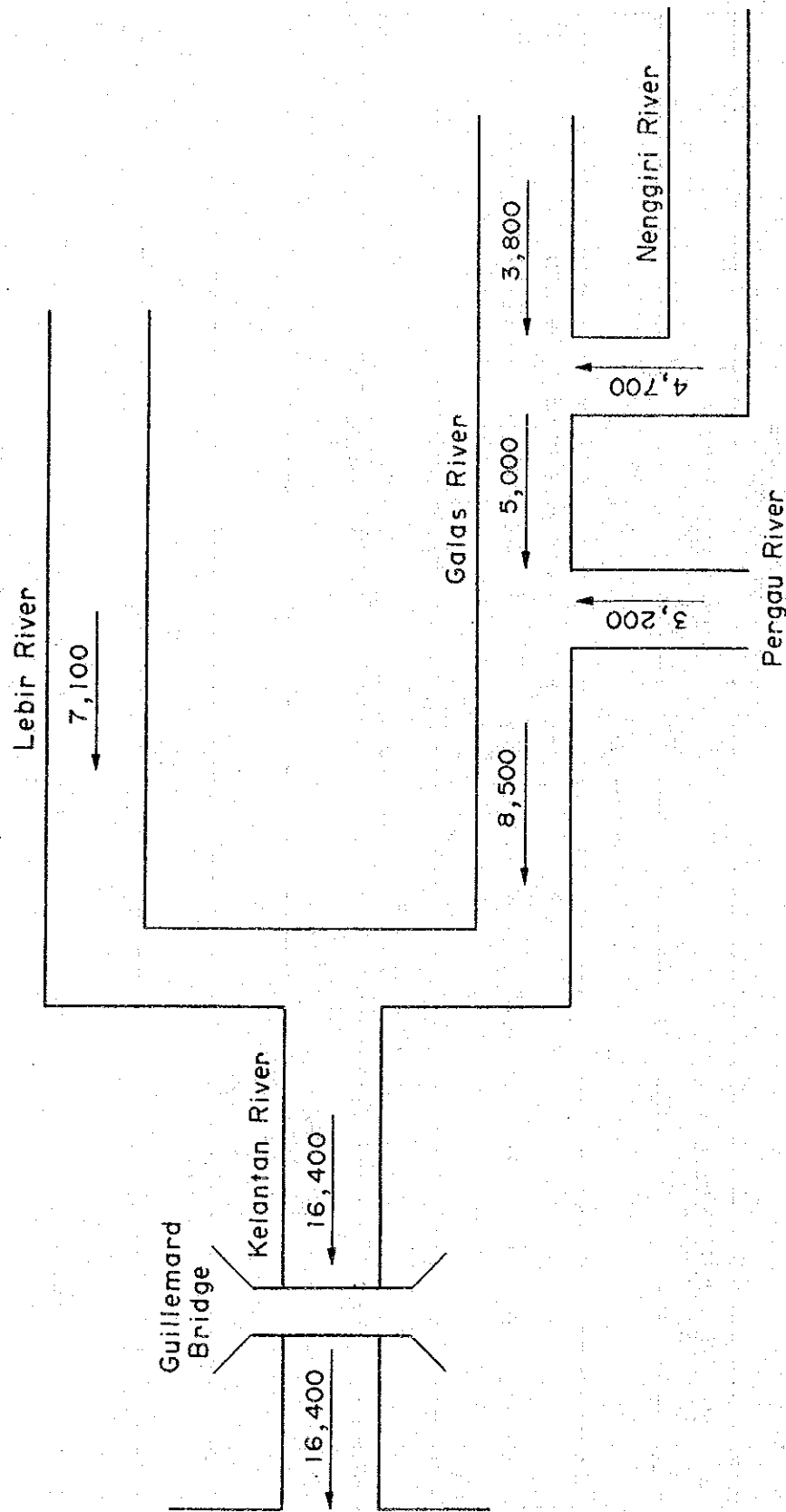


Fig.4.8

Flood Mitigation Effect  
at Guillemard Bridge

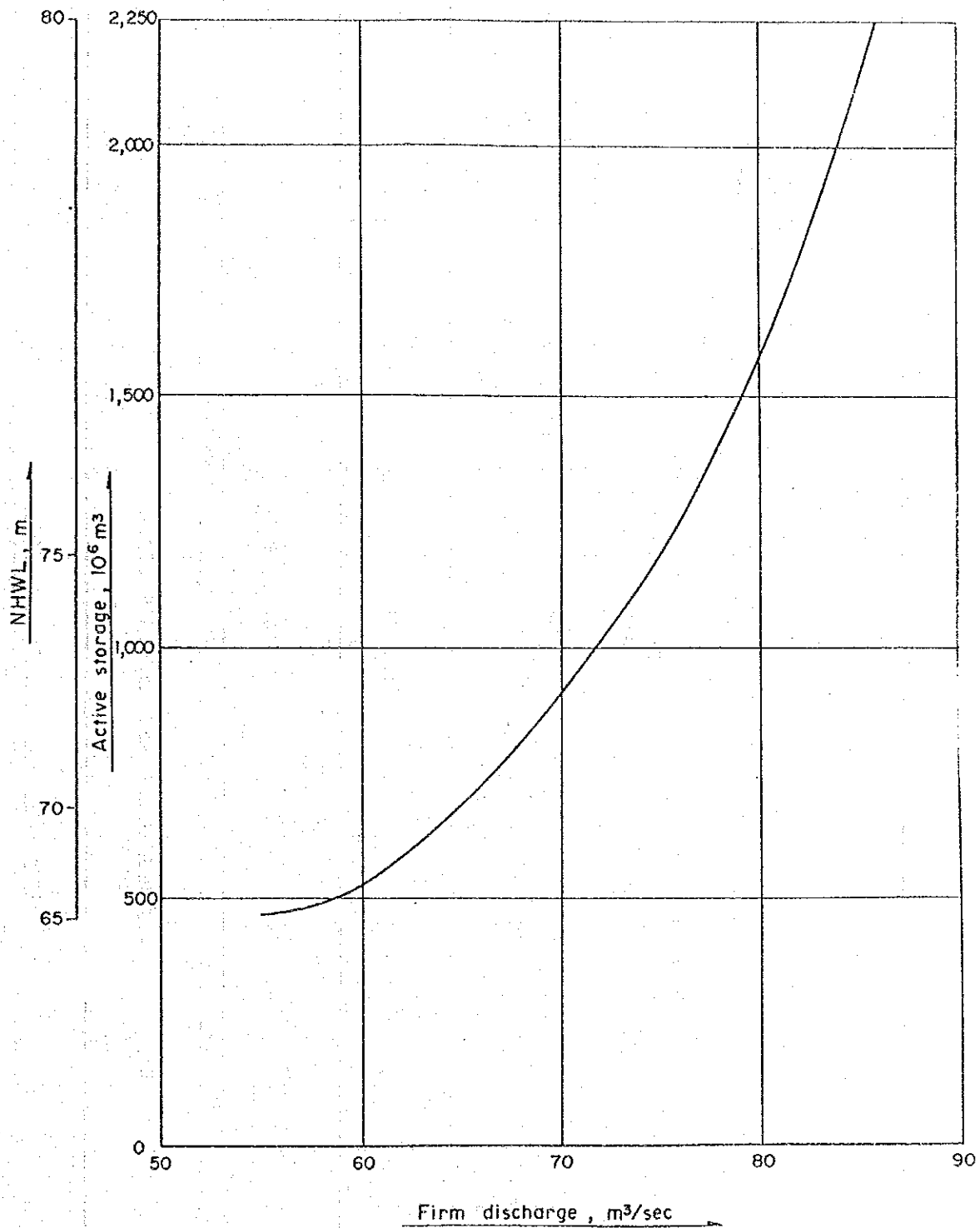
GOVERNMENT OF MALAYSIA  
STUDY  
ON  
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
JAPAN INTERNATIONAL COOPERATION AGENCY



**Fig.4.9**  
**50-year Flood Peak Discharges**  
**under Natural Condition**

GOVERNMENT OF MALAYSIA  
 STUDY  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY





**Fig.4.10**

**Storage-draft Curve  
of the Lebir Dam Scheme**

GOVERNMENT OF MALAYSIA  
**STUDY**  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY

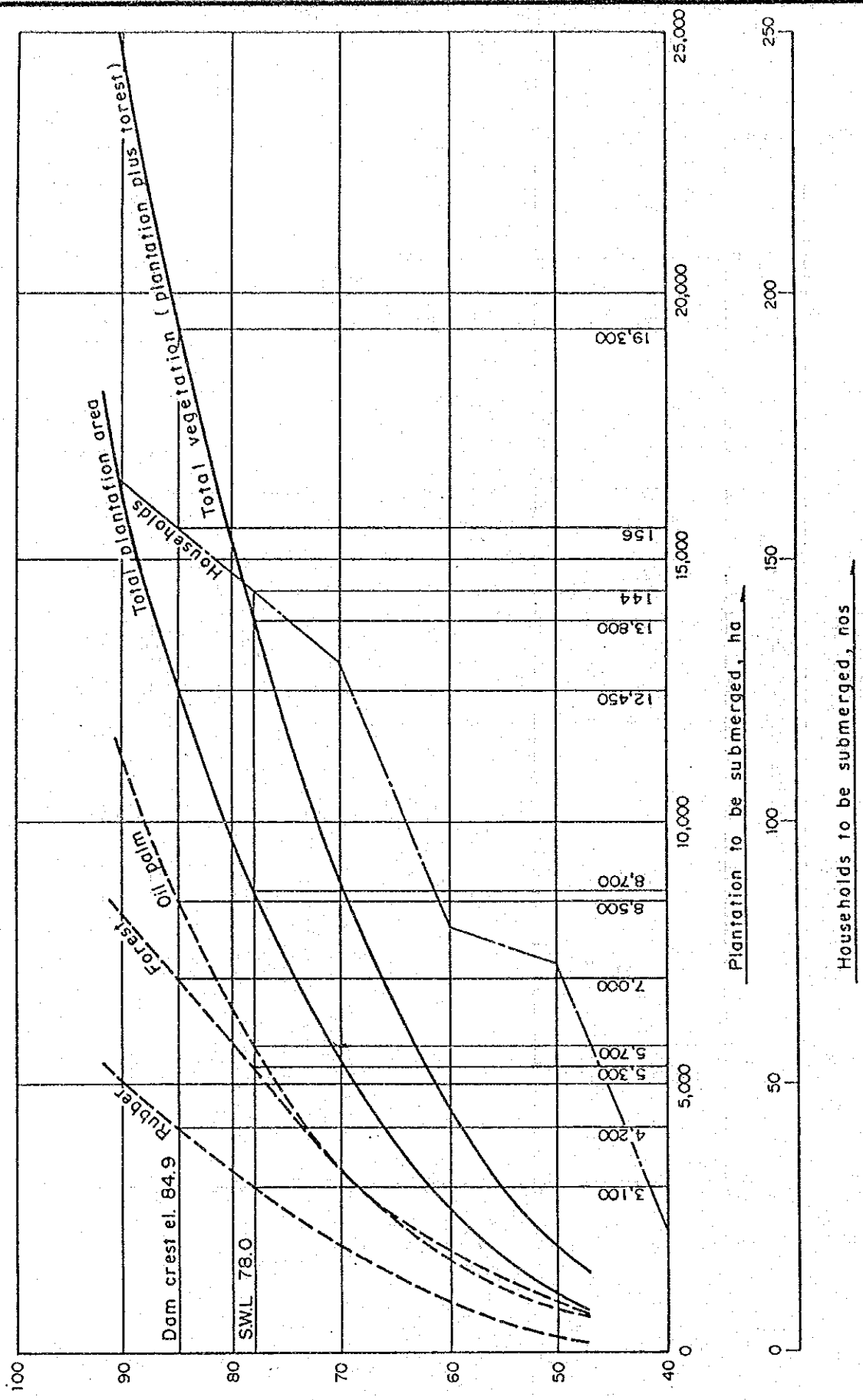


Fig. 4.11

Relationship between Elevation and Social Impact ( Lebir Scheme )

GOVERNMENT OF MALAYSIA  
 STUDY  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY

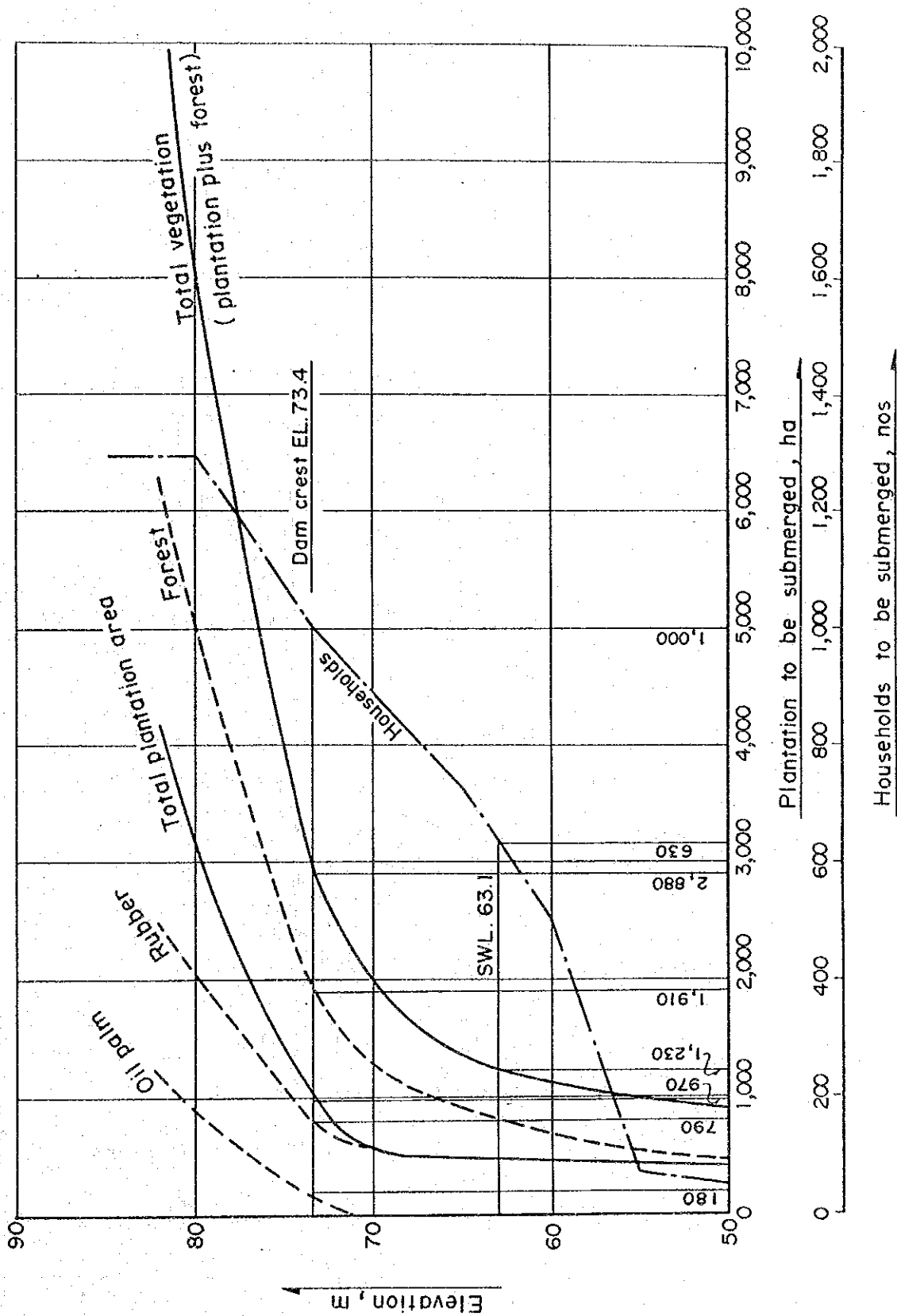


Fig.4.12

Relationship between Elevation and Social Impact ( Kemubu Scheme )

GOVERNMENT OF MALAYSIA  
 STUDY  
 ON  
 KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION  
 JAPAN INTERNATIONAL COOPERATION AGENCY

