#### 3. BASIN DEVELOPMENT FRAMEWORK

## 3.1 Basin's Role in the Region

About 87% of the State is covered by the Kelantan River basin. The rest forms the basins of minor rivers in the coastal region.

### 3.1.1 Existing development plans

In accordance with the characteristics of land use and the extent of development so far achieved, the State of Kelantan is divided into two sub-regions; North Kelantan and South Kelantan.

North Kelantan comprising 6 Districts of Bachok, Kota Bharu, Machang, Pasir Mas, Pasir Putch and Tumpat occupies 16.4% of area and 78.8% of population in the whole of the State. Whereas, South Kelantan consists of 4 Districts of Tanah Merah, Jeli, Kuala Krai and Gua Musang, covering 83.6% of the State area and 21.2% of the State population.

The persistent policy of the Government is to narrow down the gap in the standard of living and basic amenities existing between Kelantan and other States.

Agriculture and forestry sectors form the nuclei to achieve socio-economic parity for the Kelantan people. The centerpiece for the development of North Kelantan is more intensive use of agricultural land along with diversification of crops. The development strategy for South Kelantan centres on more extensive use of land for agriculture as well as more systematic approaches for the preservation and utilization of forest.

Kelantan Agricultural Development Authority (KADA) was set up in 1972 to develop, promote, assist and initiate the social and economic development of farmers in North Kelantan. KADA has succeeded in increasing yields for paddy and other crops through introduction of irrigation network and other modern technologies, thereby contributing toward the elevation of socio-economic status of farmers. Now about 50% of paddy area is under KADA.

South Kelantan Regional Development Authority (KESEDAR) was formed in 1978 to fully develop the region's resources and to ensure a more equitable sharing of benefits of economic and social development. It has developed and will continue to develop agricultural land for rubber, oil palm and other crops. It is aiming at a better management of permanent revenue forest and permanent forest reserves. It has moved and will continue to move farmers from North Kelantan for settlement in South Kelantan.

There are other Federal agencies playing an important role for agricultural development such as Federal Land Consolidation and Rehabilitation Authority (FELCRA), Rubber Industry Smallholders Development Authority (RISDA) and Federal Land Development Authority (FELDA).

A state with an advanced level of transport and communications is capable of attaining a high degree of socio-economic development because under such circumstances new and solid intra- and inter-State markets are likely to emerge based on free competition and the principle of comparative advantages (division of labour). A key for the resolution of Kelantan's backwardness is therefore to come out of its semi-autarky economy through the development of transport and communication systems. And the Gorvernment has persistently given high priority to the transport sector in its execution of Malaysia Plan. The development programmes largely comprise of roads, rail and civil aviation.

The major road network expansion in Kelantan is the East-West Highway and the Kuala Krai-Gua Musang Highway, each of which is 115 km long. Both Highways are now opened to traffic. In the highway programme emphasis will be placed on aspects of organisation, repair as well as upgrading of roads besides constructing new roads to connect to existing roads such as the Gua Musang road to Kuala Lipis and the Dabong road to Jeli. A Master Plan of electric railway with a double-track and standard gauge has been completed for linking Kota Bharu with Kuala Trengganu, Kuantan and Kuala Lumpur. The aim of the Master Plan is to modernize and expand the railway system to meet the transportation requirements during 1990's and beyond. The expansion of Kota Bharu Airport is essential to enable the landing of larger airplanes such as Air Bus and Boeing 747. This project envisaged in the 5th Malaysia Plan period and beyond will facilitate the growth and progress of the tourism industry in Kelantan.

Manufacturing in the State is still relatively undeveloped with only 7.3% of total employment. As an effort to improve and expand economic activities in the State, SEDC was accorded a key in several high priority industrial and commercial These include urban renewal, property development, undertakings. industrial ventures, modern estate plantation agriculture, commercial undertakings and tourism development. However, the projects undertaken under the leadership and guidance of SEDC have not always been fruitfully completed. Manufacturing and commerce are the activities basically better managed when left to private hands. Under 5th Malaysia Plan the role of private sector is stressed as the prime leader of economy. And the State Government is taking steps to create a climate to this direction.

Efforts are being made to develop "foot-loose" industries, providing training facilities and practical structures for industrialists, expanding industrial opportunities based on agriculture and local sources. The upgrading and expansion of small industry activities and handicraft also are being stressed upon as a commercial effort.

One more development strategy which is being stressed is the district development strategy. It revolves around the provision of basic amenities primarily for the northern region and the

expansion of the southern region by upgrading town development primarily in the north and developing small townships and rural centres in the south.

An example of major projects is the Development Project at Kubang Kerian (South-east end of MPKB jurisdiction), a new town area, according to the concept of the Federal Government, involving an area of 50 ha consisting of the construction of shophouses, business complexes, residential houses, schools and recreational centres.

In the southern district the New Town Development of both Gua Musang and Jeli is now in progress. Also, there is the Development of Kelantan South-West Region bordering Perak and Pahang States, aiming at the opening-up of new opportunities for economic activity by the private party.

### 3.1.2 Development potentials and flood mitigation

"The 5th Malaysia Plan for Kelantan" states as follows:

- (1) There is still imbalance in the development of Kelantan as compared with that of other States.
- (2) There is imbalance in the development between Subregion I and II in Kelantan.
- (3) There are insufficient basic amenities for the provision of services for socio-economic development.
- (4) The State government cannot afford to support development projects with State revenue.

All the above statements can be boiled down to one expression, i.e. underdeveloped economy of the State.

Actually the State of Kelantan has rich and abundant potentials in terms of human, agricultural, forestry, mining, water and tourism resources. Only they have not been properly or fully developed.

The Federal and State Governments, cognizant of the socioeconomic status of Kelantan, have strenuously and consistently taken the policy for elevating quantitative and qualitative levels of infrastructures in the State. As a result, discrepancies existing between Kelantan and other States are being rapidly narrowed; that is, the circumstances confining the State to the existing status are now being removed.

However, one major obstacle still remained is flooding in the Kelantan River. Habitual flooding of the coastal plain brings extensive economic losses in terms of damages to crops and property, inhibiting the growth of the agricultural, industrial and commercial sectors. The damage to the economy caused by flooding must be grasped in broader perspective than from the viewpoint of direct economic cost; that is, farmers have no

positive inclination towards the adoption of new agricultural technology, which contributes to perpetuating the traditional low productivity of the agricultural sector.

Also, flood threat has depressed and dampened the investment climate in the State. Entrepreneurs and businessmen are in no way willing to invest in flood prone areas. Thus, flood mitigation is crucial for long-term industrial development and economic progress of Kelantan.

# 3.2 Socio-economic Impacts of Flood Mitigation

Negative as well as positive impacts will arise when a comprehensive flood mitigation project is implemented. Those impacts are far-reaching and therefore must be fully taken into account in proceeding with the project.

# 3.2.1 Negative socio-economic impacts

Three multi-purpose and one flood mitigation dam projects have been proposed in the State; Dabong, Lebir, Nenggiri, and Kemubu dams. A large scale reservoir will be formed when the dam is constructed, resulting in the resettlement in the reservoir area as shown in Table IV.3.1. Resettlement involves new development of residential area and agricultural land as well as new construction of houses, commercial and industrial establishments, public institution, infrastructures, etc.

Inhabitants affected by the construction of the Dabong dam will reach about 37,000 in its full development. Rubber and oil palm plantations of more than 17,000 ha will be under water in the full development of the Lebir reservoir. The affects by the construction of the Nenggiri dam will be minimal due to the low development of the submerged area.

The only way to a successful transfer of the affected people seems to lie in the full preparation of the physical and socioeconomic environments for resettlement under full agreement and broad consensus of the parties concerned.

The negative socio-economic impacts considered besides the resettlement of local people lived in the submerged area would be the submergence of gold mines and the cancellation of mini-hydro schemes. It is hard to quantify losses for the submergence of gold mines, while if the mini-hydro schemes are submerged after implementation, considerable economical and financial losses will be incurred. Thus, the implementation of these mini-hydro schemes is desired to suspend at present.

Since the expansion and intensive use of agricultural lands will increase at a rather slow tempo in the submerged area, related losses will not grow so much as years go by.

### 3.2.2 Positive socio-economic impacts

The ultimate objective of the flood mitigation project is to induce economic development of the Kelantan River basin through increased agricultural, industrial and commercial production and activities. The obstacles and constraints that have directly and indirectly retarded and impeded the economic progress of the State will be removed, and physical and mental environments ready for economic take-off will be prepared by the implementation of the project.

Also, the related construction works will create employment opportunities for labourers. After completion of the works, permanent jobs will be created for operation and maintenance of equipment and facilities.

The project will facilitate and accelerate urbanization of the basin, which in turn will transform land use pattern, raising the value of land.

Through a heightened pace of intensive and extensive use of agricultural land, productivity and production of agricultural crops will go up, which will lead to an increased export of related agricultural products, thereby contributing towards an increase of foreign exchange earnings.

Flood mitigation will provide an amenity to the inhabitants by removing or alleviating phychological burdens. Furthermore, scenic beauty of the basin brings positive effects on tourism.

### 3.3 Socio-economic Projection

Socio-economic indices that best describe the State of Kelantan will be population, GDP, living standard and budgetary allocation.

Forecast of their future trends is important not only to know the future direction of the State, but also to predict the extent of property that will exist in future in the State in connection with flood damage study. The projection of their future trends was made based on the past growth rates.

# 3.3.1 Population

The population of Kelantan is estimated at 1,091,756 in 1988 based on SEPU forecast in "5th Malaysia Plan for Kelantan". According to the forecast, the State population will grow from 893.8 thousand to 1,147.0 thousand during the period of 1980 to 1990 at an average annual rate of 2.5% as shown in Table IV.3.2. The JICA Study Team assumed that the same growth rate would be maintained from 1990 onward.

Looking back to the past, the population of Kelantan grew from 690.8 thousand to 893.8 thousand during the last intercensal period of 1970 to 1980 at an average annual rate of 2.6%.

The population of Districts and Daerahs was forecasted based on the growth rates of population by Daerahs during the last inter-censal period.

The population of Kota Bharu District is estimated at 357,995 in 1988, occupying 32.8% of the State population. In the target year of 2010 the population of the same District is forecasted to reach 658,152, accounting for 35.0% of the State population. During the same period the population of area under MPKB which forms the core of the District population will grow from 224,719 (20.6%) to 429,550 (22.9%). It means that migration and concentration of population to the State capital will accelerate in future.

The population of North Kelantan adds up to 859,369 in 1988, sharing 78.7% of the State population. It will grow to 1,354,442 in 2010, but its share will drop to 72.1%. On the other hand, the population of South Kelantan totals 232,387 in 1988, accounting for 21.3% of the population of Kelantan, and it will increase to 525,046 in 2010, raising its share to 27.9%. Behind this lies the difference in the growth rate of population between the northern and southern sub-regions; the average annual growth rate of the northern population works out at 2.1%, while 3.8% for the southern population. This difference is brought about partly by the difference in absorptive capacity of population between the two sub-regions and partly by the Government policy for regional balance.

In 1988 Districts whose population is over 100,000 will be Kota Bharu, Pasir Mas and Tumpat. In 2010 their number will increase to eight

Population density of Kelantan is calculated at 72 per  $\rm km^2$  in 1988, and will rise to 125 per  $\rm km^2$  in 2010 as shown in Table IV.3.3. In 1988 Daerahs whose population density is beyond 1,000 per  $\rm km^2$  count only two, i.e. area under MPBK and Pasir Mas. Their number will go up to eight in 2010.

# 3.3.2 Gross domestic product

The Gross Domestic Product (GDP) of Kelantan is estimated to be M\$2,684.4 million at market prices in 1988 based on SEPU forecast in "5th Malaysia Plan for Kelantan". According to the forecast, the State economy will grow from M\$1,668.6 million to M\$3,060.0 million during the period of 1980 to 1990 at an average annual rate of 6.25% as shown in Table IV.3.4. The JICA Study Team assumed that the slightly lower growth rate of 6.0% would be appropriate from 1990 onward. Regarding to sectoral composition of GDP (industrial structure) and its future trend, "Kajian Pelan Struktur Kertas Teknikal No.2: Asas Economi" was fully referred to.

Looking back to the past, economy of Kelantan grew from M\$679.9 million to M\$1,668.6 million during the last decade of 1970 to 1980 at an average annual rate of 9.4%. Malaysian

economy made a remarkably rapid progress amidst favourable international environment for external trade during that period. Now that the circumstances have changed, it is neither reasonable, nor practical to expect a growth rate of the same order.

Despite the dominant place of the primary industry in population and employment, this industry's contribution to the economy of the State is estimated at 28.8% in 1988 or less than one third. Furthermore, it will decline in 2010 to 21.9% or less than one fourth. The share of the manufacturing sector in 1988 is only 4.5% and this level will keep more or less in the future. Overall contribution of the secondary industry to the State GDP is 11.0% and the ratio is forecasted to be maintained in the future. The contribution of tertiary industry will increase from 60.2% to 67.3% during the period of 1988 to 2010. It is noted that this forecast on the future industrial structure of Kelantan is based on the assumption that no major projects related to infrastructural improvement such as the flood mitigation project will be undertaken in the future.

In a period of 22 years from 1988 to 2010, economy of Kelantan is forecasted to grow from M\$2,684.4 to M\$9,816.8 million (3.66 times).

# 3.3.3 Living standard

Living standard of Kelantan in terms of per capita GDP for 1988 is calculated at M\$2,459 at 1988 prices. The amount is almost equal to US\$1,000 at the exchange rate of M\$2.50 to US\$1.00. It is equal to or higher than per capita GDP's in most of other ASEAN countries. However, it may be about one half of the national average. It is expected to grow from M\$2,459 in 1988 to M\$5,223 in 2010 (2.12 times) at an average annual rate of 3.5%.

## 3.3.4 Budgetary allocation

The revised budgetary allocations for Kelantan in 5th Malaysia Plan total M\$1,807 million as of May, 1988, which comes through Ministry of Land and Regional Development (27.9%), Ministry of Agriculture (19.8%), Ministry of Education (14.2%), Ministry of Public Works (13.8%), Ministry of National and Rural Development (10.2%) and others.

Ministry of Land and Regional Development takes care of agricultural development agencies such as FELDA, KESEDAR, RISDA and FELCRA. Various organizations come under Ministry of Agriculture, including Drainage and Irrigation Department (DID), Veterinary Department and KADA. Ministry of Education presides over Technical and Vocational Training Section, Educational Department, Science University of Malaysia, etc. Ministry of Public Works is composed of such organization as Road Section and Water Supply Section. Ministry of National and Rural Development covers Rural Water Supply Section, Village Road Section, Rural

Road Section, Rural Electricity Section and so forth.

It is clear from the above that the Government accords topmost priorities to the development of agriculture, infrastructure and human resources. This same policy which has been pursued in the past will be kept up into the future.

The Departments/Agencies whose allocations exceed M\$50 million are as follows:

D	epartments/Agencies	Allocations
		(M\$ '000)
1.	FELDA, MLRD	235,560
2.	Min. of Agriculture, MOA	209,950
	Road Section, MPW	126,830
4.	Education Dept., MOE	111,250
	FELCRA, MLRD	107,440
6.	KESEDAR, MLRD	106,740
7.	Technical and Vocational	78,900
	Training Section, MOE	
8	Rural Road Section, MNRD	70,880
	DID, MOA	63,410
10.	Water Supply Section, MPW	63,190
11:	Science University of Malaysia	61,730
12.	PKINK, MPE	61,100
13.	RISDA, MLRD	52,970
14.	Royal Police Dept., MHA	50,670
	Total	1,400,620

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Note: MLRD = Ministry of Land & Regional Development
MOA = Ministry of Agriculture
MPW = Ministry of Public Works
MOE = Ministry of Education
MNRD = Ministry of National & Rural Development
MPE = Ministry of Public Enterprises
MHA = Ministry of Home Affairs
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The allocations for these departments/agencies occupy 77.5% of the total.

The prevailing tide of philosophy on the management of the economy is a greater participation of the private sector as a prime mover of future economy. In parallel with it, the role of the Government will be further strengthened as a coodinator. It means that the Governmental budget will not expand so much in the future as in the past, and that selective and effective use of the budget will be stressed and pursued.

### 3.4 Land Use Plan

#### 3.4.1 General

Urban areas will continue to expand in future due to the

migration of rural population seeking better employment opportunities as well as to the natural increase of urban population.

Agricultural land will also increase mainly owing to the further development of oil palm plantations. However, the acreages under other major crops such as paddy, rubber and tobacco will not change so much in the future because an emphasis and direction of the Government policy towards them are intensive use of the existing areas and elevation of productivity.

Pasture reserves will continue to be developed because of an important place of animal husbandry in farmers' earnings.

Permanent revenue forests and permanent forest reserves will be preserved, but forest area itself will be bit by bit nibbled away before urban and agricultural development. Grasslands, swamps, etc. will also decrease as the development of Kelantan progresses.

### 3.4.2 Land use plan

## (1) Urban development

During the period of 1966 to 1981 the urban and associated areas in Kelantan increased at an average annual rate of 2.2%. This rate was adopted in projecting the increase of the said areas from 1988 onward. Since population is forecasted to increase at an average annual rate of 2.5%, the density of population in the urban and associated areas is bound to rise. The urban and associated areas will expand from 5,365 ha in 1988 to 8,743 ha in 2010 as shown in Table IV.3.5.

The jurisdiction of MPKB only covered Bandar Kota Bharu (Kota Bharu Town) was extended in 1978 by absorbing five neighbouring Daerahs (Sub-district) of Badang, Kemumin, Panji, Lundang, and Kota. The area managed by MPKB was at the same time declared to be urbanized as the development centre of the State.

The development plan of MPKB toward year 2000 as given in Fig.IV.3.1 consists of three development centres with corridors; Bandar Kota Bharu, Kubang Kerian and Pengkalan Chepa. Bandar Kota Bharu will have a function as a pivot of these three development centres as well as the centre of commerce and trading.

The development of Kubang Kerian includes the residential and industrial areas as well as Istana Negeri (State Palace) and the campus and hospital of Science University of Malaysia. The development centre of Pengkalan Chepa area will be an airport with the industrial estate, army camp and residential area.

According to the information from the Town and Country Planning Department there is no definite development plan at this moment for the major riverine towns of Pasir Mas, Tanah Merah and Kuala Krai besides Kota Bharu.

### (2) Rural development

Horticulture areas are forecasted to increase from 36,183 ha in 1988 to 39,756 ha in 2010 at an average annual rate of 0.4% based on the 1966-1981 growth rate.

Rubber acreage is assumed to increase by 1,000 ha every year. Thus, it will increase from 129,413 ha in 1988 to 151,416 ha in 2010. The policy of intensive use of the existing rubber areas by replanting will continue to be followed. RISDA's yearly replanting target is 7,000 acres (2,856 ha). Rubber land is desired to be managed on mini-estate basis to raise productivity.

Development of oil palm plantations in South Kelantan will be further stepped up, and oil palm acreage will jump up from 61,261 ha in 1988 to 140,013 ha in 2010, which would be almost maximum. Thus, the share of oil palm acreage in the total State areas will rise from 4.1% to 9.3%.

The areas for other permanent crops are projected to increase from 9,520 ha in 1988 to 11,483 ha in 2010 at an average annual rate of 0.9% based on the 1966-1981 growth rate.

Summing up, the areas for permanent crops will increase from 200,194 ha in 1988 to 302,912 ha in 2010, and along with it their share in the total State area will go up from 13.3% to 20.2%.

The intensive use of paddy areas through modern agricultural technology will be pursued further under KADA's guidance and initiative. KADA's policy target during the 5th Malaysia Plan period is to increase paddy yields by 0.1 ton per ha per year. Furthermore, the development of KADA granary area is still in progress with the target level of 500 ha a year.

As the national rice policy, rice production will be concentrated on the granary areas; that is, paddy lands in Kelantan will be developed only in the KADA project area as one of eight granary areas in Malaysia. Considering the government policy, it is assumed that the development of paddy area is confined to the KADA granary area, and therefore it is projected that the acreage will increase from 71,248 ha in 1988 to about 82,250 ha in 2010.

Tobacco is planted mainly in paddy areas. The overall policy for tobacco growing lies in an intensive utilization of the existing area rather than in expansion of acreage. National Tobacco Board does not draw a rosy picture for future demand of tobacco because of its supposed ill effects on health. Thus, it is projected that the acreage will stay at the level of 8,219 ha in 1988 in future.

The areas for other annual crops are forecasted to increase from 8,780 ha in 1988 to 11,744 ha in 2010 at an average annual rate of 1.3% based on the past records.

Summing up, the areas for annual crops will increase from 80,028 ha in 1988 to 93,994 ha in 2010, and along with it their share in the total State area will rise from 5.3% to 6.3%.

Pasture reserves are projected to increase from 4,178 ha in 1988 to 5,200 ha in 2010 at an average annual rate of 1% based on the estimated growth rate of livestock population.

Thus, agricultural land composed of horticulture, permanent and annual crops and pasture reserves, will grow from 320,583 ha in 1988 to 441,862 ha in 2010, and during this period the share of this land use category to the total area of the State will expand from 21.3% to 29.4%.

The combined areas of grasslands, swamps, unused land and unclassified land are projected to decrease from 58,985 ha in 1988 to 55,391 ha in 2010 at an average annual rate of 0.3% based on the 1974-1981 records.

Lastly, forest areas are projected as the balance between the total land use areas and the combined areas mentioned above to decline from 1,119,076 ha in 1988 to 998,013 ha in 2010 at an average annual rate of 0.5%. As a result, the share of this land use category to the total area of the State will drop from 74.4% to 66.3%.

Table IV.2.1 Population of Kelantan, 1970 to 1980

Item	1970	Annual Growth	1980	Annua 1 Growth	1988/ <u>1</u>
State of Kelantan	690,800	2.6%	893,800	2.5%	1,091,756
	(100.0%)		(100.0%)		(100.0%)
	100		•		(100.00)
Bachok	62,593	2.1%	76,991	2.0%	90,549
	(9.1%)		(8.6%)		(8.3%)
Kota Bharu	209,210	3.2%	106 740	0.00	
	(30.3%)	3.23	286,742	2.8%	357,995
	(5015-6)		(32.1%)		(32.8%)
Machang	51,977	1.5%	60,436	1.5%	67,930
	(7.5%)	•	(6.8%)		(6.2%)
			•		(012.0)
Pasir Mas	101,354	2.0%	123,026	1.9%	142,867
	(14.7%)	÷	(13.8%)		(13.1%)
D D 1					•
Pasir Puteh	71,608	1.6%	84,317	1.6%	95,536
	(10.4%)		(9.4%)		(8.8%)
Tanah Merah	49,318	2.7%	64,568	ባ ካል	70.040
	(7.1%)	2110	(7.2%)	2.7%	79,942
	( - , - , )	•	(/ • 6.4)		(7.3%)
Jeli	14,477	5.3%	24,321	5.4%	37,120
54 St. 194	(2.1%)	+ *	(2.7%)		(3.4%)
_					(,
Tumpat	73,533	2.0%	89,516	2.0%	104,492
, ·	(10.6%)		(10.0%)		(9.6%)
Gua Masang	12,578	4.4%	10 340		
<b></b>	(1.8%)	7.40	19,349 (2.2%)	4.8%	28,198
	(1.00)		(2.28)		(2.6%)
Kuala Krai	44,152	3.9%	64,534	3.8%	87,127
	(6.4%)		(7.2%)		(8.0%)
					(0.00)
MPKB	127,290	3.5%	179,307	2.9%	224,719
	(18.4%)		(20.1%)		(20.6%)

Note : 1) /1 = Estimate

<sup>2)</sup> Figures for 1970 are adjusted figures based on Population Census.

<sup>3)</sup> Figures in parentheses are shares by District.

Sources: Population Census 1970 & 1980, 5th Malaysia Plan for Kelantan and JICA

Table IV.2.2 Population Density of Kelantan, 1970 to 1988

• •		Populat	ion Density	(persons/km <sup>2</sup> )
Item	Area	1970	1980	1988/ <u>1</u>
tate of Kelantan	1,504,009 (100.0%)	46	59	72
Bachok	27,893 (1.9%)	224	276	324
Kota Bharu	40,242	520	713	889
	(2.7%)			
Machang	53,022 (3.5%)	98	114	128
Pasir Mas	64,516 (4.3%)	157	191	221
Pasir Puteh	42,564 (2.8%)	168	198	224
Tanak Merah	79,843 (5.3%)	62	81	100
Jeli	132,407 (8.8%)	11 .	18	28
Tumpat	18,127 (1.2%)	406	494	576
Gua Musang	818,090 (54.4%)	2	2	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Kuala Krai	227,305 (15.1%)	19	28	38
MPK8	12,610	1,009	1,422	1,782

Note

: 1)  $\frac{1}{1}$  = Estimate 2) Figures in parentheses are shares by District.

Sources: Agricultural Department, Kelantan

Table IV.2.3 Characteristics of Population in Kelantan

	1. Population as Per		ional Tota 180	1	1985	
	Item				~~~~~	
		Population	<u>Shar</u>	e Po	pulation	Share
	Kelantan	893,800	6.5	% 1	,026,300	6.5%
	Total (Malaysia)	13,745,200	100.0	<b>%</b> 15	,791,100	100.0%
	2. Crude Birth and C	eath Rates as C	lompared w	ith Natio	nal Augmaga	
	(per 1,000 person	is)	ompar ou n	ren nacro	na i Average	
	<u>Item</u>	1970		1980	1984	
	Crude Birth Rates			200	4001	•
	Kelantan	36.3		38.3	38.2	
	Pen. Malaysia	32.5		31.6	30.7	
	Crude Death Rates					
٠	Kelantan	9.7		6.7		
	Pen. Malaysia	7.0		5.8	6.4 5.3	
				3.0	. 3.3	
	3. Urban-Rural Distr	ibution as Comp	ared with	National	Average (%	)
		Kela	ntan		Malay	sia
	Item	********				
		1970	1980	. 1	1970	1980
٠	Urban	15.0	28.0		26.9	34.2
	Rura l	85.0	72.0	7	73.1	65.8
: 2	4. Population Growt	h as Compared w				
	Item		Average	Annual Gr	owth	
	2 00111	1957 -	1970		1970 -	1980
	Kelantan	2.	5		2.6	
		4.			2.0	
		2.1	6		2.2	
	Pen. Malaysia	2.0	6			
5	Pen. Malaysia  5. Population by Age					
5	Pen. Malaysia  5. Population by Age Age Group			Tota!		stributio
	Pen. Malaysia  5. Population by Age Age Group  0 - 14	Group Kelantan Male	, 1980	Total 366,403	% Dis	
	Pen. Malaysia  5. Population by Age Age Group  0 - 14 15 - 64	Group Kelantan Male 185,362	, 1980 Female		% Dis	42.
	Pen. Malaysia  5. Population by Age Age Group  0 - 14	Group Kelantan Male 185,362 218,467	, 1980 Female 181,041 239,589	366,403 458,056	% Dis	42. 53.
£	Pen. Malaysia  5. Population by Age Age Group  0 - 14 15 - 64	Group Kelantan Male 185,362 218,467 16,717	, 1980 Female 181,041 239,589 18,094	366,403	% Di:	42. 53. 4.
	Pen. Malaysia  5. Population by Age Age Group 0 - 14 15 - 64 65 - over	Group Kelantan Male 185,362 218,467 16,717	, 1980 Female 181,041 239,589	366,403 458,056 34,811	% Di:	stributio 42. 53. 4. 100.
	Pen. Malaysia  5. Population by Age Age Group 0 - 14 15 - 64 65 - over Total % Distribution	Group Kelantan Male 185,362 218,467 16,717 420,546 48.9	, 1980 Female 181,041 239,589 18,094 438,724 51.1	366,403 458,056 34,811 859,270 100.0	% Di:	42. 53. 4.
	Pen. Malaysia  5. Population by Age Age Group 0 - 14 15 - 64 65 - over Total % Distribution  6. Ethnic Composition	Group Kelantan Male 185,362 218,467 16,717 420,546 48.9	, 1980 Female 181,041 239,589 18,094 438,724 51.1	366,403 458,056 34,811 859,270 100.0	% Dis	42. 53. 4. 100.
	Pen. Malaysia  5. Population by Age Age Group 0 - 14 15 - 64 65 - over Total % Distribution  6. Ethnic Composition	Group Kelantan Male 185,362 218,467 16,717 420,546 48.9 Kelantan, 1970 Malays	, 1980 Female 181,041 239,589 18,094 438,724 51.1 D and 1980 Chinese	366,403 458,056 34,811 859,270 100.0 (%)	% Dis	42. 53. 4. 100.
	Pen. Malaysia  5. Population by Age Age Group 0 - 14 15 - 64 65 - over Total % Distribution  6. Ethnic Composition Year 1970	Group Kelantan Male 185,362 218,467 16,717 420,546 48.9 Kelantan, 1970 Malays 92.8	, 1980 Female 181,041 239,589 18,094 438,724 51.1 D and 1980 Chinese 5.3	366,403 458,056 34,811 859,270 100.0 (%) Indians 0.8	% Dis	42. 53. 4. 100.
	Pen. Malaysia  5. Population by Age Age Group 0 - 14 15 - 64 65 - over Total % Distribution  6. Ethnic Composition	Group Kelantan Male 185,362 218,467 16,717 420,546 48.9 Kelantan, 1970 Malays	, 1980 Female 181,041 239,589 18,094 438,724 51.1 D and 1980 Chinese	366,403 458,056 34,811 859,270 100.0 (%)	% Dis	42. 53. 4. 100.
6	Pen. Malaysia  5. Population by Age Age Group 0 - 14 15 - 64 65 - over Total % Distribution  6. Ethnic Composition Year 1970 1980  Migration Statisti	Group Kelantan Male 185,362 218,467 16,717 420,546 48.9 Kelantan, 1970 Malays 92.8 93.0	, 1980 Female 181,041 239,589 18,094 438,724 51.1 0 and 1980 Chinese 5.3 5.3	366,403 458,056 34,811 859,270 100.0 (%) Indians 0.8 0.7	% Dis	42. 53. 4. 100.
6	Pen. Malaysia  5. Population by Age Age Group 0 - 14 15 - 64 65 - over Total % Distribution  5. Ethnic Composition Year 1970 1980	Group Kelantan Male 185,362 218,467 16,717 420,546 48.9 Kelantan, 1970 Malays 92.8 93.0	, 1980 Female 181,041 239,589 18,094 438,724 51.1 0 and 1980 Chinese 5.3 5.3	366,403 458,056 34,811 859,270 100.0 (%) Indians 0.8 0.7	% Dis	42. 53. 4. 100. Total 100.0 100.0

Source : Kelantan Development Statistics, 1987

Table IV.2.4 Employment of Kelantan by Sector, 1980 to 1988

Contan	19	80	19	88/ <u>1</u>	Average Annual
Sector	Employment (Persons)	Distri- bution(%)	Employment	Distri-	Growth
Agriculture, Forestry					
& Fishery	160,021	56.5	158,329	48.3	-0.1
Mining & Quarrying	254	0.1	174	0.1	-4.6
Manufacturing	19,471	6.9	23,954	7.3	2.6
Construction	11,513	4.1	26,607	8.1	11.0
Utility	800	0.3	848	0.3	0.7
Transport, Restaurants			•		
& Storage		2.9	15,772	4.8	8.3
Wholesale & Retail	and the second s	10.9		9.9	0.6
Banks, Insurance & Real Estates	1,538	0.6	2,363	0.7	5.5
Government Services	•	14.2		17.6	4.4
Other Services	9,800	3.5		2.9	-0.2
Total	283,295	100.0	327,659	100.0	1.8

Note : /1 = Estimate Sources : 5th Malaysia Plan for Kelantan and JICA

Table IV.2.5 GDP of Kelantan by Sector, 1980 to 1988

(at 1988 prices)

Sector -				8/ <u>1</u>	Average
	Amount (M\$ Million)	% Dist.	Amount (M\$ Million)	% Dist.	Growth
Agriculture, Forestry					
& Fishery	616.2	36.9	772.3	28.8	2.9
Mining & Quarrying	24.1	1.4		1.0	1.1
Manufacturing	77.6	4.6	120.9	4.5	5.7
Construction	58.6	3.6	146.7		12.2
Utility	45.0	2.7	63.7	2.4	4.4
Transport; Restaurants					717
& Storage	110.8	6.7	273.3	10.2	11.9
Wholesale & Retail	172.6	10.3	217.2	8.1	2.9
Banks, Insurance					213
& Real Estates	190.0	11.4	334.0	12.4	7.3
Government Services	336.6	20.2	677.9		9.1
Other Services	37.1	2.2	52.0	1.9	4.3
Total	1,668.6	100.0	2,684.4	100.0	6.1
Population (1,000)	893.8		1.091.8		2.5
Per Capita GDP (M\$)	1,866.9		2.458.7		3.5

Sources: 5th Malaysia Plan for Kelantan and JICA

Note: The figures for 1988 are estimates. This table is made based on Table Biii-37 in the 5th Malaysian Plan for Kelantan. The base year of prices has been changed from 1970 to 1988.

Table IV.2.6 Annual Rate of Price Rise, 1980 to 1988

(Unit: %)

Year	GDP Deflator	<b>(</b> P	Consumer Pr eninsular Ma	
1980	6.9		6.7	
1981	1.1		9.7	
1982	2.5		5.8	
1983	4.6	e Notes	3.7	
1984	6.1		3.9	i y <sup>err</sup> e e
1985	-1.5	•	0.3	
1986	-9.4		0.7	• .
1987	3.6	•	1.5	1.4
1988	0.3			·
Average	1.6		4.0	

Sources: Economic Report 1987/88 and Fifth Malaysia Plan 1986-1990

Table VI.2.7 Fifth Plan Allocations, 1986 - 1990

		Plan Nlocation	Fifth Revised Al	
			~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	
	_	Kelantan	Malaysia	
	~~~~~~~			
A. Economic	23,548	2,388	15,280	1,123
Agriculture and Rural		1,499	6,458	808
Development	10,500	3,700	0,400	000
Mineral Resources	48	n.a.	45	0
Development	10	11144	73	v
Commerce and Industry	3,239	177	1,678	70
Transport	4.522	441	2,850	157
Communications	134	3.	815	0
Energy and Public Utilities		267	3,001	87
Feasibility Study	54	0.1	33	0.4
Research and Development	400	n.a.	400	0
				-
B. Social	9,035	570	6,379	344
Education and Training		402	4,453	282
Health and Population	_	36	464	27
Information and Broadcastin	g 52	n.a.	25	0
Hoùsing	1,980	104	1,026	24
Sewerage	n.a.	n.a.	n.a.	n.a.
Culture, Youth and Sports	216	7	124	0.4
Local and Town Council,	237	15	170	7
Welfare and Community Sys	tem			
Village and Community Development	252	6	114 -	33
Purchase of Land	n.a.	n.a.	3	0
C. Security	4,704	<u>155</u>	2,288	76
Defense	2,803	82	1,210	15
Internal Security	1,901	73	1,078	61
D. Administration	2,788	48	1,035	<u>71</u>
Total	40,075	3,161	24,982	1,614
Kelantan / Malaysia (%)		7.9		6.9

Note : /1 = Revised allocations as of 1987 Source : Kelantan Development Statistics, 1987

Table IV.2.8 Land Use, Kelantan 1966 to 1988

(Unit: ha)

Item	1966	1974	1981	1988	
1. Urban and Associated Are	eas 3,292	3,601	4,593	5,365	( 0.4%)
2. Agricultural Land	212,055	258,904	280,755	320,593	(21.3%)
1) Horticulture	32,930	34,687	35,115	36,183	(2.4%)
2) Permanent Crops	99,674	144,913	166,540	200,194	(13.3%)
(1) Rubber	91,285	130,652	142,209	129,413	(8.6%)
(2) Oil Palm	497	5,302	15,362	61,261	(4.1%)
(3) Other Permanent (	rops 7,892	8,959	8,969	9,520	( 0.6%)
3) Cropland		79,304	78,772	80,028	(5.3%)
(1) Paddy	76,871	75,849	75,626	71,248	( 4.7%)
(2) Other Annual Crop	s 2,580	3,455	3,146	8,780	( 0.6%)
4) Pasture Reserves	0			4,178	
3. Grasslands	27,593	18,812	18,116	17,446	( 1.2%)
4. Swamps	26,404	26,166	25,503	25,093	(1.7%)
5. Forest	1,215,961	1,179,819	1,158,466	1,119,076	(74.4%)
6. Unsused Land	6,392	1,890	1,871	1,852	( 0.1%)
7. Unclassified Land	12,312	14,817	14,705	14,594	( 1.0%)
Total	1,504,009	1,504,009	1,504,009	1,504,009	( 100%)
		6.4.3			

Source : Department of Agriculture, KADA, RISDA, FELCRA, KESEDAR, SEPU & JICA

Table IV.3.1 Negative Socio-eonomic Impact

Assumed  Dam Scheme Crest Scheme Crest Scheme Crest Scheme Crest Scheme Crest Scheme Crest  (m) Dabong 80.0 40 1,400 9.850 11,230 7,400 37,200 71.0 40 540 6,090 6,030 6,100 30,700 62.0 40 390 5,580 4,110 4,800 24,100 82.0 40 390 5,580 4,570 140 700 82.3 - 2,120 1,180 2,290 90 450 144.0 - 1,160 2,990 6,600 1,295 6,510 77.7 - 5,80 1,60 3,760 1,200 6,040 77.7 - 560 1,60 3,760 1,200 6,040 77.7 - 560 1,60 3,760 1,000 5,030 Lower Pergau 50.0 10 150 1,420 620 1,050 5,280			Agricultu	itural land	and (ha)	1 4 1 1 1 1	 	166 TOK	ricultural	items	1 1 1 1	1 1 2 1 1 1
Elevation Paddy Palm Rubber Forest Houses (m)  80.0 40 1,400 9,850 11,230 7,400 71.0 40 5,090 6,030 6,100 71.0 40 390 5,580 4,110 4,800 91.1 11,840 5,290 8,600 165 76.7 - 5,350 2,880 4,570 140 62.3 - 2,120 1,180 2,290 640 144.0 - 1,160 2,990 6,600 1,295 77.7 - 560 1,600 3,780 1,000 73.4 - 180 790 1,910 1,000			† 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	t 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 2 2 1 1 1 2 1 1 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Road (Km)	
Elevation Paddy Palm Rubber Forest Houses (m)  80.0	Dam	ASSUMED Dam		٠.	•					Publi	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	t t ; ; ; t
80.0 40 1,400 9,850 11,230 7,400 37,20 71.0 40 540 6,090 6,030 6,100 30,70 62.0 40 390 5,580 4,110 4,800 24,10 76.7 - 5,350 2,880 4,570 140 70 62.3 - 2,120 1,180 2,290 90 4,57 114.0 13,900 640 3,22 114.0 1,160 2,990 6,600 1,295 6,51 77.7 - 560 1,660 3,780 1,200 6,04 73.4 - 180 790 1,910 1,000 5,03		Crest Elevation (m)	Paddy		Rubber	Forest (ha)	S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Population	Rail Kay (Km)		Rough.	E 0
71.0 40 540 6,030 6,100 30,70  71.0 40 390 5,580 4,110 4,800 24,10  76.7 - 5,350 2,880 4,570 140  76.3 - 2,120 1,180 2,290 90  144.0 13,900 640 3,22  114.0 1,600 320 1,61  82.0 - 1,160 2,990 6,600 1,295 6,51  77.7 - 560 1,60 3,780 1,200 6,04  73.4 - 180 790 1,910 1,000 5,03		1		6	L C	, N		7 20	· · · · · · · · · · · · · · · · · · ·	r.	, <del>,</del> ,	7
62.0 40 390 5,580 4,110 4,800 24,10 76.7 - 5,350 2,880 4,570 140 70 62.3 - 2,120 1,180 2,290 640 3,22 144.0 13,900 640 3,22 119.0 - 1,160 2,990 6,600 1,295 6,51 77.7 - 560 1,660 3,780 1,200 6,04 73.4 - 180 790 1,910 1,000 5,03	n 5 2 8	: -	9 0	540	00	רא ל	0 4	0.70		- 77	23	) M
91.1 11,840 5,290 8,600 165 83 76.7 - 5,350 2,880 4,570 140 70 62.3 - 2,120 1,180 2,290 90 45 144.0 13,900 640 3,22 144.0 1,600 320 1,61 119.0 - 1,160 2,990 6,600 1,295 6,51 77.7 - 560 1,660 3,780 1,200 6,04 73.4 - 180 790 1,910 1,000 5,03		62.0	0.7	390	. KO	-	80	4,10	3.0	26	14	30
iri 169.0 - 2,120 1,180 2,290 90 45  iri 169.0 13,900 640 3,22  144.0 1,160 2,990 6,600 1,295 6,51  77.7 - 560 1,660 3,780 1,200 6,04  73.4 - 180 790 1,910 1,000 5,03	Lebir	91.1		11,840	5,290	•	165	830	,	ľ		so O
iri 169.0 13,900 640 3,22 144.0 6,100 510 2,57 119.0 1,160 2,990 6,600 1,295 6,51 77.7 - 560 1,660 3,780 1,200 6,04 73.4 - 180 790 1,910 1,000 5,03		7.97	1	٠,	2,880	-	140	200	,		ı	-7
iri 169.0 13,900 640 3,22 144.0 6,100 510 2,57 119.0 - 1,160 2,990 6,600 1,295 6,51 77.7 - 560 1,660 3,780 1,200 6,04 73.4 - 180 790 1,910 1,000 5,03 Pergau 50.0 10 150 1,420 620 1,050 5,28		62.3	,	-	1,180		0.6	450	•		1	17
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u 82.0 - 1,160 2,990 6,600 1,295 6,51 77.7 - 560 1,660 3,780 1,200 6,04 73.4 - 180 790 1,910 1,000 5,03 pergau 50.0 10 150 1,420 620 1,050 5,28		144.0	•	•	•	6,100	510	,57	,	•	1,2	
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77.7 - 560 1,660 3,780 1,200 6,04 73.4 - 180 790 1,910 1,000 5,03 Pergau 50.0 10 150 1,420 620 1,050 5,28	Кешири	82.0		<b>4</b> 0	2,990	,60	1,295	ιν ←	28 2/	•	30	21
73.4 - 180 790 1,910 1,000 5,03 Pergau 50.0 10 150 1,420 620 1,050 5,28		7.77	•	9	1,660	, 78	•	0.4	M		2	6 6
Pergau 50.0 10 150 1,420 620 1,050 5,28		73.4	Ī	00	290	,91	-	03	1,6		٥	່ເດ
		50.0	10	K)	, 42	N	50,	, 28	1	20	10	ω

Note: 1/ New route for the submerged porition 2/ Shifting the railway track to the higher elevation

Table IV.3.2 Population Forecast, Kelantan (1/3)

	0 1		2661.	2000	2005	2010
			1	• • • • • • • • • • • • • • • • • • •		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
State of Kelantan	1,091,756	1,146,997	1,297,727	1,468,255	1,661,197	1,879,488
Bachock	90,549	96	σ	~	277 661	
Reklam		7 00	, 6	, ,	1	•
	1 0	704	0,0	0	ò	œ.
	17,322	. 95	, 56	1,2	2,94	4,
Gunong Barat	8,663	,94	,67	4	1,15	H
Perupok	15,143	5,51	6,44	7.3	8.23	Ġ
Repek	11,214	,54	,36	13,196	4.01	, 4
Mentuan	18,395	Q,	1,7	4,42	28	30,315
Telong	5,632	13	,56	4	1.35	ัก
Tanjong Pauh	6,460	, 73	,45	8,218	9,016	တ်
Kota Bharu	357,995	9,38	37,72	03,38	6.82	53
MPKB	224,719	239,191	8,79	3,56	3.79	
Banggu	16,131	7,06	56	2.35	5.41	28
Beta	8,524	,87	79	,76	76	
Kadok	14,962	,68	58	9,62	1,81	
Limbat	7,001	, 22	79	8,37	8,96	
Pangkal Kalong	31,759	4,46	2,15	1,33	2,23	
Pendek	13,133	13,755	15,399	17,166	19,047	21,023
Peringat	16,623	7,16	8,54	76.6	1,35	
Salor	9,985	, 25	10,914	1,57	2,21	
Sering	15,158	5,72	7,17	8,68	0,22	21,782
Z	060 73	Ų	•		Č	1
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Labok	9,749	χ. Q	0,24	ດຸນ	0,82	e e
Panyit		8,90	,28	, 64	97	10,256
Pulai Chondong	11,777	12,014	12,590	13,138	13,646	4
Tanah Merah	8,512	8,584	74.	8	.95	8,988

Table IV.3.2 Population Forecast, Kelantan (2/3)

				1	;	
Administrative Division	1988	1990	1995	2000	2005	2010
Temangan	5,531	5,579	5,685	5,768	5,826	5,854
Ulu Sat	23,614	24,714	27,615	30,724	34,025	37,482
Pasir Mas	142,867	147,734	160,275	173,269	186,601	200,058
Alor Pasir	8,169	8,406	9,005	9,605	10,198	10,771
Bunut Susu	12,295	12,589	13,319	14,030	14,711	15,344
Chetok	12,423	12,762	13,614	14,460	15,289	16,081
Gual Periok	vo.	9,745	9,976	10,170	10,319	10,415
Kangkong	~~	15,520	16,455	17,371	18,253	19,079
Kuala Lemal	9,362	9,715	10,626	11,573	12,546	13,529
Kubang Gadong	19,807	20,560	22,506	24,531	26,615	28,724
Kubang Sepat	11,911	12,313	13,341	14,393	15,457	16,512
Pasir Mas	23,145	23,992	26,173	28,430	30,740	33,063
Rantau Panjang	120,968	22,132	25,260	28,706	32,473	36,540
rosed rotting	325	98,180	104.866	111.601	118,300	124,822
Ratu Sebutir	-3	9,589		10,135	10,349	10,512
Bukit Abal	9,618	9,750	10,060	10,336	10,570	10,752
Bukit Awang	7.887	8,100	8,634	9,164	9,682	10,175
Bukit Jawa	18,258	18,721	19,875	21,010	22,108	23,140
	8,078	8,226	8,582	8,914	9,217	9,480
Jeram	8,124	8,329	8,838	9,338	9,820	10,273
Limbongan	15,641	16,182	17,569	18,993	20,439	21,879
Semerak	18,465	19,283	21,429	23,711	26,115	28,611
Tanah Merah	79,942	84,044	95,126	107,448	121,093	136,080
Kusial	33,719	35,175	38,987	43,026	47,265	51,648
Jedok	120,027	21,713	26,502	32,207	38,961	46,882
Ulu Kusial	נא	210,158	21,774	23,417	25,069	26,696
Sokor	ω	6,998	7,863	8,798	9,798	10,854
	. 1   1   2   5   1   5   1   5   1   1   5   1   1				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	

Table IV.3.2 Population Forecast, Kelantan (3/3)

Administrative Division	1988	0661	1995	2000	2005	2010
			9			
Jell	3/,120	41,169	53,360	69,1/8	89,654	116,035
Jeli	19,858	22,240	29,437	38,795	50,894	66,414
Belimbing	7,586	8,678	12,112	16,834	23,288	32,046
Kuala Balah	9,676	10,251	11,811	13,549	15,472	17,575
	1:				25-	: :
Tumpat	104,492	108,230	117,979	128,257	139,009	150,747
Jal Resar	098'6	10,188	11,025	11,880	12,742	13,595
Kebakat	11,539	11,987	13,148	14,358	15,609	16,879
Pengkalan Kubor	15,544	16,380	18,619	21,073	23,741	26,606
Sungai Pinang	14,763	15,077	15,849	16,589	17,284	17,913
Terbok	12,509	13,021	14,355	15,757	17,217	19,366
Tumpat	17,029	17,129	17,333	17,464	17,515	17,473
Wakaf Bharu	23,248	24,448	27,650	31,136	34,901	38,915
				"		
Gua Musang	28,198	31,020	39,626	51,028	66,154	86,179
Galas	16,039	18,337	25,556	35,463	48,985	67,306
Bertam		11,519	12,621	13,770	14,955	16,156
Ulu Lebir	1,066	1,164	1,449	1,795	2,214	2,717
Kuala Krai	87,127	93,583	111,706	132,988	157,870	186,752
Batu Mengkebang	53,820	57,233	66,555	77,063	88,819	101,828
Olak Jeram	23,330	25,723	32,744	41,503	52,362	65,714
Dabong	-9,977	10,627	12,407	14,422	16,689	19,210
						1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Sources : 5th Malaysia Plan for Kelantan and Population Census, 1970 and 1980

Kelantan	
Porecast	6 8 0 3 3 4 4 4
Density	5
Population	1) 1) 11 11 11 1
TE TV 3.3	
Table	1

			, 120000 10 to	(-1+) manuara	(Unit :	persons/km2)
Administrative Division	1988	1990	1995	2000	2002	2010
		4				
State of Kelantan	72	76	86	76	110	125
			1			. A
Bachok	324	3	368	0	438	476
Beklam	323	327	337	346	353	359
Gunong Timor	300	-1	340	O.	398	429
Gunong Barat	454	S	507	4	585	624
Perupok	871	g	976	O	1,049	1,096
Repek	172	~	299	$\dashv$	339	358
Mentuan	461	$\infty$	545	-	684	160
Telong	87	95	118	4	177	216
Tanjong Pauh	407	424	470	. <del>- 1</del>	568	521
	,					
Kota Bharu	688	4	$\infty$	S	1,433	O
MPKB	1,782	O	,21	,56	σ,	,4
Banggu	524	S	3	$\sim$	826	935
Beta	366	$\alpha$	0	9	206	551
Kadok	527	S	-4	O.	768	849
Limbat	907.	ᆏ	S	ω	520	554
Pangkal Kalong	6.19	∾.	S	~	626	1,133
	585	H	$\alpha$	O	849	938
Peringat	381	g	N	S	490	522
Salor	459	471	501	532	561	589
Sering	665	ወ	ŝ	2	887	956
Machang	128	ਜਵ ਜ	663	4	157	165
Labok	105	107	-	-	117	119
Panyit	204	208	۳4	2	233	240
Pulai Chondong	235	240	251	262	272	282
Tanah Merah	182	184	$\omega$	Q.	192	193
	6			• • • • • • • • • • • • • • • • • • •	1 (	111111111111

( To be continued )

Table IV.3.3 Population Density Forecast, Kelantan (2/3)

	C.C.AT STORT	בסלמדים המוצדים	y rolecast,	Netantau (413)	(Unit : pe	persons/km2)
Administrative Division	1988	1990	1995	2000	2005	2010
reserved	78			00 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
Ulu Sat	103	108	120	134	148	164
Pasir Mas	221	228	248	268	289	310
Alor Pasir	220	226	242	258	274	290
Bunut Susu	324	332	351	370	388	405
Chetok	261	268	286	304	321	338
Gual Periok	81	82	84	88	87	Ø
Kangkong	136	139	147	156	164	171
Kuala Lemal	300	31.1	340	371	402	434
Kubang Gadong	351	364	399	435	472	209
Kubang Sepat	529	547	593	049	687	734
Pasir Mas	1,165	1,208	1,318	1,432	1,548	1,665
Rantau Panjang	128	135	154	175	198	224
				:.		
Pasir Puteh	224	230	246	10	277	~~
Batu Sebutir	219	222	229		240	
Bukit Abal	176	179	184	$\sim$	194	m
Bukit Awang	279	287	305	$\sim$ 1	343	·n
Bukit Jawa	237	243	258	·	287	r
Gong Datok	218	222	232	240	249	257
Jeram	152	156	166	_	184	C)1
Limbongan	884	91.5	666	~	1,156	"
Semerak	160	167	185	$\circ$	226	
Tanah Merah	100	0	119	134	151	170
Kusial	225	(1)	0	∞	-	ず
Jedok	100	108	m	161		235
Ulu Kusial	112	~1	2	234	144	n.
Sokor	24	25	28	31	35	4

( To be continued )

	Table IV.3.3 Pop	wlation Densi	ty Forecast,	Population Density Forecast, Kelantan (3/3)		noreone (Im2)
			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		. [	T SOURS I PURE
Administrative Division	1988	1990	1995	2000	2005	2010
Jeli	28	31	40	52	29	88
Jeli	. 49	17	95	125	164	215
Belimbing	24	28	39	54	76	104
Kuala Balah	13	71	16	19	21	25
Tumpat	576	597	650	707	766	832
Jal Resar	767	304	329	354	380	406
Kebakat	752	781	857	936	1,018	1,101
Pengkalan Kubor	618	651	740	838	944	1,058
Sungai Pinang	486	967	522	546	569	590
Terbok	467	487	537	589	644	724
Tumpat	689	693	701	107	709	707
Wakaf Bharu	910	957	1,082	1,219	1,366	1,524
Gua Musang	ო	m	7	ψ	ø	r-1 r-1
Galas	17	19	27	38	52	73
Bertam	2	2	ന	സ	m	4
Ulu Lebir						<b></b>
Kuala Krai	38	41	67	58	69	88
Batu Mengkebang	79	. 89	97	92	106	122
Olak Jeram	37	7	53	29	85	106
Dabong	12	12	មា H	17	20	23

Sources : 5th Malaysia Plan for Kelantan, Population Census, 1970 & 1980 and Agricultural Development

Table IV.3.4 GDP Forecast, Kelantan

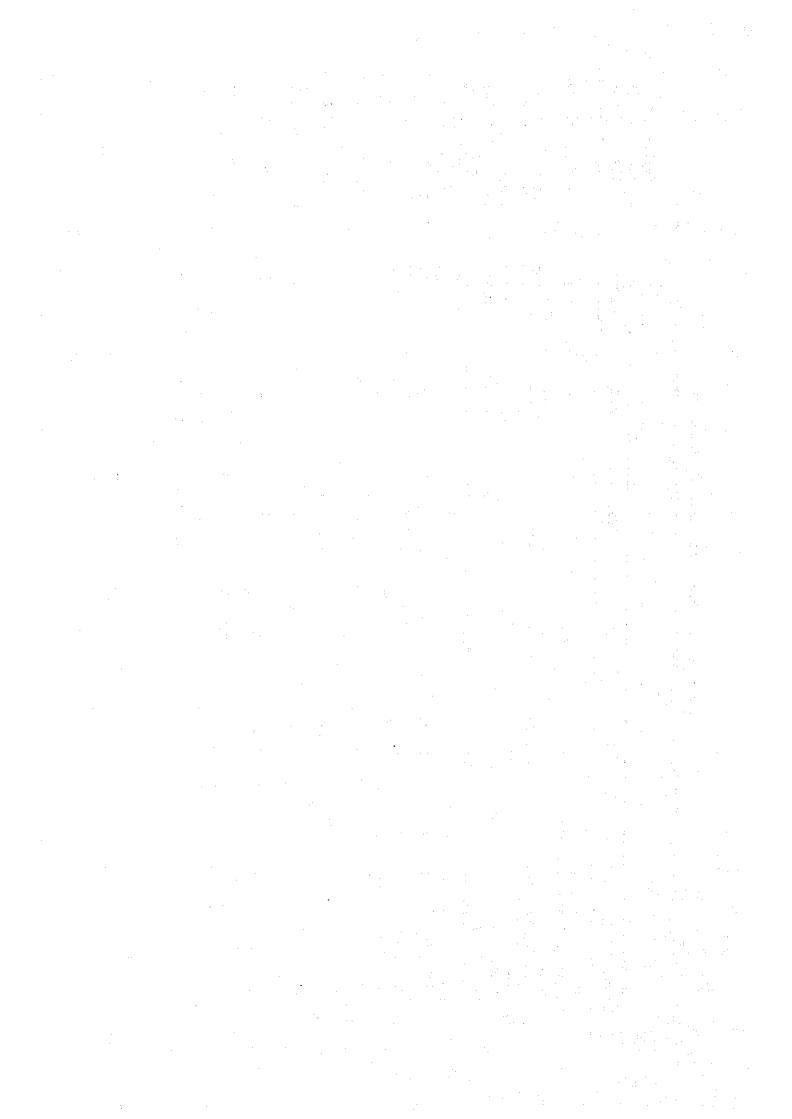
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	E P 1	1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	(Unit:	\$ million at 1	1988 prices)
Sector	1988	1990	1995	2000	2005	2010
Agriculture, Forestry & Fishery	772.3	808.2	1,039.3	1,330.5	1,696.7	2,154.0
Mining & Quarrying	26.4	26.8	34.2	43.7	55.5	70.2
Manufacturing	120.9	136.6	183.2	244.9	325.7	431.3
Construction	146.7	192.9	252.7	329.8	428.7	554.8
Utility	63.7	67.7	107.7	170.8	269.8	424.3
Transport, Restaurants & Storage	273.3	341.0	513.9	771.3	1,152.9	1,715.6
Wholesale & Retail	217.2	225.1	295.0	384.9	500.0	646.6
Banks, Insurance & Real Estates	334.0	376.7	532.0	748.6	1,048.5	1,461.9
Government Services	677.9	829.1	1,066.1	1,365.0	1,740.4	2,209.0
Other Services	52.0	55.9	71.8	92.0	117.4	149.1
Total	7.684.4	0 090 8	9	1. 0. 1.	i. C C	( (
Population (1000)	1,091.8	1,147.0	1,297.7	1,468.3	1,661.2	1.879.5
Per Capita GDP (MS)	2,458.7	2,667.8	3,156.3	3,733.2	4,415.8	5,223.1
						1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

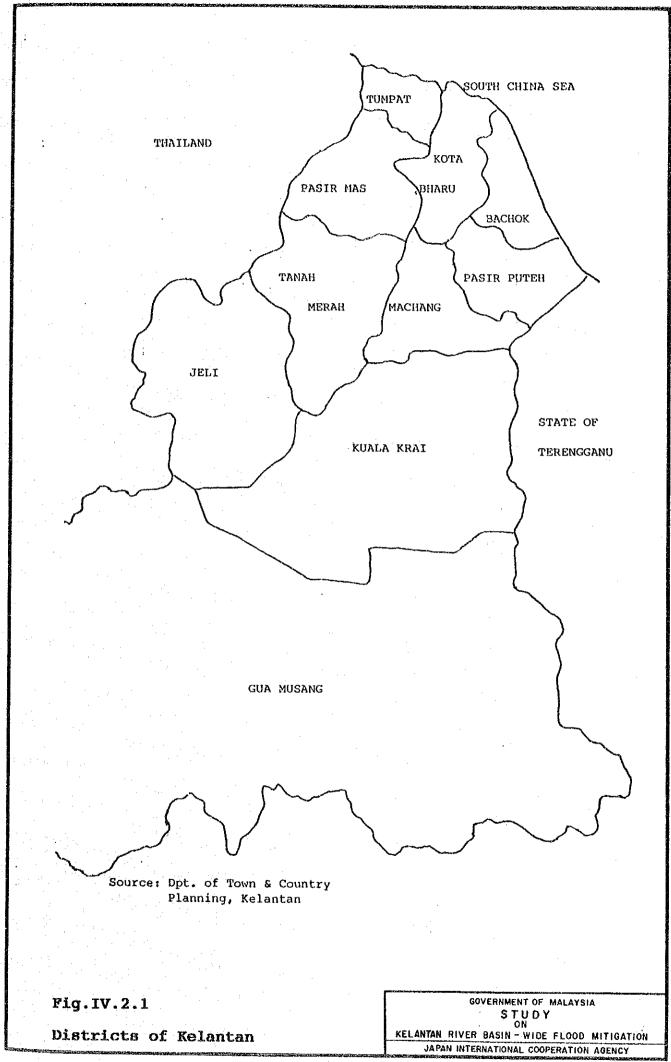
Sources : 5th Malaysia Plan for Kelantan and Kajian Pelan Struktur Kertas Tekknikai No.2 : Asas Ekonomi

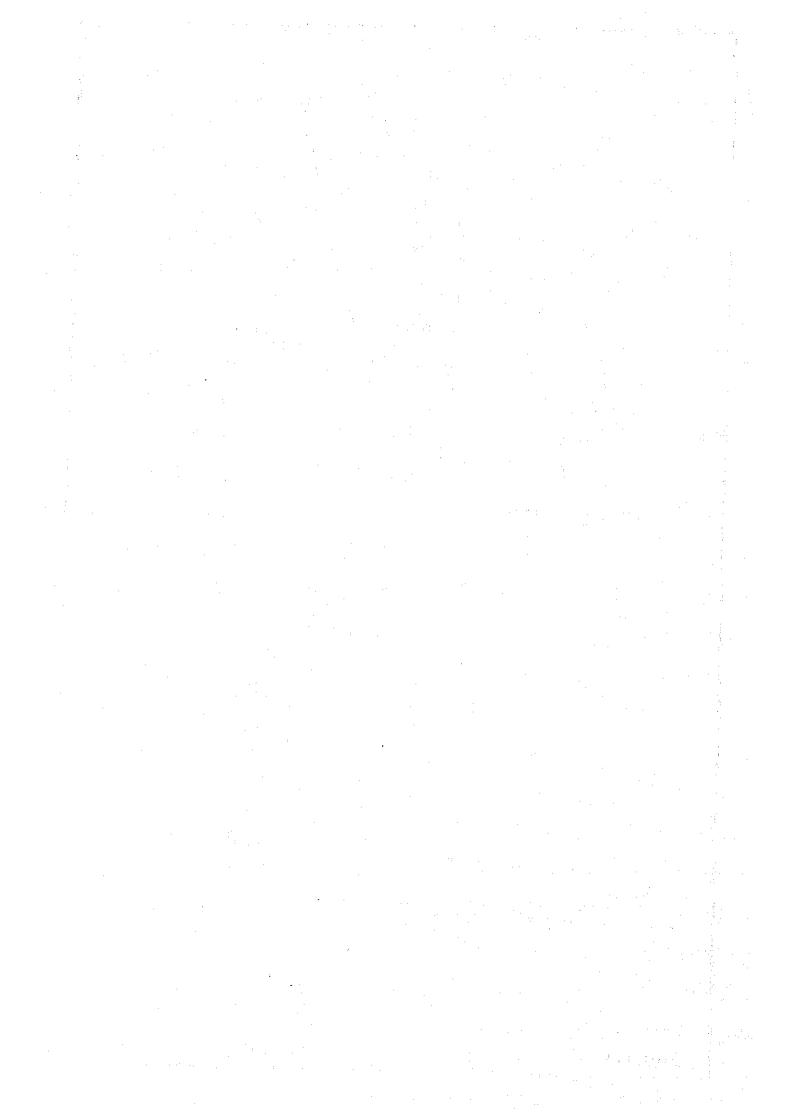
Table IV.3.5 Land Use Forecast, Kelantan

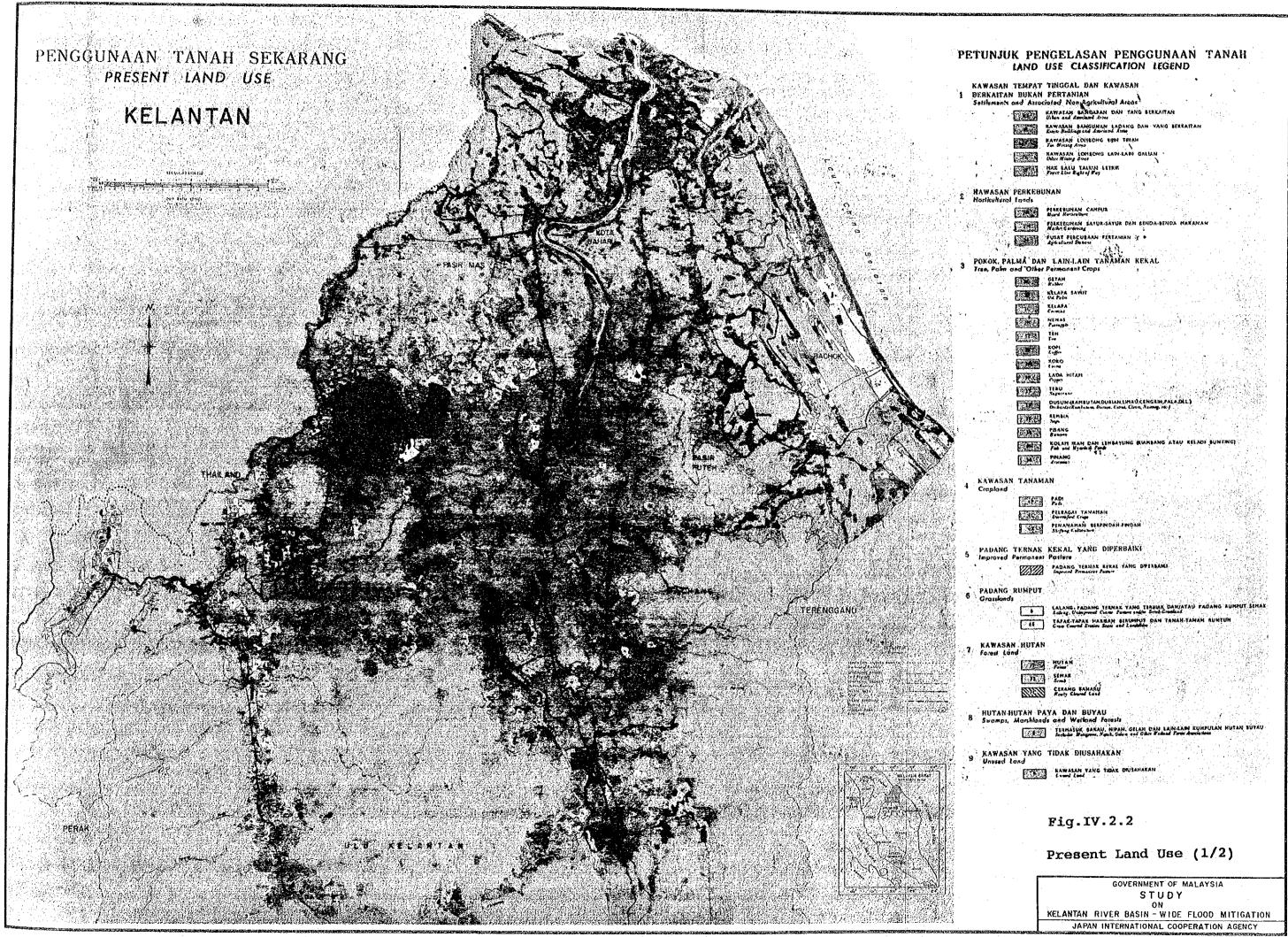
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Item	1988	1990	1995	2000	2005	2010	Z Dist.
1. Urban and Associated Areas	5,365	5,609	6,267	7,003	7,825	8,743	(0.62)
2. Agricultural Land	320,583	331,275	358.061	586 788	600 117	0	
1) Upland Crops	36 183	707 98	1000	7000	706.111	708, Tee	(25.62)
2) Perennial Crops	200,194	200,494	27,784	28,090	38,914	39,756	(2.62)
(1) Rubber	100,410	014,000	176,167	604,089	767,177	302,912	(20.22)
	-1	8T6, 161	136,419	141,417	146,416	151,416	(10.12)
(2) Other Demonstrate C	-	68,157	85,397	102,637	119,877	140,013	(9.32)
3) Annual Crops	9,520	9,684	10,105	10,545	11,004	11,483	(0.8%)
•	80,028	81,260	84,377	87,538	90,743	93,994	(6.32)
(T) Faddy	71,248	72,245	74,746	77,248	79,750	82,250	(5.52)
•	8,780	•	9,631	10,290	10,993	11,744	(0.82)
4) Fasture Reserves	4,178	4,262	4,479	4,708	4,948	5,200	(0.32)
3. Grasslands	17,446	17,259	16,801	16,354	15,920	15,498	(1.02)
4. Swamps	25,093	24,977	24,690	24,406	24,126	23,849	(1.62)
5. Forest	1,119,076	1,108,480	1,081,873	1,055,085	1,028,101	998,013	(66.32)
6. Unsused Land	1,852	1,847	1,833	1,820	1,807	1,794	(0.12)
7. Unclassified Land	14,594	14,562	14,484	14,406	14,328	14,250	(1.02)
Total	1,504,009	1,504,009	1,504,009	1,504,009	1,504,009	1,504.009	(100.02)

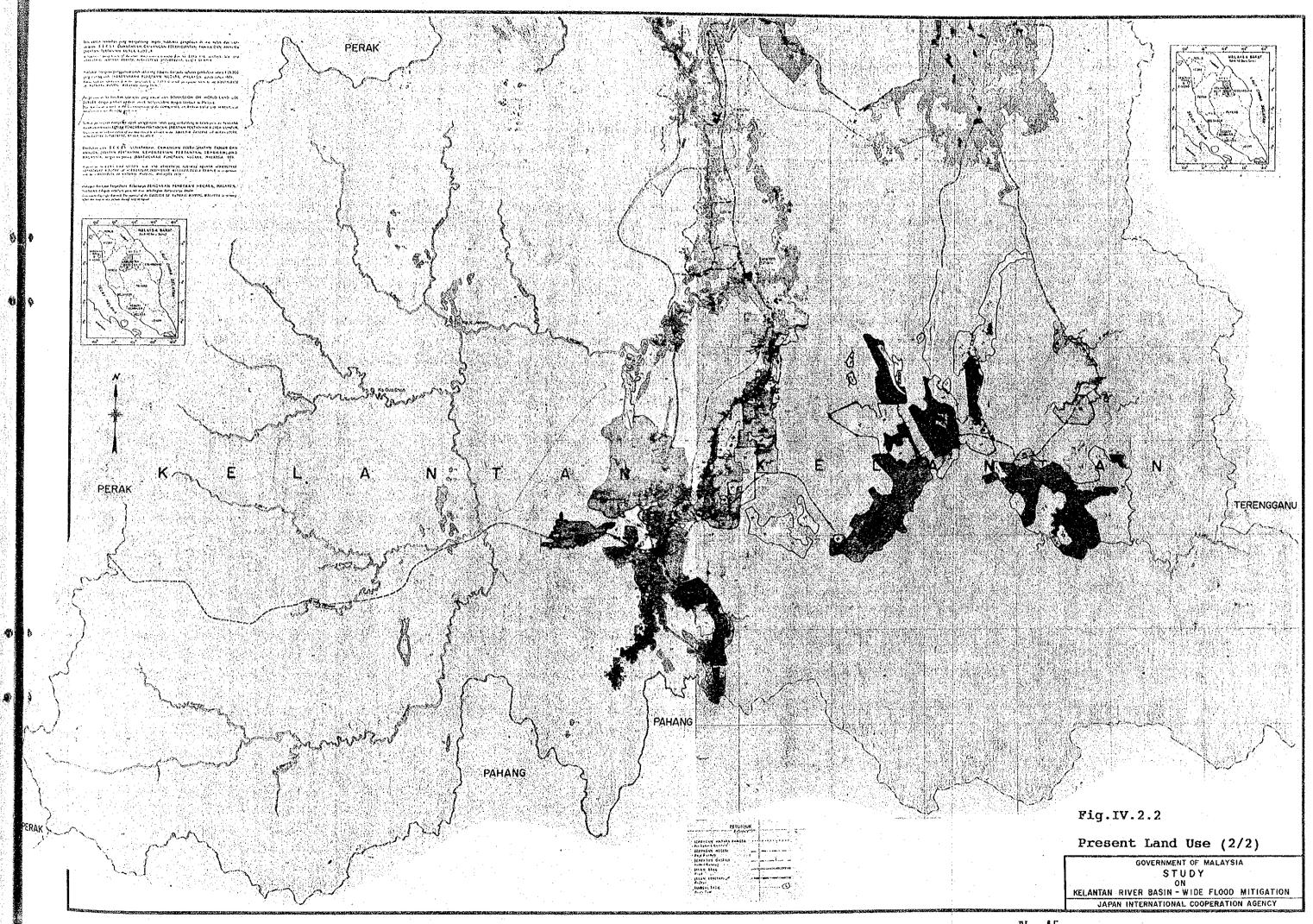
Sources : Fifth Malaysia Plan 1986 - 1990 for Kelantan (SEPU), KADA, RISDA & JICA

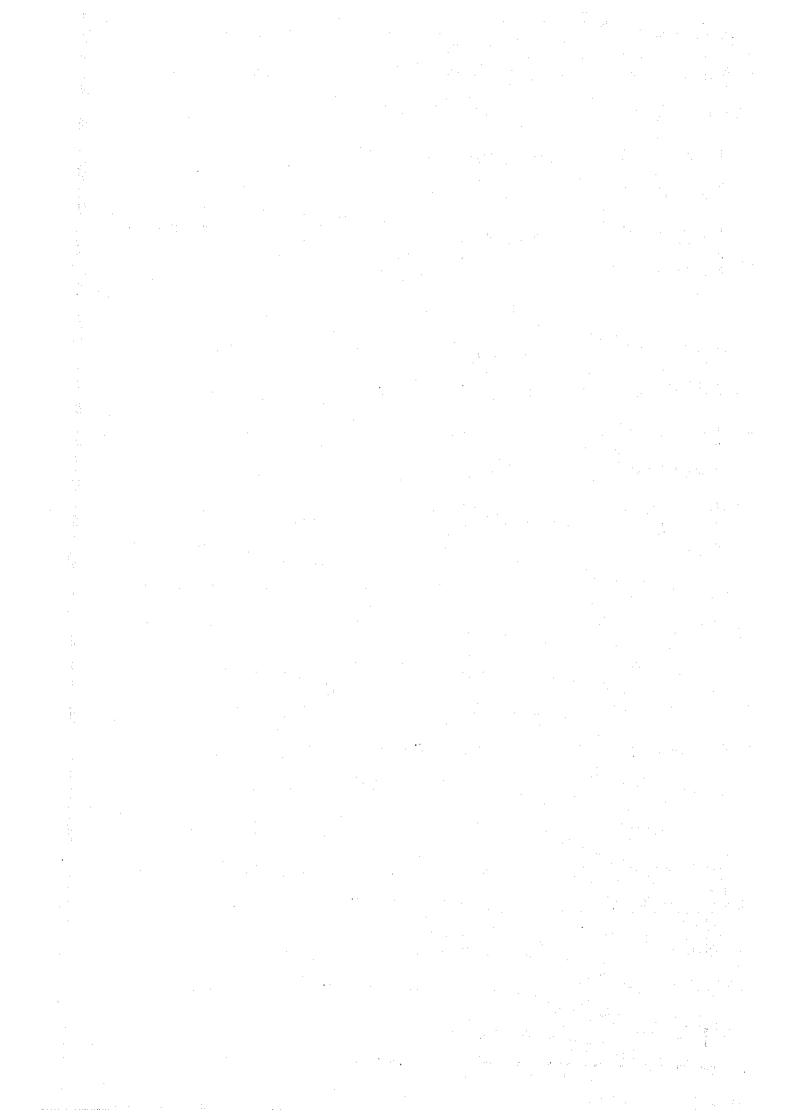


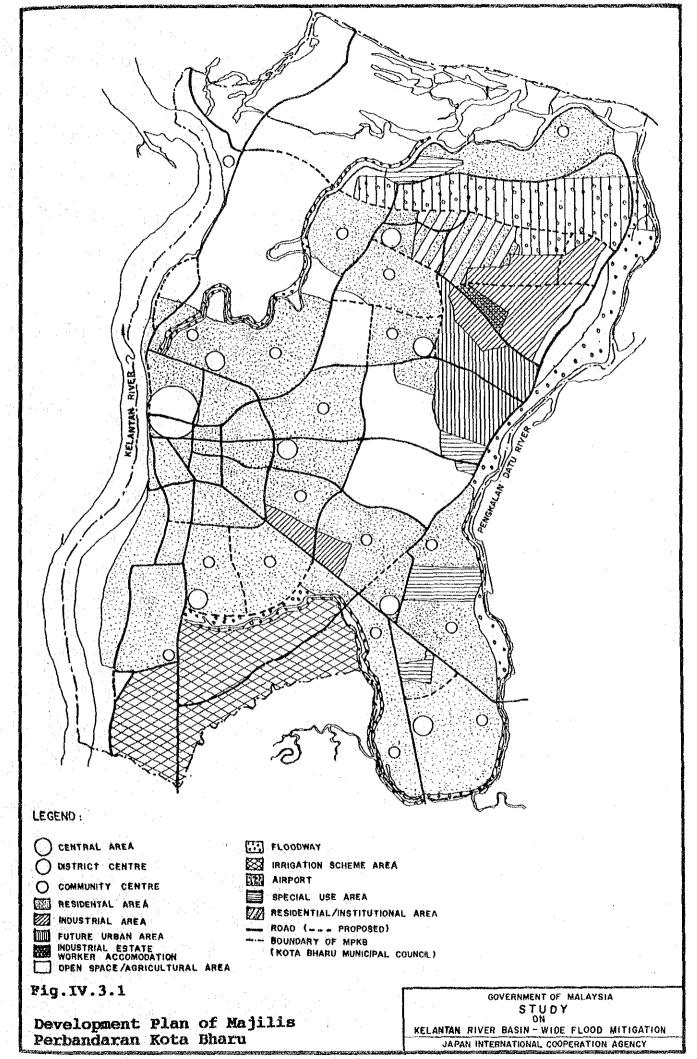




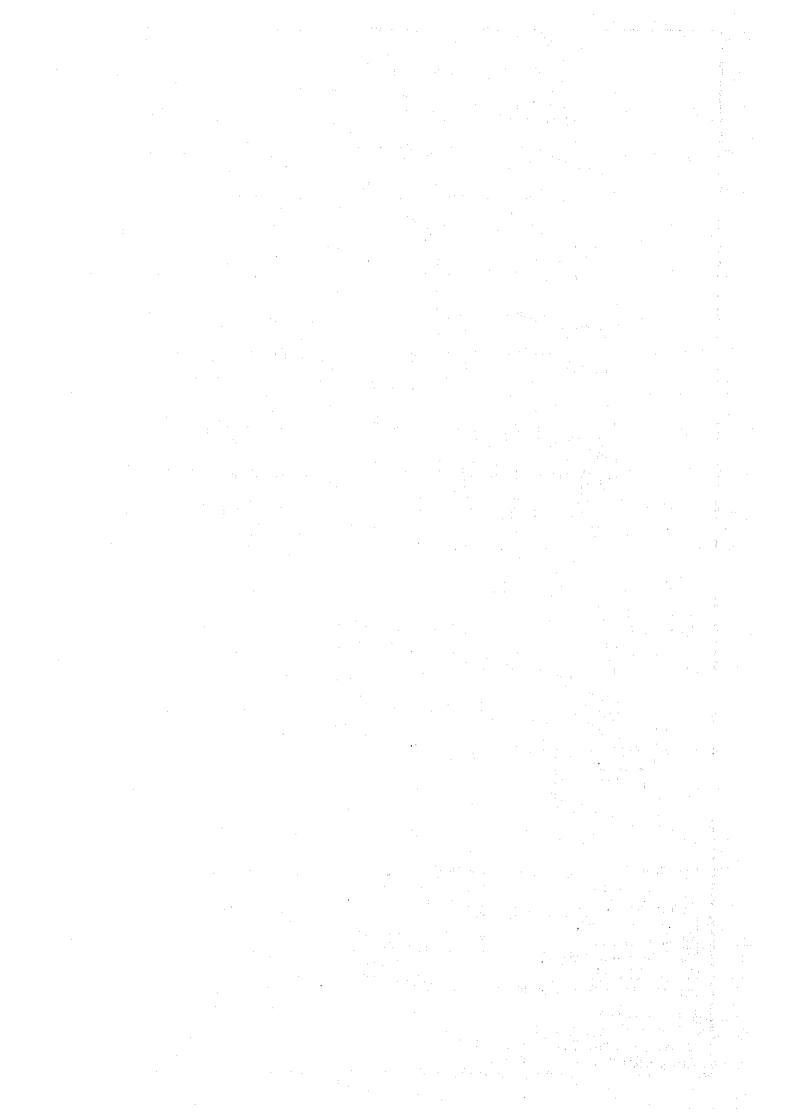








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# ANNEX V

# FLOOD DAMAGE STUDY

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## V. FLOOD DAMAGE STUDY

## 1. INTRODUCTION

The Kelantan River basin is characterized as the basin with ample rainfall of about 2,700 mm a year. The northeast monsoon prevailing in the period of November to January brings about 50% of average annual rainfall. This downpour of rain in this period causes habitual flooding in the downstream areas of the Kelantan River, resulting in suffering from flood damages.

Especially, rainstorms occurred in January, 1967 caused an overflow of the Kelantan and its adjacent rivers including tributaries, resulting in inundation of the entire coastal area of the Kelantan State. According to the Flood Report of January 1967 flood, the inundation area spreads over 3,000 km² which is equivalent to 20% of the Kelantan State area. Inhabitants of 537,000, 85% of state population of 637,000, including the evacuated persons of 125,000 suffered from flooding, and damages were estimated to be a historical maximum.

The flood damage study aims at estimating the damages for probable floods based on the past floods with various scales. DID carries out the survey for each large flood, the results of which are compiled in a book with a title of Flood Report. Flood Report of Jan. 1967 flood (1967-flood) discusses a considerably detailed survey for the inundation area of 1967-flood with a recurrence interval of some 50 years compared with others. The delineation of inundation area for probable floods caused by an overflow of the Kelantan River and its tributaries is therefore based on 1967-flood as well as recent floods of Dec. 1983 (1983-flood) and Nov. Dec. 1986 (1986-flood) with the recurrence intervals of some 13 and 3 years, respectively.

The procedure to estimate damages for probable floods is discussed as follows:

- The extent of inundation area of floods in 1967, 1983 and 1986 is first of all confirmed with topographic maps and hearing at sites. The study area in this flood damage study defined as the probable inundation area is delineated based on the inundation area of 1967-flood.
- The properties in the probable inundation area are estimated by counting the number and value of various assets. The number and unit value of assets as well as the increase rate of assets in future are based on the results of socio-economic studies. The damage rate, which shows a relationship between degree of damages, and depth and duration of flooding, is referred to past studies.
- Probable flood damages are assessed by multiplying the damage rate by the value of assets in the inundation areas of probable floods.

The probable damages so estimated are classified into agricultural, non-agricultural and indirect damages. The topographic maps with a scale of 1 to 50,000 and 1 to 25,000 as well as photomaps with a scale of 1 to 6,336 are used for this flood damage study. A general work flow of this flood damage study is depicted in Fig. V.1.1.

#### 2. EXISTING RECORDS ON PAST LARGE FLOODS

The records on past large floods are compiled in the Flood Reports including the information on the magnitude of flood, delineation of inundation areas, quantified damages and so on. The preparation of Flood Report was commenced in 1966. A severe flood with a recurrence interval of 50 years hit the downstream areas of the Kelantan River in January 1967. The record of this flood is compiled in the second Flood Report. Since 1966, the Flood Report is compiled whenever damages due to the inundation from the Kelantan and other rivers occur in the lowland areas of the Kelantan State.

Table V.2.1 shows a list of Flood Reports prepared by DID as well as annual maximum discharge recorded at Guillemard Bridge. Records of 1967-flood, which is the largest among the floods with Flood Report, are discussed by focussing in area-depth-duration and flood damages.

#### 2.1 Area-depth-duration Relationship

The inundation of 1967-flood caused by the overflow from the Kelantan and adjacent rivers such as Golok, Kemasin and Semerak including their tributaries spreaded over all the Districts of the Kelantan State. Fig.V.2.1 delineates the inundation area in 1967-flood, while Table V.2.2 shows that all the districts of North Kelantan were almost flooded.

Flood water of the Kelantan River staying at the bankful stage overflowed at the beginning of January, 1967 and inundated nearly the entire coastal plain including such major towns as Kuala Krai, Pasir Mas and Kota Bharu. The inundation depth was generally 2 to 3 m at Kuala Krai, 0.8 to 1.2 m at Pasir Mas and 0.5 to 1.0 m at Kota Bharu. The durations of inundation were generally 2 to 3 days at Kuala Krai, 2 to 3 days at Pasir Mas and 4 to 5 days at Kota Bharu, but it lasted for 1 to 2 weeks in the lower area of the coastal region.

The Golok River and its tributaries were already in spate condition since December 1966, and river water partly overflowed the river bank. At the beginning of January 1967, river water of the Golok River overflowed its bank along its entire stretches and the inundation depth reached 1.5 m at Rantau Panjang and 4.3 m at Kuala Jambu. Overtopped flood water flowed down to the South China Sea, inundating the coastal region.

On the right bank of the Kelantan River, river water overspilled its banks almost along the entire river stretches from Kg. Mata Ayer down to the coast and eventually flood water flowed over the Kemasin River basin. The outflow from the Kelantan River caused severe losses to crops, livestocks and properties, especially in the Bachok District. Inundation depth was generally 0.5 to 3.0 m and the duration of inundation was generally 1 week in the Kemasin River basin.

The flood of the Semerak River basin was caused by heavy precipitation at the beginning of January 1967. Inundation depth was generally 0.5 to 3.0 m and the flood lasted about 1 week.

Table V.2.3 summarizes the information on flood water level, water depth, duration of inundation, cause of flooding and so on at various places mentioned in the Flood Report of 1967-flood. On the other hand, Tables V.2.4 and V.2.5 show the summary of 1983 and 1986 floods. 1983-flood is the second largest since 1965.

## 2.2 Actual Flood Damage Records

The large magnitude flood in January 1967 caused serious flood damage in the downstream plain area of the Kelantan River basin. The flood damages exert not only to the destruction of houses, losses of properties, damages to agricultural products and social infrastructures, but also to the loss of lives especially in the riparian areas.

The damaged paddy area caused by this flood was approximately 77,500 ha which is about 26% of the total inundation area of 298,000 ha. About 537,000 persons were affected by the flood, of which 125,000 persons were forced to evacuate from the lowland area and death toll went up to 38 persons in total. The flood damage of 1967-flood was M\$ 30 million in total in the Kelantan State at 1967 price level. Among them, the damage to agricultural crops was estimated at around M\$14 million.

The breakdown of the flood damage due to 1967-flood as well as 1983 and 1986-floods is shown in Table V.2.6. In this table, the flood damage for non-agriculture in 1967-flood consisting of house/building, public facilities like roads, bridges and so on amounts to about M\$2 million. However, the damage for house/building is estimated only for public facilities, but damage for common houses is not included. Furthermore, the damage for public building is not also estimated in 1983-flood. Fig. V.2.2 shows the comparison of flood damages between 1967-flood and floods in recent years. The records of flood damages given in Flood Reports are used as a reference in estimating probable flood damages discussed in subsequent Chapters.

#### 3. ESTIMATION OF PROBABLE INUNDATION AREA

The delineation of probable inundation area for the estimate of probable flood damages is based on the flood map for the 1967-flood referring to 1983-flood and 1986-flood. At first, accuracy of those maps is confirmed using 1 to 25,000 scale topographic maps newly contoured in this study and interviews at sites. In case that some discrepancies are found on the flood maps, correction is given.

The reasons why the flood maps of 1983-flood and 1986-flood as well as 1967-flood are selected for the estimate of the probable inundation area are as follows:

- (1) The delineation of probable inundation area requires the flood maps prepared for the floods with large, intermediate and small scales. 1967-flood corresponds to the large scale flood as given in Table V.2.1, whilst 1982, 1984 and 1986-flood for the small scale flood, and 1973, 1983-flood for the intermediate scale flood.
- (2) It was confirmed from the interview in the flood prone areas that the information for inundation depth, duration and so on of the floods with the small and intermediate scales is more fresh and accurate in the floods of recent years. Thus, 1986 and 1983-flood are selected as the one to represent the flood with the small and intermediate scales, respectively. On the other hand, local senior persons have strong memories on 1967-flood, which represents the flood with the large scale.
- (3) The flood maps for the 1967, 1983 and 1986-floods have a relatively high accuracy compared with others. Especially, the in-depth survey for the inundation areas was carried out for 1967-flood.
- (4) The hydrological study clarifies that the return periods of 1967, 1983 and 1986-flood correspond to once in 50, 13 and 3 years, respectively.

Following are taken into consideration for estimating the extent of probable inundation areas:

- Upstream areas of Kuala Krai in the Kelantan River

According to the Flood Report of 1967-flood, inundation took place even in the upstream areas of Kuala Krai (Ulu Kelantan), however, damages in these areas were as small as 1.0% of total damages. Due to this, these areas are excluded from the area to estimate flood damages in this study. Thus, damages for probable floods are estimated for the Kelantan River basin extended in the downstream reaches of Kuala Krai.

- The boundary between the Kelantan and Golok rivers

It can be presumed from the map for 1967-flood that flood water overflowed from the Kelantan River came up to the right bank of the Golok River. A boundary to divide the flood prone areas between the Kelantan and Golok rivers is however drawn using a railway running between Tanah Merah and Pasir Mas and a highway between Repek and Tumpat (refer to Fig. V.3.1).

- The boundary between the Kelantan and Semerak rivers

A low mountain running towards the north from Machang to Bukit Mak Lipah and a low ridge running towards the northeast from Gunong Timor to the coast through Jelawat show a divide between the Kelantan and Semerak river basins except a paddy area between Melor and Gunong Timor. A highway running between Melor and Jelawat through the paddy area is used as the boundary to divide the flood prone areas between the Kelantan and Semerak rivers based on the results of the interview at sites.

- The boundary between the Kelantan and Kemasin rivers

Overflow from the Kelantan River in 1967-flood swept over the entire Kemasin River basin. Thus, the entire Kemasin River basin is counted as the flood prone area of the Kelantan River.

Fig. V.3.1 prepared on basis of the assumptions and conditions mentioned above as well as the inundation map of 1967-flood (refer to Fig. V.2.1) delineates the maximum extent of inundation area for the 50-year probable flood caused by flooding of the Kelantan River; that is, this maximum extent of inundation area is defined as the survey area of the flood damage study.

Interviews for confirming the flood maps of 1967, 1983 and 1986-floods given in respective Flood Reports were carried out at 120 sites in the area delineated in Fig. V.3.1. Major items interviewed are water depth, duration of flooding and direction of water flow. Besides the site interviews, the delineation of inundation area for 1967, 1983 and 1986 floods will be discussed in subsequent Chapter 5.

#### 4. ESTIMATION PROCEDURE OF FLOOD DAMAGE VALUE

#### 4.1 General

Identification of assets in the inundation area is performed to obtain the basis to estimate flood damages. The increase of assets in future is projected based on the number and value of assets identified.

Since the number and value of assets in the inundation area have been surveyed and projected for the time period from present to year 2010 in Annex IV, Socio-economic Study, those estimated figures are applied in this study. On the other hand, the flood damage rate used in estimating the flood damage value of each asset is basically referred to the values actually applied in the past studies of Malaysia (refer to References 2, 3 and 4). The value of assets is expressed by the price in year 1988.

The evaluation of assets necessary for estimating probable flood damages discussed in the subsequent Chapter 5 is carried out by the following procedure:

- Identification of urban and rural areas in the probable inundation area divided by river stretch
- Identification of assets in the probable inundation area
  - Estimation of asset distribution
  - Preliminary study of socio-economic condition in the probable inundation area
  - Estimation of present and future unit value of assets, and damage rate.

# 4.2 Identification of Urban and Rural Areas in the Probable Inundation Area Divided by River Stretch

Four major towns of Kota Bharu, Pasir Mas, Tanah Merah and Kuala Krai are developed at the riverside in the downstream reaches of the Kelantan River, i.e. in the study area. Subdistricts (Daerah) where those four towns are located including neighbouring sub-districts are relatively well populated. These four populated areas are thus defined as the urban areas in this study, while the remaining parts in the study area are called the rural areas.

Considering the location of four major towns mentioned above and the place of tributaries flowing into the Kelantan River, a 100 km long river stretch of the Kelantan River from Kuala Krai to the estuary is divided into twelve sections, which are named KL1, KL2,..., KL12 toward the upstream reaches from the estuary as shown in Fig. V.4.1.

The sections so divided into twelve will be the base for the estimate of flood damages, and the flood damages estimated by