

5.3.3 Policies on Regional Economic Development

Future socio-economic development can bring about the following:

- 1) Inducement of too many modern industries will make little contribution to the regional economy because they will not absorb much from the local market, employ only a small number of highly skilled workers and sell their products mainly outside the Study Area.
- 2) The manpower demand for technical and skilled staff accompanying industrial development and need for additional estate labourers maintaining maturing trees will necessitate immigration from elsewhere. In this regard, Terengganu people should be given opportunities to participate in the new jobs through vocational retraining, education and other measures.
- 3) Generally the traditional sector is subject to enjoying only small economic benefit from the projects derived from the context of the regional or the national economic development. Out-flow of labour forces from this sector might create an adverse effect unless directed into agro-base industries.
- 4) Environmental problems will occur and become serious unless attention is properly paid by management for the control of projects.

Taking into account the above issues, the following policies should be undertaken in order to accomplish the successful socio-economic development, otherwise the socio-economic imbalance will still remain.

- 1) Make effort to establish and/or raise supportive and downstream industries by mobilizing the private sector's activities.
- 2) Induce a wide variety of manufacturing industries from other areas.
- 3) Promote the establishment of manufacturing industries by the local sector.
- 4) Encourage immigration and integrate them into the Terengganu community.
- 5) Research, development and investment on mechanization for labour saving devices shall be seriously undertaken, especially in the agricultural sector.
- 6) Assist those who change their jobs by providing opportunity of vocational and technology retraining.

5.4 FUTURE ECONOMIC STRUCTURE

5.4.1 Methodology and Premises

The economic framework was studied in terms of GRP and the income account of the State was not only broken down into sub-regions, but also the forecasted

projects and plans were integrated in the estimate of GRP, GRE, income level, population and employment in the South Terengganu Area.

Fig. 5.2 shows the inter-relationship of the determinant factors of the economy of the area. The economic base of the study area consists of the agro-based products and petro-gas products. These are exported and generate value added in the area, which in turn activates the economies in other part of the production and services in the tertiary sector. The chain of these multiplying relationships results in GRP of the area. The development in the sub-sectors is forecast by studying the existing status and potentials.

The basic assumption is tabulated in Table 5.10. General prospect on the future sub-regional economy which will be encouraged under the integrated industrial development policies is taken into account as follows:

- 1) Primary sectors and mining sector will increase productions. However, their shares in GRP will be reduced.
- 2) Manufacturing and construction will increase their productions and percentage shares in GRP.
- 3) Utilities, transportation and communication sectors will increase both production and percent shares.
- 4) Service sectors will increase production and percent share.
- 5) Government services will increase the amount but the percent share will decrease.

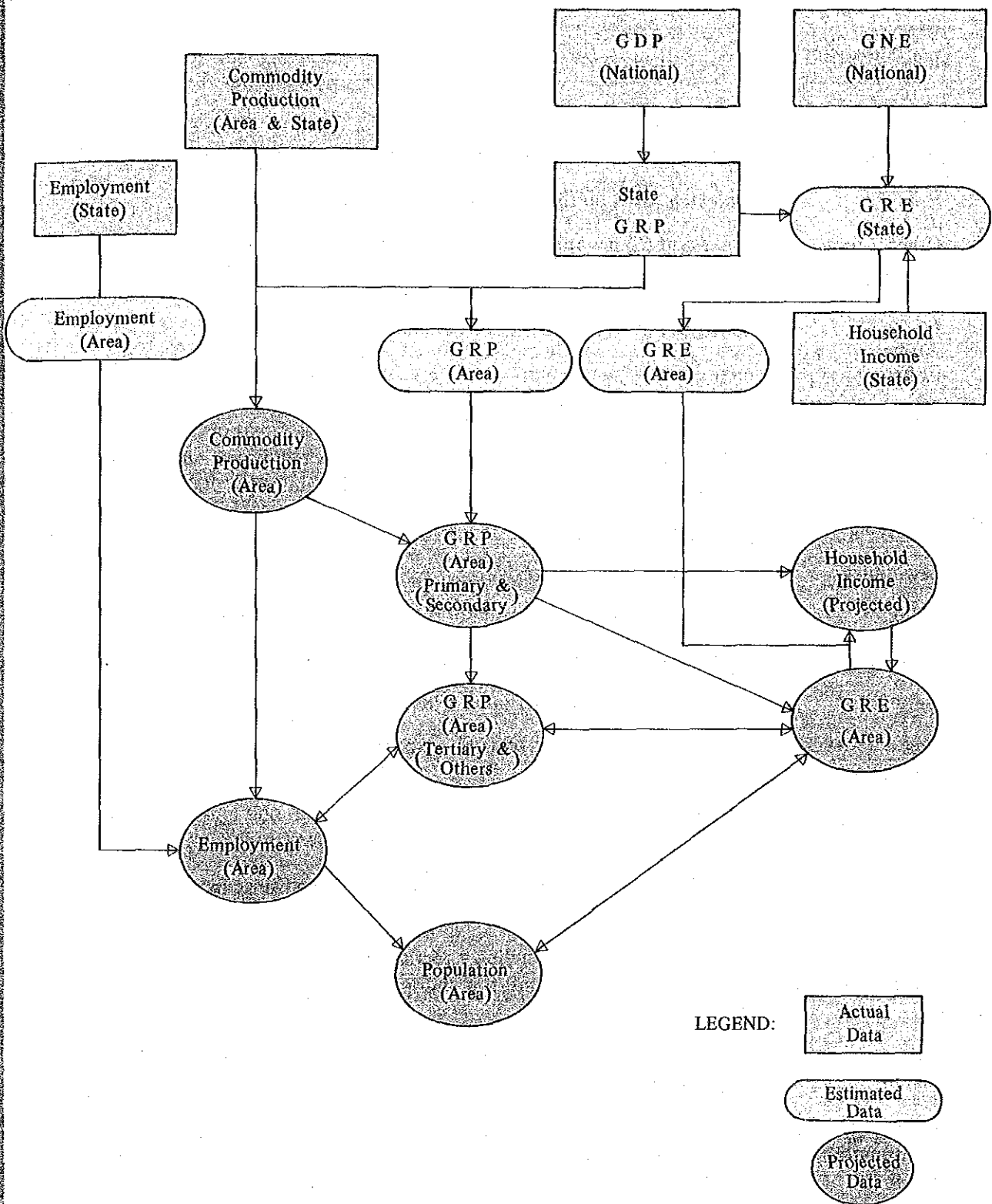


Fig. 5.2 INTER-RELATIONSHIP OF THE GRP COMPONENT

Table 5.10 Assumed Development in Subsectors

Sub-sector	Assumed Developments
Paddy	: continue '83 level
Oil Palm	: projected considering the maturity, 1,551,000 t/FFB in 2000
Rubber	: projected based on the possible yield, 10,340 t/DRC in 2000
Other Crops	: increase at 5% per annum by '90. 3% afterwards, including cocoa
Coconuts	: continue '83 level
Livestock	: increase at 5% by 1990 and 4% per annum afterwards
Fishery	: increase at 2% per annum
Crude Oil	: based on Petronas estimate, stable after '90
Natural Gas	: follows the Petronas estimate of 1990. Projected based on increasing demand through the southward pipeline 1,043 mmscfd in 2000
Quarrying	: increase at 5% per annum
Sawmilling	: follow same trend as forestry
Latex	: follows the growth in the yield of rubber in estate production
Palm Oil	: follows the growth in oil palm production
Refinery	: 30,000 bpd, start production in 1984 and no expansion
Gas Separation	: start from 1984 and will be expanded along the growth of gas production
Petrochemical	: start from 1990. 150,000 t/year ethylene and 50,000 t/year propylene are used for the products of LLDPE, HDPE, VCM and PP
DR Mill	: start from '85 at 0.6 mil/ton of sponge iron and an expansion to the double capacity in the 1990s
Steel Plants	: various programmes including a section mill of 0.2 mil/ton in the 1980s and a cold mill of 0.3 mil/ton and a hot mill of 0.8 mil/ton in the late 1990s
Other Manufacturing	: 11 factories (except cottage manufacturers) will be added annually, each output M\$34 million per year
Government Consumption Services	: 8% per annum, based on the state current expenditure and the estimate is deflated with CPI (7%)
Government Investment	: 5% per annum, based on the current spending and constraint prospect

5.4.2 Economic Framework

As a result, the average growth rate of GRP from 1983 to 2000 is forecast at 8.4% per annum, which is higher than the TMPS projection of 7 ~ 7.4% for the whole state up to the year 2000.

This rate of 8.4% per annum itself is extremely high, when considering the world of current economic stagnation. The economy in the Study Area is strongly dependent in terms of production and market on the world economic situation but this estimate is not out of possibility because:

- 1) The volume of GRP in 1983 is still so small that the high growth rate can be expected on calculated figures.
- 2) A great deal of growth, especially in the manufacturing sector, is targeted on industrial developments centring on capital intensive steel, petroleum and gas products. This will contribute highly to spreading sub-regional economic activities to the related sectors as well as to the high growth rate of GRP itself.

Table 5.11 Projected Gross Regional Product of the Study Area

(Unit: M\$million in 1970 prices)

	1983	1985	1990	1995	2000
Agriculture, Fishery and Forestry	133.7 (26.3)	166.3 (23.3)	232.0 (18.2)	252.6 (15.9)	280.1 (13.9)
Mining and Quarrying	269.3 (52.9)	297.2 (41.6)	448.4 (35.2)	519.9 (32.8)	543.4 (27.1)
Manufacturing	23.7 (4.6)	126.6 (17.7)	347.1 (27.3)	506.7 (31.9)	716.3 (35.7)
Construction	16.2 (3.2)	25.6 (3.6)	46.2 (3.6)	66.8 (4.2)	98.8 (4.9)
Utilities	5.3 (1.0)	12.1 (1.7)	31.2 (2.5)	35.0 (2.2)	63.9 (3.2)
Transport, Storage and Communication	6.5 (1.3)	10.3 (1.4)	22.6 (1.8)	27.2 (1.7)	41.2 (2.1)
Trade, Hotels and Restaurants	10.4 (2.1)	17.3 (2.4)	36.7 (2.9)	44.1 (2.8)	71.5 (3.6)
Finance, Insurance and Real Estate	14.9 (2.9)	23.5 (3.3)	57.8 (4.5)	65.3 (4.1)	94.8 (4.7)
Government Services	26.6 (5.2)	33.2 (4.6)	46.5 (3.7)	65.7 (4.1)	91.1 (4.5)
Other Services	2.4 (0.5)	2.7 (0.4)	3.7 (0.3)	5.2 (0.3)	7.2 (0.3)
Total	509.0	715.0	1,272.2	1,588.5	2,008.3

Source: Study Team

Note: The share composition is shown by the figures in the parenthesis.

- 3) Services in the tertiary industry will grow caused by the increased demand in the area. Although not high as the above industry the agricultural sector in total is also forecast to develop.
- 4) Export to and import from other regions will hold their importance because increased commodity products in the area have markets in other regions.

Table 5.12 Projected Gross Regional Expenditure

(Unit: M\$million in 1970 prices)

	1983	1985	1990	1995	2000
GRP at Producers' Value	509.0	715.0	1,272.2	1,588.5	2,008.3
GRP at Purchasers' Value (GRE)	515.1	723.6	1,257.4	1,607.1	2,023.7
Private Consumption	134.0	182.2	310.3	366.2	482.1
Government Consumption	43.6	49.9	70.0	98.0	137.2
Fixed Capital Formation	142.4	172.2	327.1	431.2	526.2
Net External Demand	195.1	319.3	550.0	711.7	878.2

Source: Study Team

The following premises must be achieved in order to realize the above economic development.

- Necessary infrastructure including utilities and transportation, which will enable access to markets, should be improved. Industrial activities should not be interrupted by hazards of the infrastructure.
- Work force shall be supplied properly both in terms of quantity and quality. To fully enjoy the benefits of development, it is necessary to establish manpower training systems to supply a skilled workforce and management staff. Rehabilitation programme for the people in traditional villages who intend to join the modern sector will be also required.
- Improvements in housing and living environments shall be undertaken to meet the increasing population and levelling-up of living standards. It will also contribute towards stabilizing the adjustments of the required workforce.

6.1 NATURAL CONDITIONS

6.1.1 Geography

Topography:

Structurally Peninsular Malaysia is made up of three series of mountain ranges running parallel in a north-south direction. They are Titiwangsa, Gunung Tahan and Timur.

On the west coast of Peninsular Malaysia there exist broad lowlands and undulating hinterland with soil condition favourable for agriculture. Along the west coast region as well, the existence of an international sealane and the Straits of Malacca has resulted the emergency of important ports and harbours e.g. Port Kelang, Penang, etc.

While on the east coast, specially in Terengganu, the mountains are close to the coast leaving only a narrow coastal sandy strip and large swampy areas with poor soil conditions. The physical features imposed a barrier to communications and the inaccessibility of some areas hindered development.

The Study Area features high mountains such as Mt. Mandi Angin on the western side and low hills, rolling plains and swamps on the eastern side. Mt. Mandi Angin has an elevation of 1,460 m located to the western side of the Study Area. Geologically, the rocks are carboniferous and granite in the hilly and mountainous areas with alluvium in the coastal lowlands. The area is characterised as tropical rain forest.

Locational Characteristics of the Study Area:

The South Terengganu sub-region is located between Kuala Terengganu and Kuantan and is about 120 kilometres from north to south and 60 kilometres from east to west and about 500 kilometres from the Federal Capital of Kuala Lumpur.

As shown in Fig. 6.1, Dungun located on the northern end of the Study Area is 70 kilometres south of Kuala Terengganu, and Cukai on the southern end of the study area is 50 kilometres north of Kuantan town.

Most of the major towns along the coastal region such as Dungun, Kerteh and Cukai are located approximately at 30 kilometre intervals.

The Study Area covers 5,370 km², roughly 40 percent of the Terengganu state as shown in Table 6.1. The KETENGAH area covers 83 percent of the Study Area and almost 34% of the Terengganu state.

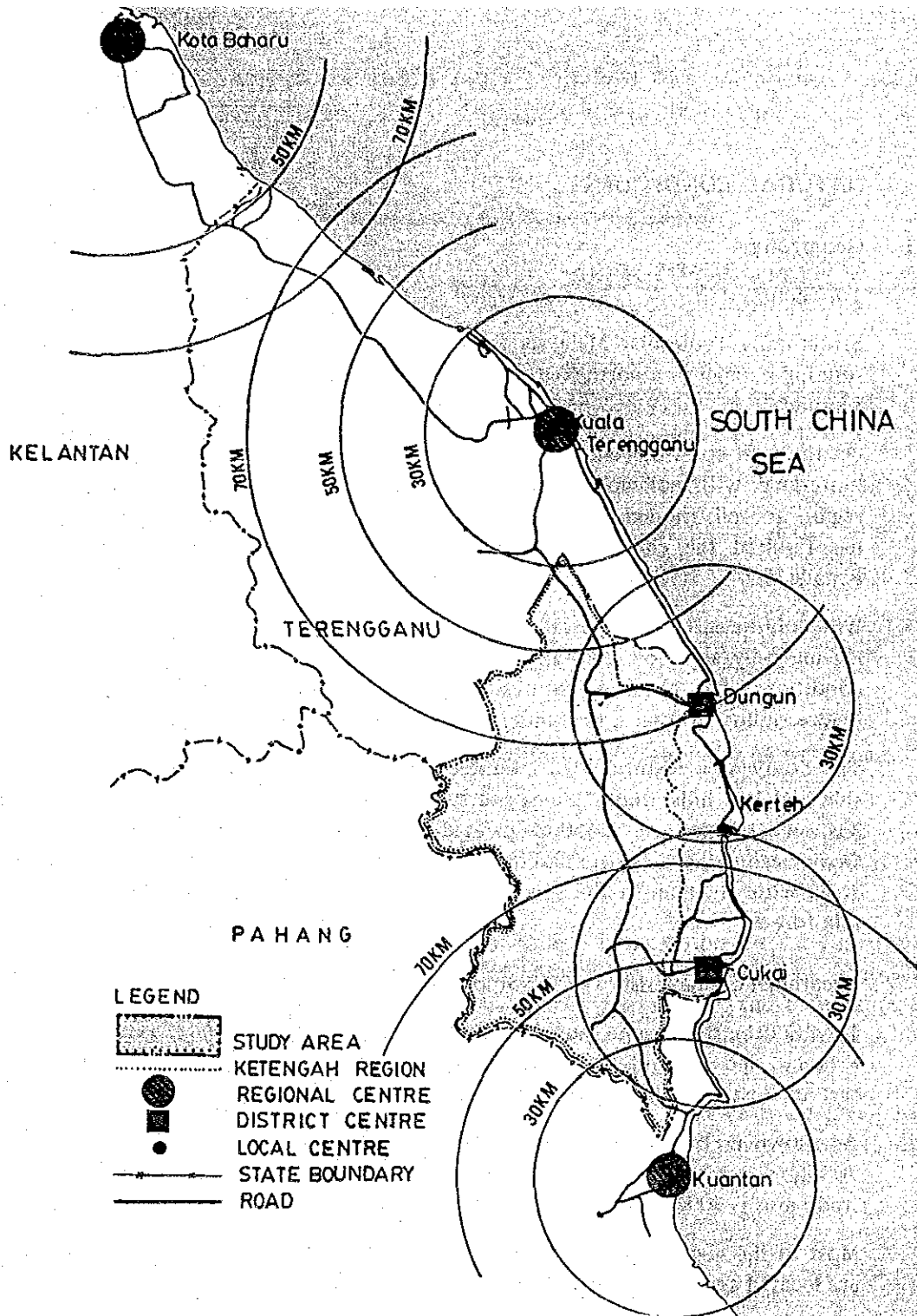


Fig. 6.1 LOCATION MAP OF THE SUB-REGIONS

Table 6.1 Classification of the Study Area

(Unit: km²)

District	Dungun	Kemaman	Hulu Terengganu	Total (Share: %)
Study Area	2,616	2,636	118	5,370 (100)
KETENGAH	2,302	2,020	118	4,440 (83)
Coastal Region	314	616	—	930 (17)

Source: Population Census, 1970, with some figures adjusted by the Study Team.

Climate:

Peninsular Malaysia has a tropical type of climate in which precipitation is a significant variable climatic element.

The west coast region has a moderate rainfall throughout the year, but in the east coast region especially in Terengganu the north-east monsoon brings heavy rainfall to the coast and inland areas. Maximum monthly rainfall occurs in December, which is about 600 millimetres or more, while a minimum of not less than 100 millimetres is for the average in non-monsoon months.

This heavy rainfall sometimes results in a large run-off volume into the rivers causing floods, disruption to communications and economic activities and property and revenue.

The north-east monsoon with strong winds and heavy precipitation is dominant from November to January. The annual precipitation in the study area is more than 3000 millimetres, which is the highest in Malaysia.

While the south-west monsoon with moderate precipitation blows from June to October, and has comparatively less effect on the climatic conditions in the area.

The general profile of the topography together with precipitation and forest structure is diagrammatically shown below in Fig. 6.2.

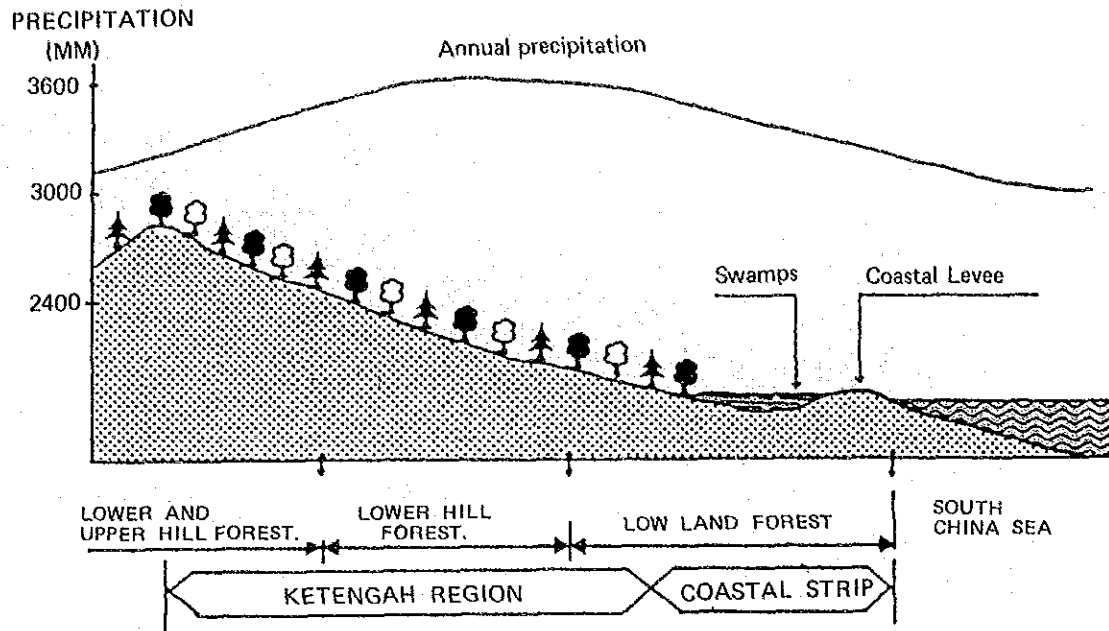


Fig. 6.2 GENERAL PROFILE OF NATURAL CONDITIONS

6.1.2 Resources

On the west coast of the Peninsular Malaysia, large tin mining areas are situated. Rubber and oil palm suite well to the moderate climatic conditions and favourable soil. Thus the west coast region with the availability of such resources and accessibility to international ports has retained the predominant development.

In the east coast, developments in transportation, communication and urbanization were generally slow in the past because of being late in the primary sector's development, dispersed population and low development in manufacturing industries. Existence of mineral resources is explored but the economic viability is questionable.

For improvement of the economic and development disparity between the east and west coast as mentioned above, the Government of Malaysia started regional land development projects such as KETENGAH, DARA, KEJORA, etc. mainly in the eastern regions under the New Economic Policy.

Petroleum and gas exploration started from the end of last decade, 200 km off-shore from the Terengganu coast. The presence of oil and gas is a significant impact for the development of the eastern region especially for the State of Terengganu.

According to the data of PETRONAS, the petroleum reserves in Terengganu as of 1983 accounts for 1,606 million barrels which is 62.5% of the total reserves in Malaysia. At present petroleum of about 200 thousand barrels per day (BPD) is extracted from the field.

On the other hand, natural gas reserves in Terengganu is estimated at 25.8 trillion cubic feet (TCF) including associated gas and non-associated gas. This is equivalent to about 52% of the total reserves in Malaysia.

Although forest products have been a by-product of agricultural land development so far, forest resources are also one important resource. The productive forestry area in the Study Area is estimated at about 180 thousand hectares including the integrated timber complex of 121 thousand hectares and concession areas of 26 thousand hectares in the KETENGAH area and the other area with the government sawmill agreement of 34 thousand hectares. These forest areas can continuously and constantly produce about 200 thousand m³ of annual output of logs under proper management.

The Study Area is endowed with rich primary resources ranging from agriculture to mining. Therefore, emphasis must be placed on effective utilization and integration of these resources for sub-regional development.

6.1.3 Land and Landuse

The Study Area with approximately 5,370 square kilometres is divided into two areas: the KETENGAH area of about 4,440 square kilometres and the coastal strip area of about 930 square kilometres.

Land Conditions:

The distribution of forest areas which has been fostered by the tropical rainforest climate is as shown in Fig. 6.3. The forest areas belong mainly to the KETENGAH area and some in the coastal strip area.

The forest areas in the KETENGAH are divided into three categories as follows:

Committed to the Integrated Timber Complex:	121,408 ha
Permanent Forest Reserve:	100,987 ha
Under Chenderong Concession:	26,305 ha
<hr/>	
Total	248,700 ha
Other concessions	34,000 ha

As shown above, the lands with about 34 thousand hectares committed to the long term sawmill agreement in the Study Area is covered by the forest areas.

Soil conditions in the Study Area are classified into five classes from Class 1 where the soils are suitable for the widest range of crops, to Class 5 where the soils are least suitable for crop growth.

Fig. 6.4 shows the outcome of this classification. The areas classified by Class 1 and Class 2, where agricultural development is evaluated to be suitable, are distributed mainly in the eastern part of the Study Area, between Kerteh and Cukai along the coast, and alongside the major rivers.

Observing the KETENGAH development plan as shown in Fig. 6.5 based on this soil classification map, it can be identified that most of the potential areas for agricultural development are involved in the development planning areas in the KETENGAH programme.

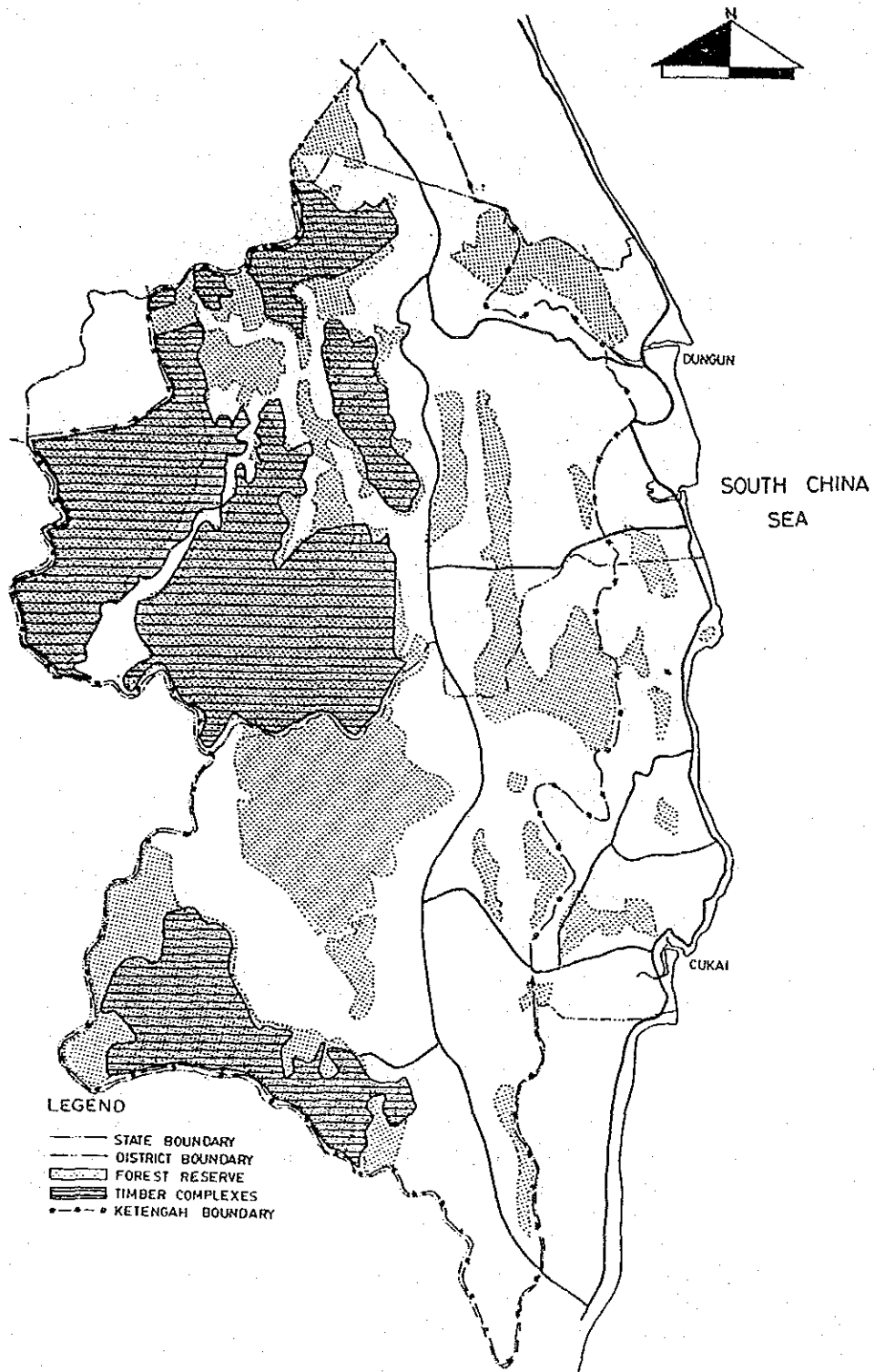
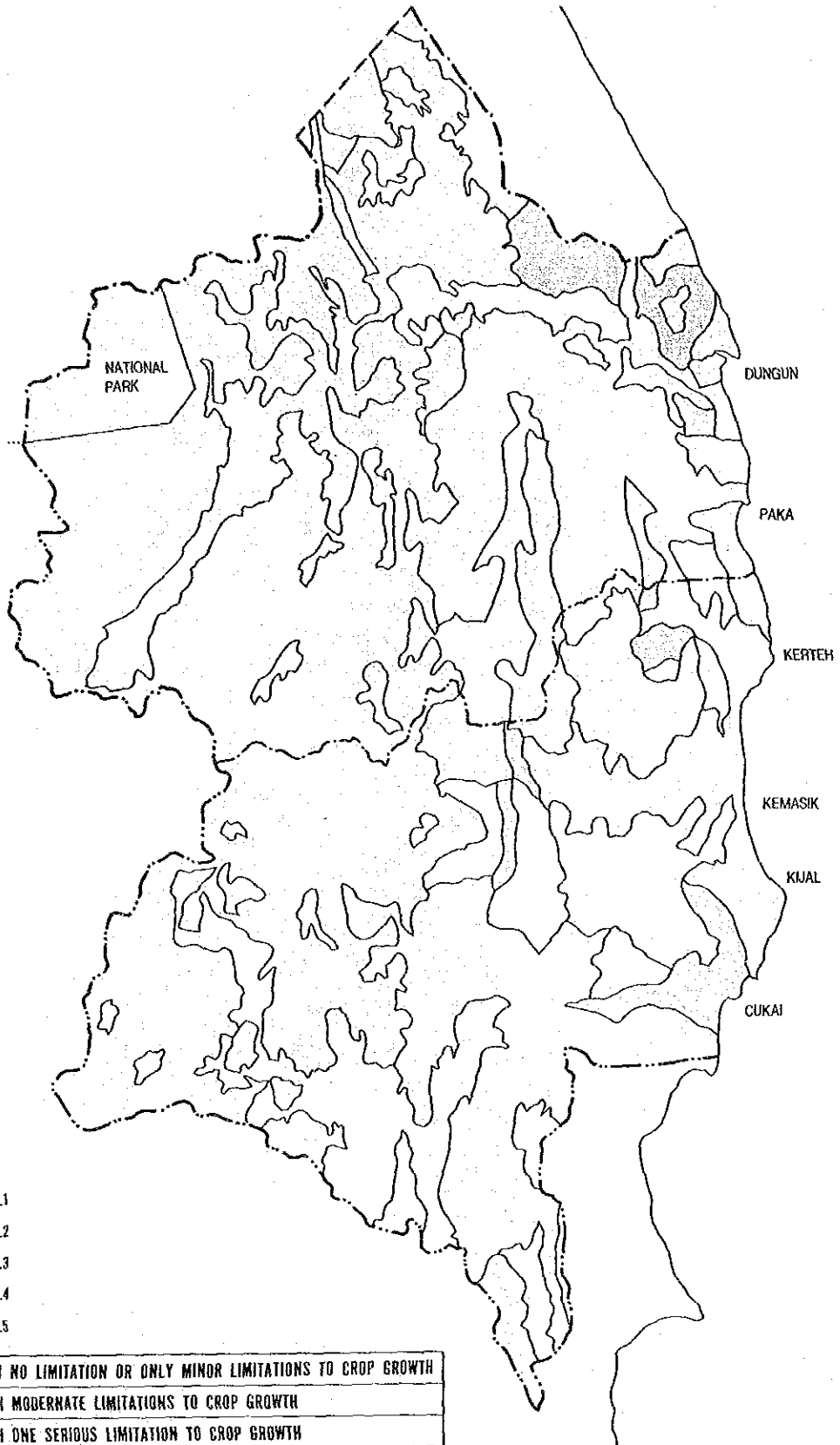


Fig. 6.3 DISTRIBUTION OF FOREST AREAS



LEGEND

	CLASS.1
	CLASS.2
	CLASS.3
	CLASS.4
	CLASS.5

CLASS.1	SOILS WITH NO LIMITATION OR ONLY MINOR LIMITATIONS TO CROP GROWTH
CLASS.2	SOILS WITH MODERNATE LIMITATIONS TO CROP GROWTH
CLASS.3	SOILS WITH ONE SERIOUS LIMITATION TO CROP GROWTH
CLASS.4	SOILS WITH MORE THAN ONE SERIOUS LIMITATION TO CROP GROWTH
CLASS.5	SOILS WITH AT LEAST ONE VERY SERIOUS LIMITATION TO CROP GROWTH

Source: S.D.O.A.

Fig. 6.4 SOIL CLASSIFICATION MAP

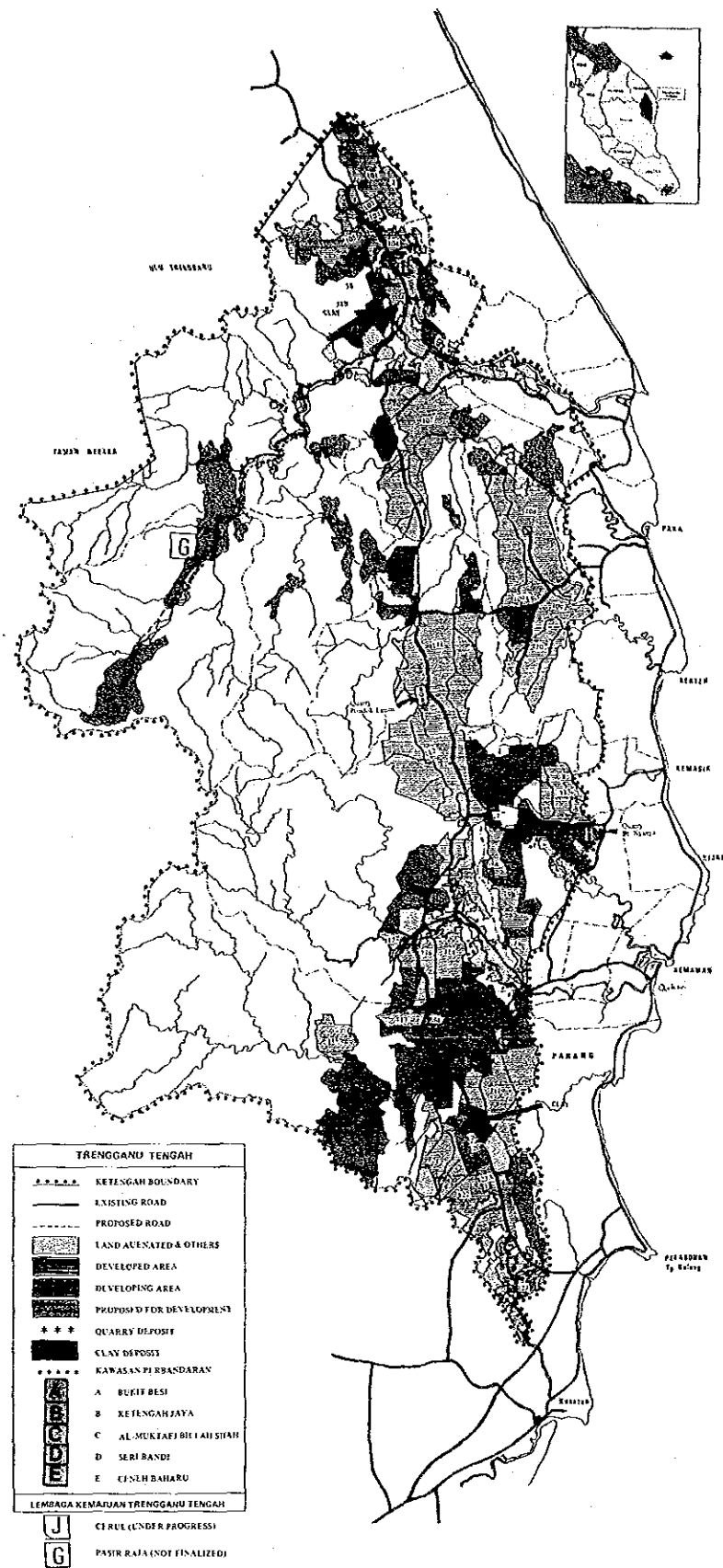


Fig. 6.5 DEVELOPMENT SCHEME OF KETENGGAH PROGRAMME

Landuse Pattern:

Towns are situated at river mouths on sandy ground of which surrounding land is either used for agricultural activities or occupied by swamps. Land protruding into the sea is hilly and is usually covered with forest.

Sand dunes run along the coast and are utilized for urban and agricultural activities, while the inland has many extensive tracts of flat land which are swampy. Kerteh and Kemasik are situated in small river basins and are adjacent to the coastal line. There is abundance of forest areas and tree crops are planted on the cultivated hilly area inland. A general identification of present landuse pattern in the Study Area is as shown in Fig. 6.6.

6.2 HUMAN SETTLEMENT PATTERN

6.2.1 Existing Settlement Patterns

Settlements in the study area are classified into five categories in terms of locational characteristics:

1) Town on river mouths

Examples are Dungun with urban population of about 36 thousand and Cukai with that of about 18 thousand. They serve as district centres of the Study Area and have been developed as a core town for socio-economic activities.

2) Coastal kampungs

Kampungs on the coast form the main settlement areas such as Kerteh and Kemasik which have been developed on the dune with favourable ground conditions for agricultural, fishery, and some cottage industry activities.

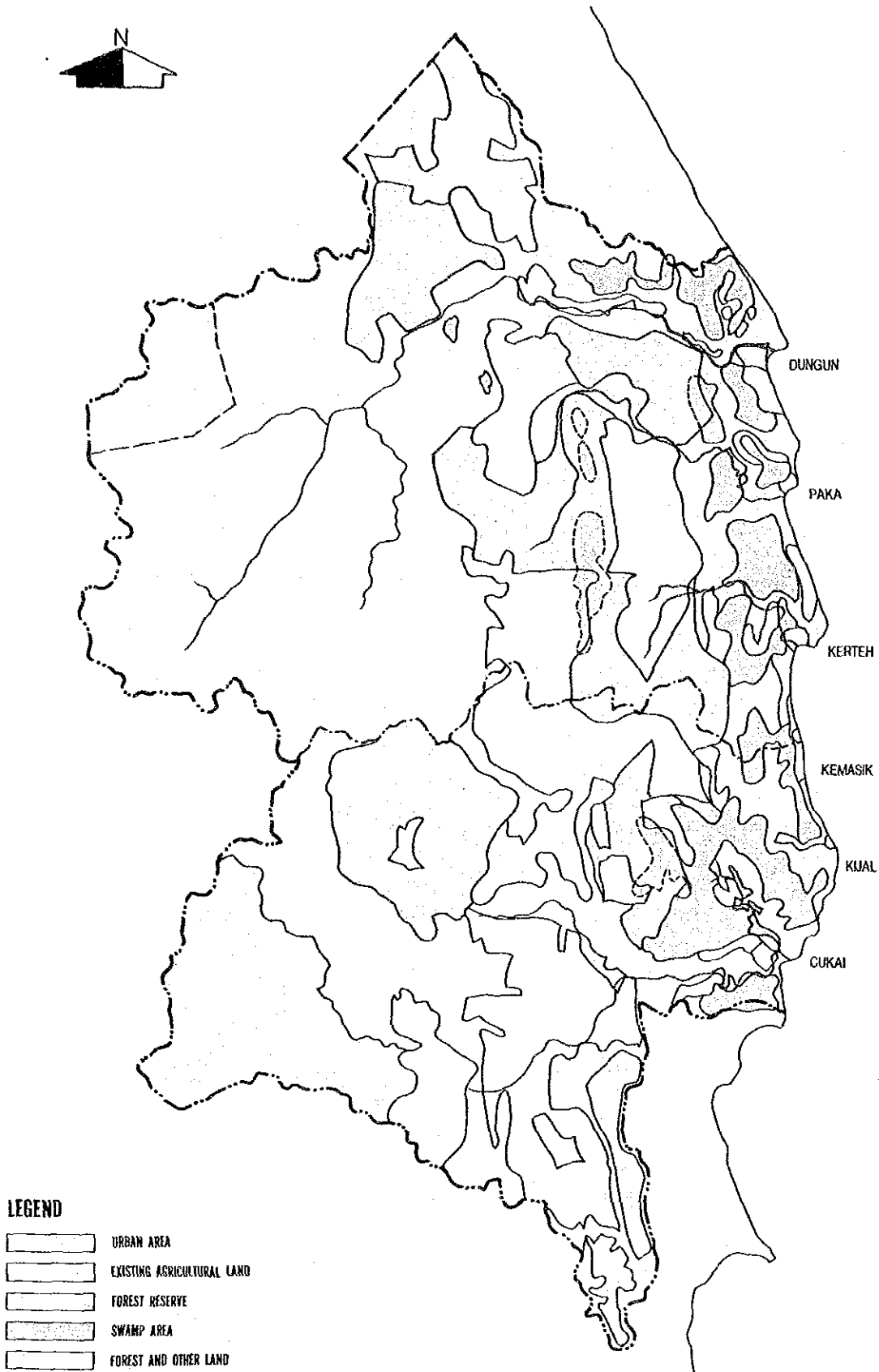
3) Riverine kampungs

These settlements are situated in the mountainous area and have been developed in close connection with the settlements along the rivers. Settlements have recently been expanding into areas along the roads and highways.

Population on the river basins is estimated as follows: the Dungun river basin, 42,000 and the Kemaman river basin, 51,000 which together account for 80 percent of population in the study area.

4) New townships in KETENGAH

New towns have been developed intentionally, under the new-settlement programme since September 1976 and population has reached at 12,878 in 1983. The growth and development of six new towns are tabulated in Table 6.2.



Source: DID and KETENGAH

Fig. 6.6 PRESENT LANDUSE PATTERN

Table 6.2 Development of KETENGAH Towns

Town	Construction Date	Township Area (ha)	Date of Settlement	Population 1983	Projected Population
Bukit Besi	March 1978	1,618	Jan. 1981	1,496	7,743
Ketengah Jaya	Sept. 1976	1,782	Sept. 1978	5,624	21,261
Al Muktafi Billah Shah	Sept. 1976	2,800	Feb. 1981	2,118	13,308
Seri Bandi	March 1978	1,047	Feb. 1980	1,304	8,623
Cench Bahar	June 1977	2,609	Oct. 1980	2,336	14,130
Cherul	Dec. 1983	547	—	—	8,371
Total		10,430		12,878	73,436

Source: KETENGAH, An Overview of Its Performance in 1983 and The Quarter Report April 1984.

5) Petronas New Town

A new satellite town for those who work for PETRONAS plants in the coastal region is presently under construction at Kerteh. It is expected to be a local centre with superior amenities and facilities.

The location of the main settlements and their populations are shown in Table 6.3 and Fig. 6.7.

Table 6.3 Population by District in 1970 and 1980

District/Mukim	1970	1980	Increase of Population 1970 - 1980
Abang	871	970	1.11
Besul	806	1,723	2.14
Jengai	822	893	1.09
Jerangau	11,009	8,950	0.81
Kuala Paka	5,343	7,013	1.31
Kuala Dungun	27,179	28,277	1.04
Kumpal	1,609	1,839	1.14
Pasir Raja	821	885	1.08
Rasau	730	2,332	3.19
Sura	5,241	6,841	1.31
Ulu Paka	38	820	21.58
Dungun District	54,469	60,543	1.11
Banggol	128	102	0.80
Binjal	2,366	3,330	1.41
Cukai	18,351	25,384	1.38
Kerteh	4,766	5,999	1.26
Kemasek	3,463	4,283	1.24
Kijal	4,188	5,135	1.23
Pasir Semut	1,084	1,604	1.50
Telok Kalong	1,224	1,771	1.45
Tebak	5,365	10,530	1.96
Bandi	766	839	1.10
Ule Cukai	1,422	1,994	1.40
Ule Jabor	1,780	5,214	2.93
Kemaman District	44,903	66,187	1.47
Kuala Terengganu District	173,534	241,271	1.39
State of Terengganu	405,539	542,280	1.34

Source: Mukim Areas and Population 1970
Population and Housing Census 1980

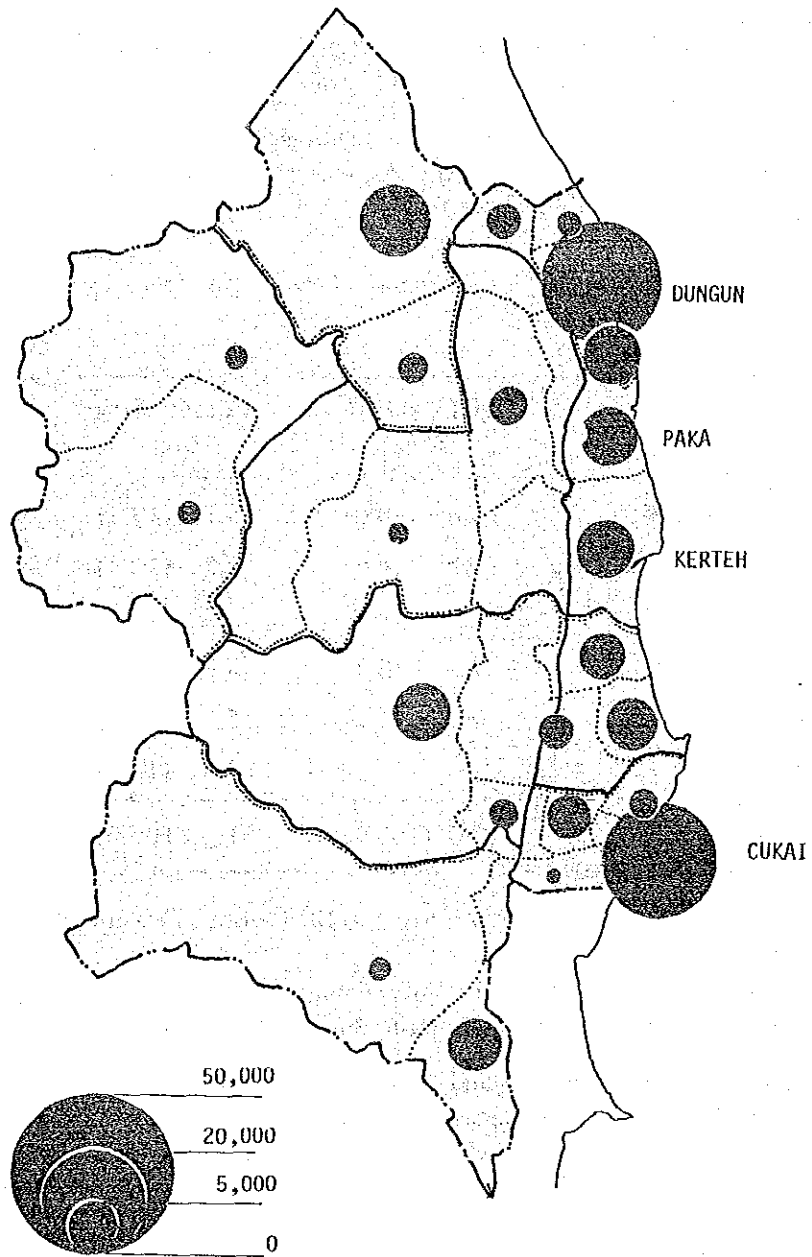


Fig. 6.7 EXISTING POPULATION DISTRIBUTION AND HUMAN SETTLEMENT CENTRES

6.2.2 Work Places

It is estimated that there are about 48,300 work places in the Study Area, of which 65 percent, about 31,300 work places, are located in the coastal strip area and 35 percent, about 17,000 in the KETENGAH area in 1983.

Around 90 percent of work places in the KETENGAH area are engaged in the primary industry with a few in other industries.

While, in the coastal strip area, the major sector to absorb employment is the government service sector with the primary industry and the commercial sectors following as shown in Table 6.4.

Table 6.4 Number of Work Places, 1983

(Unit: '000, %)

	KETENGAH Area		Coastal Strip Area		Total	
Primary Industry	15.3	(90.0)	6.1	(19.5)	21.4	(44.3)
Mining & Manufacturing	1.1	(6.5)	4.5	(14.4)	9.0	(18.6)
Construction			3.4	(10.9)		
Government Service	0.4	(2.3)	8.2	(26.2)	8.6	(17.8)
Commerce	0.2	(1.2)	5.3	(16.9)	9.3	(19.3)
Other Service			3.8	(12.1)		
Total	17.0	(100.0)	31.3	(100.0)	48.3	(100.0)

Source: Study Team by referring to the Census 1980 and other data.

There are about 10 industrial estates being created with a total area of 1,710 hectares including those under construction and planned in the Study Area.

Table 6.5 shows locations and development scales of these industrial estates. If all of them would be successfully occupied by manufacturing factories, more than 170 thousand work places could be newly created.

Table 6.5 Industrial Estates Planned/Under-Construction

Name of Industrial Estate	Location	Proposed Area (ha)
1. Dungun	Coastal Strip Area	22.27
2. Kerteh	"	120.00
3. Telok Kalong	"	1,210.00
4. Jakar I	"	45.34
5. Jakar II	"	16.19
Sub-total		1,413.80
6. Bukit Besi	KETENGAH Area	47.55
7. Al Muktafi Billah Shah	"	87.90
8. Ketengah Jaya	"	24.15
9. Seri Bandi	"	46.76
10. Ceneh Bahar	"	91.10
Sub-total		297.46
Total		1,711.26

Source: MIDA 1984

Meanwhile, palm oil mills and the related activities occupy a large share of the industrial output and are expected to possess a large absorption capacity for labour in the KETENGAH area. In Kerteh and Telok Kalong, plant construction is in progress as of September 1984 and both areas will be cores of industrialization in the southern part of Terengganu.

The socio-economic framework examined in Chapter 5 requires an increase of employment of about 45.5 thousand up to 2000, of which about 20 thousand, equivalent to 43% of the total increase, are to be provided by the manufacturing sector. This means that an intensive industrial development is most crucial in terms of preparation of work places.

Table 6.6 Type of Living Quarters, 1980

District	No. of Household	Total No. of Living Quarters	Built or Converted for Living/Sleeping				Not Intended for Living/Sleeping			Collective Living Quarters		
			Bungalow	Semi-Detached	Terrace	Flat/Room	Others	Space in a Building	Natural Shelter, Mobile House, etc.	Labour Camps	Others (Hotels/Resthouse, Medical, Social, Institution, etc.)	
Dungun	12,533	13,873 (100.0)	11,639 (83.9)	708 (5.1)	652 (4.7)	291 (2.1)	28 (0.2)	291 (2.1)	153 (1.1)	111 (0.8)		
Kemaman	3,631	15,487 (100.0)	11,553 (74.6)	2,478 (16.0)	728 (4.7)	356 (2.3)	31 (0.2)	217 (1.4)	77 (0.5)	47 (0.3)		
Total	26,164	29,360 (100.0)	23,192 (79.0)	3,186 (10.9)	1,380 (4.7)	647 (2.2)	59 (0.2)	508 (1.7)	230 (0.8)	158 (0.5)		

Source: TMPS, 1983

6.2.3 Housing

General

Living quarters in Dungun and Kemaman Districts number 29,360 compared with the 26,164 households in 1980. 79 percent of which are classified as bungalows as shown in Table 6.6.

In Kemaman District, the share of semi-detached houses to the total houses is 16 percent which is much higher than the average in the State of 6.5 percent.

Public Housing

The supply of public housing in the coastal region, Table 6.7 shows that 1,420 units have already been completed and 1,830 units are under construction and 2,356 units are proposed for the future developments, according to State Economic and Development Corporation (SEDC).

Of the total living units of 1,830 under construction, 1,285 units (68%) are in Kerteh and Kemasik and 475 units in Cukai. On the other hand, the proposed 1,844 unit, equivalent to 78% of the total units, is to be in Cukai.

The service level of the public housing supply is only 0.07 units per household in 1983 and will be 0.16 in the near future when the units under construction are completed. However, looking toward the year 2000, even if all the units including the proposed ones are completed, the service level will be only about 0.13 units per household.

Table 6.7 Housing Unit Supplied by SEDC in the Coastal Strip

Type of Dwelling	Completed	Under Construction	Proposed	Total
DUNGUN	316	—	402	718
Low Cost	296	—	207	503
High Cost	20	—	195	215
PAKA	—	130	110	240
Low Cost	—	130	110	240
KERTEH KEMASIK	318	1,285	—	1,603
Low Cost	318	60	—	378
Medium Cost	—	465	—	465
High Cost	—	760	—	760
CUKAI	786	475	1,844	3,105
Low Cost	547	475	636	1,288
Medium Cost	—	—	800	800
High Cost	239	0	408	647
<hr/>				
TOTAL	1,420	1,830	2,356	5,606
Low Cost	1,161	605	953	2,349
Medium Cost	—	465	800	1,265
High Cost	259	360	603	1,622

Source: SEDC, July 1984

Public housing supply plays an important role in providing accommodation especially for the low income group. Under the programme by SEDC, the number of low cost units will total 2,349 after completion of the proposed units, however, this means a service level of 0.05 units per household, say 5%. On the other hand, as examined in the section of 5.2.2 Income, the share of the people in the poverty range will be 14% even if the targeted socio-economic development is undertaken.

The team notes that the existing programme of low cost housing supply cannot satisfy the demand by the year 2000. An emphasis, therefore, should be placed on the provision of low cost housing for the low income group.

KETENGAH Housing

In the KETENGAH area, 4,447 housing units are completed or under construction all of which are located in the KETENGAH five new townships. The detailed breakdown of the housing types developed in the KETENGAH townships is as shown in Table 6.8.

Table 6.8 Housing Development in KETENGAH Towns

Town	Type	No. of Units	Status
Bukit Besi	Hollow Block	1	Completed
	Prototype	14	Completed
	Kos Rendah	459	Completed
TOTAL		474	
Ketengah Jaya	Kos Rendah	30	Completed
	Felda Housing	933	Completed
	Felda Housing	1,275	Under Const.
TOTAL		2,238	
Al Muktafi Billah Shah	Kos Rendah	390	Completed
	Staff Housing	11	Under Const.
	Kos Rendah	441	Under Const.
TOTAL		842	
Sri Bandi	Kos Rendah	169	Completed
	Felcra Staff	212	Completed
	Housing Prefab-timber	35	Under Const.
	Felcra Staff Housing	60	Under Const.
	Ketengah Jaya Staff Housing	17	Under Const.
TOTAL		494	
Ceneh Bahar	Kos Rendah	399	Completed
TOTAL		399	
GRAND TOTAL		4,447	

Source: TMPS, 1983

6.3 TRANSPORTATION

6.3.1 Road

Existing Road Network:

A trunk road, Federal Highway Route III, runs in a north-south direction along the coast linking urban areas of Dungun, Kerteh, Cukai, and other towns. From this highway feeder roads were constructed westward to the interior populated areas. In 1980, Jerangau-Jabor Highway was completed for the purpose of accelerating the agricultural development in the inland and KETENGAH areas, forming another north-south direction trunk road about 30 km west of the coastal trunk road. As a result, the existing main road network resembles a ladder shape as shown in Fig. 6.8 with two north-south roads and four major east-west connecting roads between them.

There are a number of other roads, generally called the mukim roads apart from the Federal and State roads. The mukim roads link-up with kampungs remote from the trunk roads. These roads are only a few kilometres length in most cases, but serve as an important means of transport to people in these inner areas.

Road Conditions and Maintenance:

Most roads in the study area are maintained in a fairly good condition. The Jabatan Kerja Raya (JKR) Terengganu is in charge of the maintenance of the roads. The main problems of the roads at present are deterioration of the surface due to some poor design features, soil erosion, poor drainage and excessive loading by lorries. Land-slides and poor pavement condition are found along the recently opened Jerangau-Jabor Highway and Feeders from 1 to 6. The flood prone sections of roads are located near rivers and swampy areas and also where drainage is poor. For example, Cukai-Air Putih Road and the Federal Highway Route III between MS54 and 58 were flooded, and the water level was between 3 to 17 feet above the road surface during the monsoon in late 1983.

Traffic Volume:

The 1983 traffic data indicate that the volume of traffic on the Federal Route III is in the range of 3,500 ~ 4,500 vehicles per day, except in the urban areas of Dungun and Cukai where an approximate volume of about 8,000 ~ 9,000 vehicles occurs because of the additional short distance city traffic. The traffic volume per day on Jerangau-Jabor Highway (J-J Road) is 1,200 ~ 1,300 vehicles per day. Traffic volumes on other roads linking Route III and Jerangau-Jabor Road are similar. The study area had an overall traffic growth rate of 15% per annum during 5 years from 1973 to 1978, and 13% per annum from 1978 to 1983.

Public Transport Service:

The public transport system in the area is provided by public bus services, taxis, school buses, and trishaws. Of these services long distance inter-regional services are provided mainly by buses and taxis, while the short distance intra-urban services

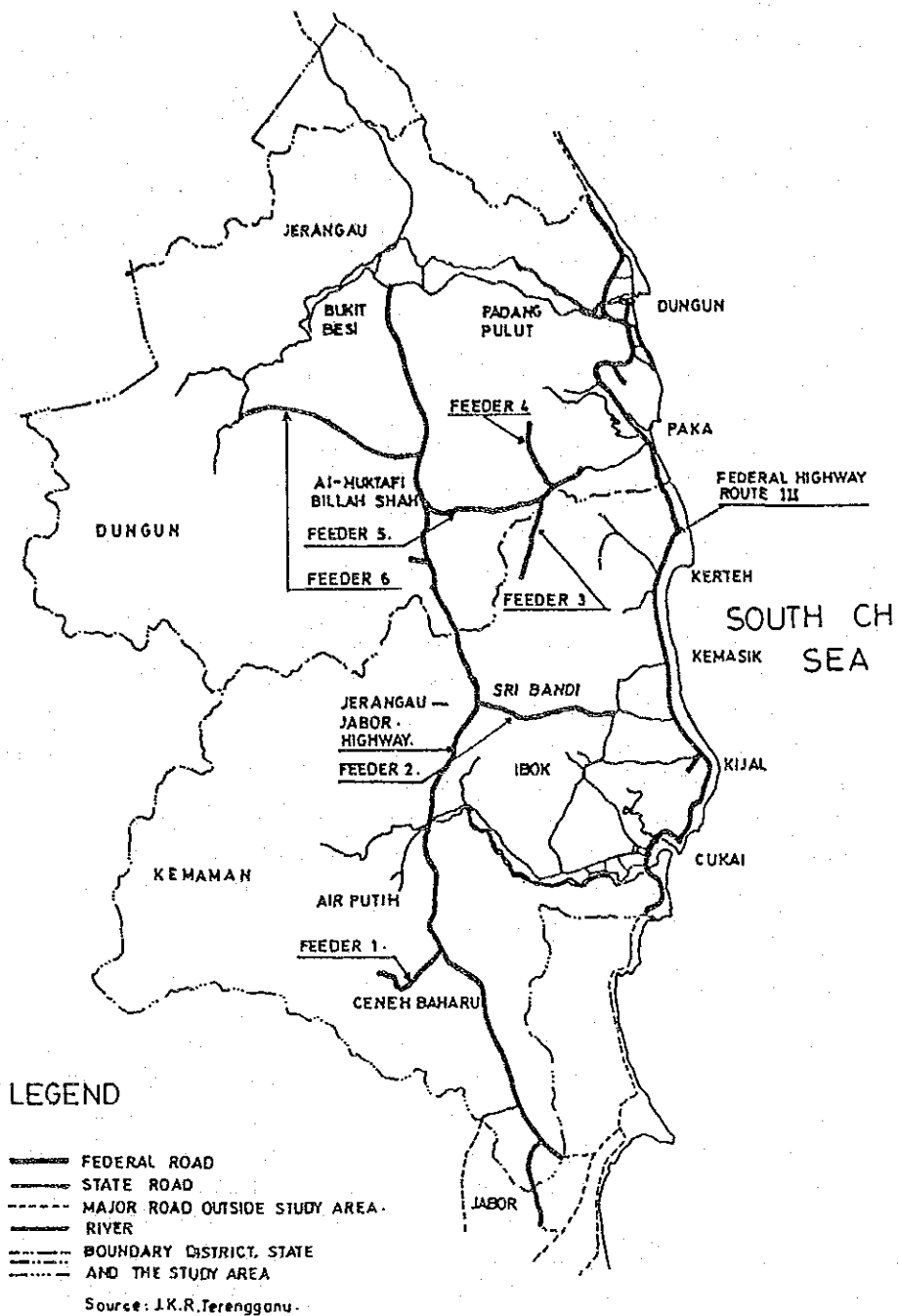
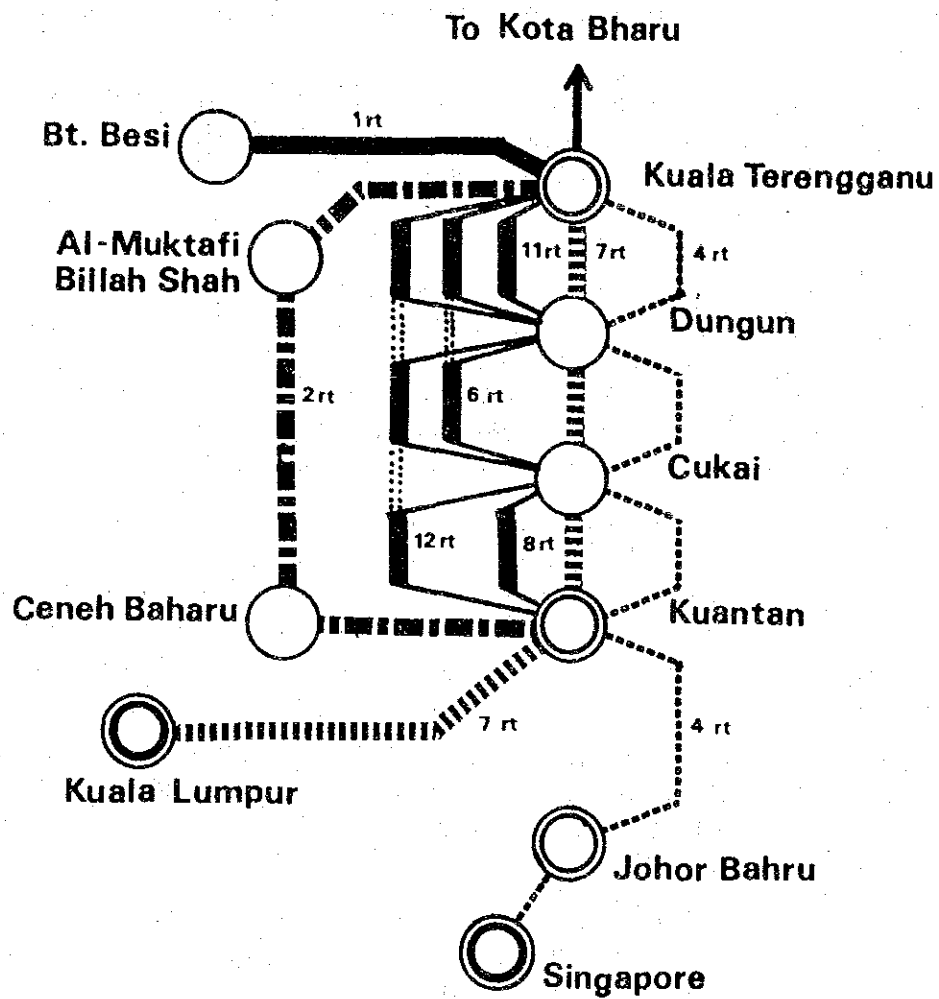


Fig. 6.8 EXISTING ROAD NETWORK IN THE STUDY AREA



LEGEND

-) regional route
- - - - -**) inter regional route
- rt** round trip

Fig. 6.9 EXISTING BUS NETWORK SYSTEM

are provided by taxis, school buses and trishaws. No intra-urban bus service exists. In the KETENGAH area, some school buses circulate a few townships.

The bus services in the study area are operated by private bus companies without substantial financial support from the Government. These companies are small in size and much service cannot be expected from them. There is usually a shortage of bus services/operations resulting in schedule changes and inconvenience to the public.

The existing bus network system is as shown in Fig. 6.9. The relationship between major towns in the coastal strip area is comparatively strong in number of trips operated than the towns in KETENGAH area.

6.3.2 Airport

There is one airstrip, the Dungun Airfield, in the study area. This is clay surfaced 366 metre runway and is located seven kilometres south of the city centre, but has no scheduled service. Nearby airports are the Kuala Terengganu airport, approximately 100 km north of Dungun, and the Kuantan airport approximately 70 km south of Cukai, and the newly built Kerteh airport.

The Kuala Terengganu Airport was extended to have a longer runway of 46 metres x 2,012 metres, a more stable and concrete runway surface, larger apron and a terminal building. There are three or four round trips per day between Kuala Lumpur and Kuala Terengganu. From June, 1984 MAS replaced part of F27 flights with B737 jet flight for four times a week. No direct international flights are available.

The Kuantan airport is jointly operated by DCA and the Royal Malaysian Air Force. The facility of the airport currently falls into A4 category under the NASP classification system, with a runway of 46 metres x 2,804 metres. B737 and the similar size aircraft can take-off and land.

MAS is currently operating domestic flights from Kuantan to Kuala Lumpur and Johor Bahru. Most of these flights are operated by the F27 aircraft. There are two round trips per week to Singapore by B737 or the equivalent.

In addition to these existing airports/airfield, PETRONAS is building its own airport/heliport at Kerteh in cooperation with the State Economic Development Corporation (SEDC). The Kerteh Airport is scheduled to have a runway of 30 metres x 1,100 metres. Scheduled services to Kuala Lumpur started in March, 1985 by Malaysian Air Charter.

6.3.3 Port

The major ports in the Study Area are located at Dungun and Cukai. These suffer from siltation and river mouth bar formation. There are two other ports near the study area. One of them is the Kuala Terengganu port which is one of the seven minor ports in Peninsular Malaysia and the other is the Kuantan Port which is one of the four international ports in Peninsular Malaysia.

Taking into account the promotion of international activities through export-oriented industries in the Study Area, the function of the Kuantan Port should be particularly noted in terms of its effective utilization.

There is another significant development being carried out at present at the Tanjung Berhala Port, approximately 10 kilometres north of Cukai. It has three berths in the supply base, the east wharf and the liquefied propane gas jetty. The supply base is operated for servicing the support activities for the off-shore oil rigs and for handling of construction materials for the development of the nearby Telok Kalong industrial estate.

The major characteristics of existing ports are summarized as shown in Table 6.9.

Table 6.9 Major Characteristics of Existing Ports

Port	Accommodation Limit	Operational Period	Present Operations	Cargo
Kuala Terengganu ¹⁾	Vessels to 2,000 DWT	Year-round	Regular traffic	Oil, oil products, sawn timber, and fish
Cukai ¹⁾	Vessels to 500 DWT	Year-round (with occasional draught restriction)	Regular traffic	Timber, palm oil crude & products
Dungun ¹⁾	Vessels to 100 DWT	Non-monsoon	Small fishing vessels	Fish, palm oil, and logs
Kuantan ²⁾	Vessels to 35,000 DWT	Year-round	Regular traffic including ocean-going vessels	General commercial goods as a major international port

Source: 1) Terengganu Coastal Regional Study
2) The Port of Kuantan Authority

6.3.4 Telecommunications

Telephone facilities within the study area are linked to the main exchanges at Kuala Terengganu and Kuantan. The exchanges at Kemasik and Kemaman are connected to Kuantan. Those at Paka, Dungun and Bukit Besi are connected to Kuala Terengganu. For long distance communication, the Kuala Terengganu exchange is linked to exchanges in Kuala Lumpur, Penang, Ipoh, Kota Bharu and Kuantan.

The total exchange line capacity of the 5 exchanges in the study area was 2,320 in 1981. The total number of subscribers was 1,409 and those on the waiting list were 342. Thus the ratio between the total of subscribers and waiting to the line capacity was 75 percent.

The Jabatan Telekom Terengganu aims to increase the line capacity to 48,360 by 1985. This will meet the requirements up to the year 2000. The number of households per line was 37 for Dungun and 43 for Kemaman in 1980. These are estimated to improve to 16 and 18, respectively by the year 2000.

6.4 SOCIAL INFRASTRUCTURE

Social infrastructure consists of health, education, postal services, police, fire and other public services facilities. In this section, two main facilities, i.e. health and education facilities are noted in terms of their service levels and distribution.

6.4.1 Health

As of 1980, the Terengganu State had 125 primary clinics, 7 large health centres and 5 hospitals. Existing health facilities in the Study Area are summarized by mukim as shown in Table 6.10.

A primary health clinic is located at each community unit of four thousand four hundred persons in the State, while in the Study Area, the ratio is one to three thousand five hundred persons. Large health centres and district hospitals are found in towns along the coast.

The Fourth Malaysia Plan provides new health centres in Bukit Besi (Mukim Jerangau), Bukit Kuang (Mukim Telok Kalong) and Binjai. It recommends that the facilities and conditions of each hospital is to be improved in accordance with the increase in population. Along this policy a new hospital is planned in Kerteh.

Table 6.10 Existing Locations of Health Facilities, 1980

Name of Mukim	Primary Health Clinic	Main Health Centre	District Hospital	
Kuala Dungun	3	—	1	
Sura	1	—	—	—
Kuala Paka	1	1	—	—
Abang	9	—	—	Besut, Rasau, Jerangau, Kampung Pasir Raja
Jengai	2	—	—	Hulu Paka
Kuala Cukai	3	1	1	—
Binjai	1	—	—	—
Kemasik	5	1	—	Kijal Telok Kalong
Hulu Jabor	4	—	—	—
Kerteh	4	—	—	Pasir Semut Bandi, Jabok
Bangol	3	—	—	Hulu Cukai
TOTAL	36	3	2	

Source: Health Department, Terengganu

6.4.2 Education

There are 60 primary schools and seven secondary schools in the Dungun and Kemaman Districts as shown in Table 6.11 and Fig. 6.10.

The percentage of pupils in primary schools to the population is 16.9 percent in Dungun and 15.4 percent in Kemaman. The ratio by Mukim varies from 12.8 percent to 16.8 percent.

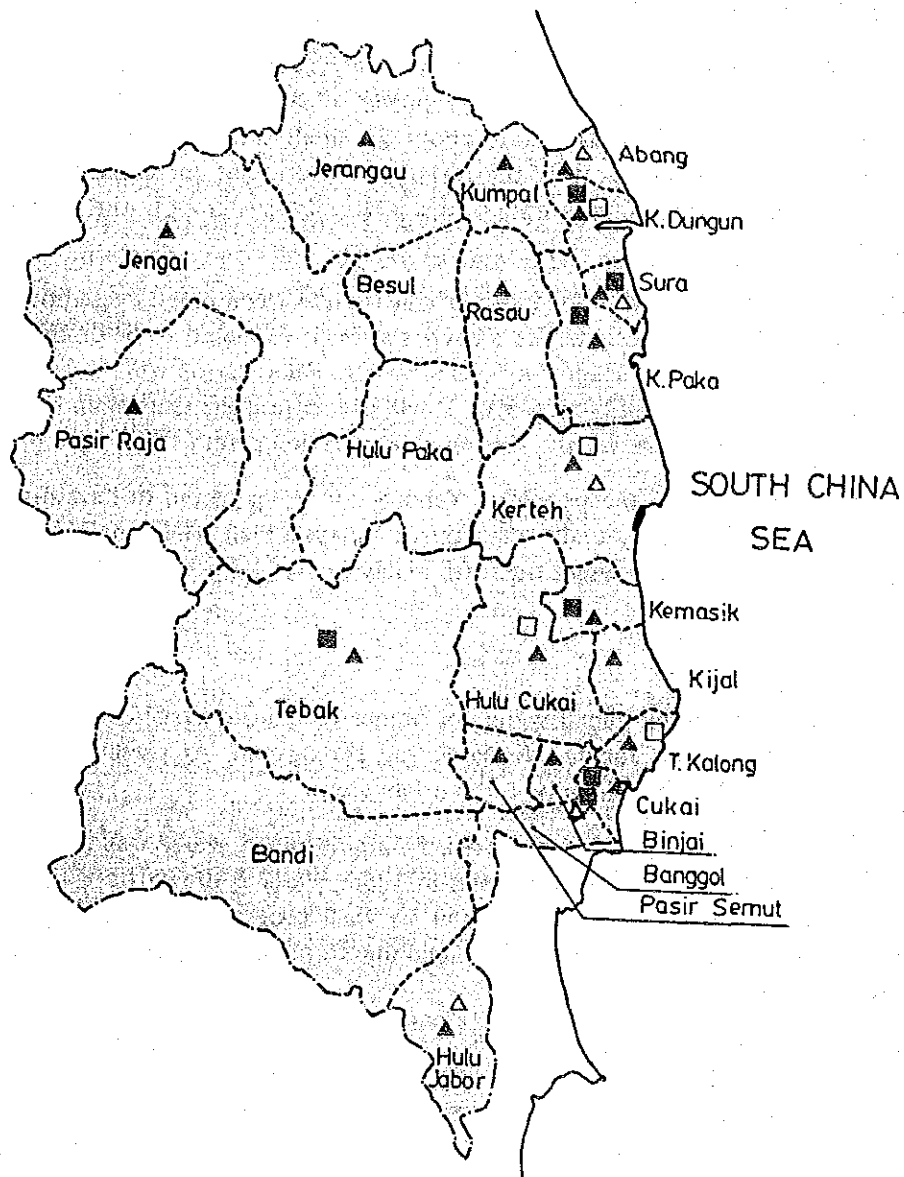
Average number of classes per primary school is 10.1 in Dungun and 11.2 in Kemaman. Average number of pupils per class is 30.6 and 33.9, respectively. In both districts the figures are almost same as the average figures of the State, i.e. 11 classes/school and 32 pupils/class.

The FMP Mid Term Review provides for a construction plan for primary schools in Abang, Sura, Kerteh, Kuala Cukai and Hulu Jabor and opening of secondary schools in Dungun, Kerteh, Kuala Cukai and Telok Kalong.

Table 6.11 New Establishment of Schools

<u>Dungun District</u>							
Name of Mukim	Population Density Persons/Mile ²	No. of Primary Schools	No. of Classes	Primary Pupils as % Total Population	No. of Secondary Schools	No. of Classes	Secondary Pupils as % Total Population
Kuala Dungun	1,000	8	139	17.9	1	60	8.4
Sura	501 – 1,000	3	18	5.8	1	45	21.4
Kuala Paka	101 – 250	5	43	17.8	1	15	7.8
Abang Besul Jerangau Kumpal Rasau	25 – 100	13	110	20.0	—	—	—
Jengai	25	4	24	7.4	—	—	—
<u>Kemaman District</u>							
Name of Mukim	Population Density Persons/Mile ²	No. of Primary Schools	No. of Classes	Primary Pupils as % Total Population	No. of Secondary Schools	No. of Classes	Secondary Pupils as % Total Population
Kuala Cukai	1,000	6	112	16.7	2	83	11.5
Binjai	251 – 500	2	12	12.9	—	—	—
Kemasik Kijal Telok Kalong	101 – 250	7	60	15.5	1	28	9.6
Hulu Jabor	101 – 250	3	30	16.8	—	—	—
Kerteh Pasir Semut	25 – 100	4	37	16.0	—	—	—
Banggol Bandi Tebak Hulu Cukai	25	5	50	12.8	1	12	3.2

Source: Education Dept. Terengganu, 1981



LEGEND:

- ▲ Existing Primary School
- △ Proposed New Primary School (FNP)
- Existing Secondary School
- Proposed New Secondary School (FNP)

Source: Education Dept., Terengganu

Fig. 6.10 EXISTING AND PROPOSED SCHOOL LOCATIONS

6.5 UTILITIES

6.5.1 Electrical Power Supply

Electrical power is supplied by the Lembaga Letrik Negara (LLN) in the Study Area. Electric power is generated by diesel power stations at Dungun, Kemaman and Al Muktafi Billah Shah. There are about 21 small stations that provide 12 hour services in remote areas. It is the ultimate objective of the LLN Terengganu to incorporate them into the State's power supply system of the national grid network.

The Kenyir hydro-electric power plant and the Paka combined cycle power station are now under construction. The Kenyir station is expected to be on-line by 1985/1986, and will have a capacity of 400 MW. The Paka station will be ready in 1984/85, and its capacity will be 600 MW. It will use natural gas as its main fuel obtained from the off-shore wells via the Kerteh gas-separation plant.

About 90 percent of the people of Terengganu are expected to have direct access to electric power supply under the Fourth Malaysia Plan. The remaining 10 percent will receive their supply under the Fifth Malaysia Plan.

6.5.2 Water Supply

The supply of potable piped water for domestic and industrial consumption is the responsibility of the Jabatan Kerja Raya, Terengganu. At present potable piped water is generally available only in the urban areas.

The ratio of housing units served with potable piped water was 32.8 percent in Dungun and 45 percent in Kemaman in 1980. Water is drawn from the intakes of Sungai Dungun and Sungai Kemaman. A rush program is being implemented in Kemaman to meet the increasing demand due to rapid development projects around Kerteh and Cukai.

The total water requirement was 0.72 million gallon per day (MGD) for Dungun and 1.25 MGD for Kemaman in 1980. It is forecast that the requirements will increase to 4.73 and 5.95 MGD, respectively in 2000. With completion of all projects under the Fourth Malaysia Plan in 1985, the Study Area will have an adequate supply of potable water up to 1990. To satisfy the water requirements for the year 2000, additional projects are needed in Kemaman.

6.5.3 Sewerage

Domestic sewage is discharged into pit latrines, pour-flush latrines and septic tanks or directly discharged into surface drains. The surface drains are polluted by these discharges in the built-up areas. Only 6 percent of housing units have the flush toilet system in Terengganu, compared with 27 percent in Peninsular Malaysia.

The main sources of industrial waste water are the palm oil mills in the Study Area. The discharge of industrial effluent is regulated by the Environmental Quality Regulations regarding palm oil, rubber, sanitary sewage and industrial effluents.

With industrialization and urbanization, implementation of water pollution controls becomes necessary to prevent deterioration of the environment. The TMPS recommends short-term and long-term programmes against the problems of sewage discharges.

6.5.4 Drainage

The Study Area is drained by 4 major rivers; Sg. Dungun, Sg. Paka, Sg. Kerteh and Sg. Kemaman as shown in Fig. 6.11. The western half of the study area is mountainous with the highest eastern ridge of Mt. Mandi Angin (EL. 1,460m). The eastern half is featured by low hills, rolling plains and swamps. These flat areas are subject to flooding due to the low capacity of the rivers and the large runoff volume during the rainy season. The runoff capacity is a function of the slope of the river which is 1/5,000 within 20 kilometres of the sea. The river cross sections are as follows:

River	Width (m)	Depth (m)
Dungun	150 – 240	6 – 9
Paka	90 – 100	6 – 9
Kemaman	130 – 150	4.5 – 6
Cukai	140 – 145	8

Floods in Terengganu State have occurred every 2 or 3 years over the past 20 years. Flood damages have increased in proportion with developments in agricultural and urban areas. The land clearing and conversion of forest to agricultural areas increases the storm runoff in the upper catchment areas, thus, resulting in overflow and flooding of the main rivers in the flat coastal areas. The total forest area decreased from 10,093 sq.km or 78% of the area of the whole State in 1966 to 6,608 sq.km or 51% in 1979 due to forest exploitation not only for logging purpose but for agricultural land developments.

Since flood waters rise to high levels and last for several days, all activities in the area are affected and disrupted. During the December 1983 flood, traffic on the road from Kuantan to Kuala Terengganu was suspended for about two weeks.

Though a series of studies on floods have been carried out, flood control measures (such as arresting and impoundment of flood water, river improvements, etc.) have not been implemented. Solution to flooding is the most crucial issue. The recommendations on the method of flood control are examined in this Study and are proposed in the Section 8.5, "Flood Control and Drainage System Development".

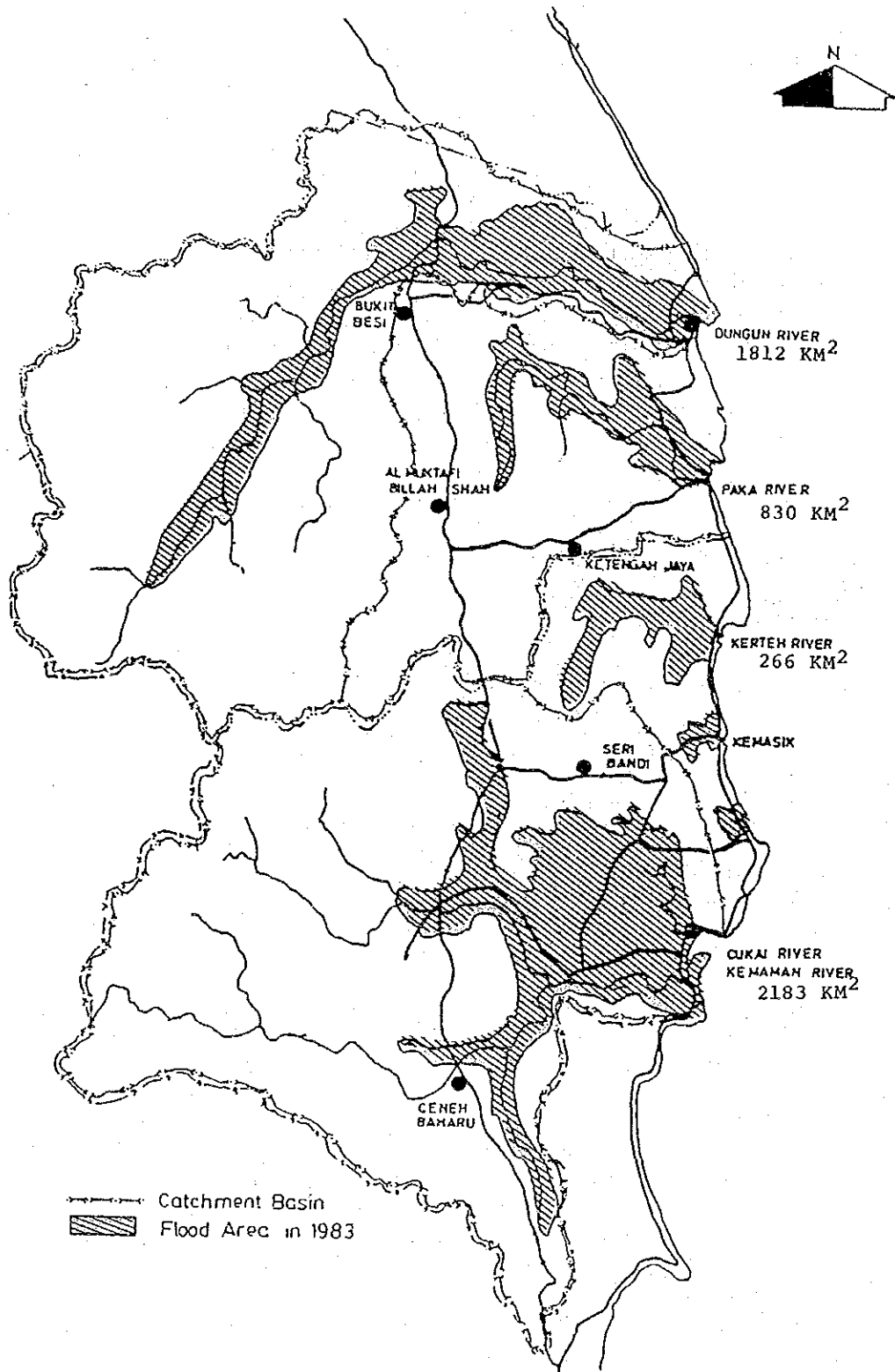


Fig. 6.11 CATCHMENT BASIN AND FLOOD AREA

7.1 PRINCIPLES FOR FUTURE DEVELOPMENT

As mentioned in the Section 2.4, the development strategies in the Study Area derived from the national and regional contexts are focused on three issues as follows:

- Maximization of resource utilization;
- Integration of on-going and likely development projects into a sound sub-regional socio-economy; and
- Optimum systems of human settlement and labour force distribution.

7.1.1 Maximization of Resource Utilization

Discussed in Section 6.1.2, Resources, the Study Area is well endowed in terms of agricultural and mineral resources.

The first principle for future development inevitably comes from a policy to maximize the endowments, taking into account significance of strengthening not only of the sub-regional economic base, but also of the national economic base.

In this regard, the socio-economic analysis carried out by this Study envisages that it will be possible to encourage the sub-regional economy in the Study Area with a GRP growth rate of 8.2 percent per annum, if the deliberate and strategic industrialization programme is realized by effectively utilizing the existing resources.

In this scenario attention should be paid to the potential of manufacturing development based on petroleum and gas being exploited at off-shore sites. This is very influential upon the GRP growth whether or not the petrochemical complex development is realistic.

However, it should be recognized that the surrounding conditions to enable the development of such a kind of industry as a petrochemical complex and so on are quite severe on investment activities due to the economic depression and market oversupply. A specific strategy and emphasis, therefore, is necessary to achieve this target.

From a regional economic planning point of view, diversification of industry is extremely significant for the formation of a sound growth base. An integrated mobilization of agricultural and forest resources should take priority in this sense. The KETENGAH development programme, therefore, should involve diversification policy from primary production to the enlargement of value added industries through encouragement of processing industries. A homogeneous industrial structure is subject to weakness due to fluctuation of the world markets.

Generally encouragement of the production sector such as agriculture, mining and manufacturing stimulate the tertiary sector's activities through an economical interrelationship between sectors. In this regard, it can be said that the local resource-oriented industry is more effective in stimulating the tertiary sector's activities.

From a physical structure planning point of view, there are three roles to be undertaken:

- i) To prepare a proper spatial basis to ensure these anticipated activities;
- ii) To provide an appropriate infrastructure network system;
- iii) To develop/improve the living space with amenities to absorb people who play a role of actors in the regional development.

7.1.2 Integration of On-going Projects/Developments

The on-going and likely development projects are seeds for the future development and imply a direction of progress. The on-going and just completed projects in the Study Area vary from industrial to social developments.

The most notable projects are so-called resource based developments such as the KETENGAH programme and the petroleum and gas extraction base development. Besides these, major projects/developments prominent for furthering industrialization are as follows:

Kuantan Port:

The condition that a well-installed international commercial port with a container system was developed at the location with an economic distance of 30 km from Cukai Town is very meaningful in stimulating industrial activities which are aimed at the export-oriented business.

Formation of Energy Centre:

It is significant that at the national level an energy centre is being formed centring on the LLN Power Station at Paka. This means that one of the basic factors indispensable for industrialization has been installed.

Telok Kalong Industrial Port:

This enlarges the industrial development potential for the so-called capital intensive and export-oriented manufacturing processes.

Industrial Estates:

Five locations for industrial estates with the total area of 1,414 hectares which have been provided in the coastal strip area are recognized as a potential to induce the new industrial investments.

Vocational Education System:

The vocational education/training system being operated in the Terengganu State should be encouraged in order to meet the demand of skilled workers which will obviously increase with the future industrialization. Higher educational facilities should be developed, associated with this system.

Railway System:

The east-west railway line, expected to go through the Study Area, is now being examined by the Malaysian Government. However, the plan and programmes are not concrete enough to be incorporated in the sub-regional plan.

The proposed railway will run along the coastline parallel to Route III, with railway stations at Cukai, Kerteh and Paka in the initial stage, and Dungun in the second stage. A branch line to link with Telok Kalong industrial estate is proposed. Several impacts are anticipated by the development of this railway.

Although detailed discussion on the impacts is difficult, it can be said that the railway concept is extremely meaningful in terms of:

- Effect on a stable interregional transport system by provision of a substitute transportation mode, especially for freight transport;
- Effect on up-grading of accessibility to the major markets, especially for the industrial sectors who produce bulky goods suitable for railway transport;
- Effect on reducing mental as well as time distance between the Study Area and the major urban centres in the country, especially in passengers; and
- Effect on urban landuse in the areas near the railway station by giving possibilities to develop new commercial, public and/or residential uses.

7.1.3 Optimum Distribution System of Settlements and Labour Force

The first problem is that there is no fully established core town on the east coast to support the industrial growth pole.

From a physical development planning point of view, it is important to provide core towns with amenities for urban living, which will have the following features:

- Diversified industrial activities;
- A social system of tertiary schools and research and development (R&D) institutes, which supports modern industries; and
- Modern comforts of urban amenities including potable water, electricity and sewerage services.

Three major towns located on the coastal “corridor” should be developed so that the town can share with each other a growth pattern in an integrated manner.

This integration will form a metropolitan area to provide urban services and amenities with high level or degree (essential, desirable and high quality) which any one town could not provide alone. Furthermore, by providing a high degree of

urban services and amenities, the effect of "trickle down" will occur and will contribute to improving the rural standard of living. This is in line with the National and State Policies and simultaneously will help to induce industries to the east coast.

The process is as follows:

- 1) To conceptually recognize the three major towns of Dungun, Kerteh and Cukai as one consolidated town;
- 2) To provide each town with municipal facilities so that these towns collectively have a higher degree of functional capability than that of a sub-regional centre;
- 3) To provide an efficient public transportation as well as a well-maintained road systems which will ensure a high degree of mobility between three towns;
- 4) To provide urban development initially within the three towns so as to accelerate the urbanization to form a linear shaped metropolitan area; and
- 5) To design and implement a flood mitigation and surface drainage system which will permit growth in flood-free areas.

In the above process, there are two notable issues:

- It will be important to invite schools and R&D institutions to sustain the continuous manpower development in the future to meet the demand in the industrial sectors and maintain the technology development.
- It is also necessary to change the impression that the transportation networks and communications are easily broken by the recurring seasonal flooding. The flood control measures must be taken as soon as possible.

The second problem is that there is no defined settlement hierarchy system to integrate the settlement centres in the KETENGAH area and the major towns in the coastal strip area by socio-economic activity level.

The KETENGAH area in the inland area has been developed to produce timber, palm oil, rubber and other cash crops, which played an important role for development of the economy of the area by the initiative of FELDA, RISDA and KETENGAH, etc. The KETENGAH has been constructing six new townships where families of those engaged in estate production can settle down. These were originally planned in the midst of agricultural estates inhabited mainly by those working in the estates and their families. The town have not reached the level of population development as originally planned.

Promotion of new settlements is strongly needed to support the estate production system.

The new townships in the KETENGAH area have to function as service centres to support the hinterland agricultural activities, and simultaneously have to be supported by the major towns with the basic urban functions at a higher level of service.

An interrelationship between both areas should be intentionally established in the areas of human resources, technology and productive knowledge, social and medical services, commerce and so on.

For this purpose, an emphasis should be placed on the development of transportation systems to link both areas by physical planning and the development of social infrastructure systems in social planning.

7.2 DEVELOPMENT FRAMEWORK

7.2.1 Physical Constraints

The critical geographical constraint in the Study Area is the scarcity of readily usable land remaining on the coastal strip area for further urban development. Supply of land in this area relies on the extent of low land development or swamp reclamation. To expand the urban areas and upgrade urban functions, low land and swamp areas around the existing urban areas of both Dungun and Cukai area are to be developed.

Thus, the major prerequisite for development of the area is flood control which will create larger areas for urbanization. The selection of a development area is largely dependent on the drainage system of the area. The land should be made free from flooding by improvements to either land, river, or both.

On the coastal strip, the deficiencies in infrastructure will be another physical constraint for the rapid urbanization accompanied by the industrial development. For a sound development of the area, for example, the main roads should be so maintained as to be free from flood, and the roads passing through the towns and villages should have enough right-of-way and geometric design and pavement for traffic safety.

7.2.2 Population and Work Places Distribution

Population Distribution:

As studied in section 5.1.1, the estimate of population in the Study Area is approximately 304,300 in the year 2000. It consists of 131,300 urban population and 173,000 rural population, compared with 54,400 and 106,700 respectively in 1983. The share of urban population to the total increases from 34% at present to 43% in the year 2000.

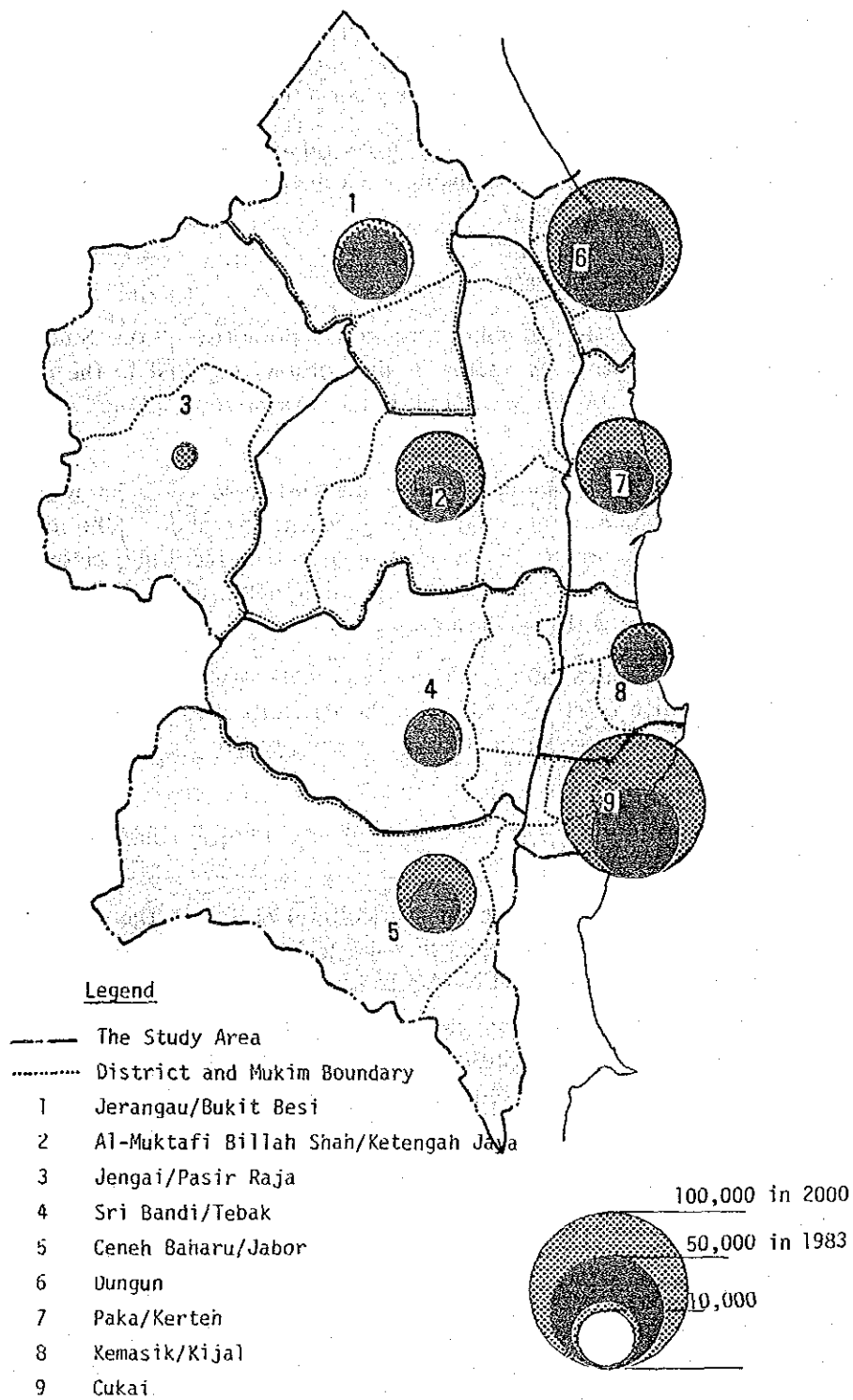
Based on this framework, at the same time, taking into account the population growth trend during the last decade and potential growth, the population distribution pattern in 2000 is projected by zone which is defined as the area integrated with some spatially homogeneous districts/areas as shown in Table 7.1 and Fig. 7.1.

Table 7.1 Population Distribution 1983 – 2000

Zone	Name of Mukim	1983	1990	2000
KETENGAH AREA		59,465 (12,878)	78,000 (25,100)	92,500 (58,400)
1	Jerangau/B. Besi	23,119 (1,496)	25,600 (2,900)	25,700 (5,700)
2	AMBS/Jaya	13,245 (7,742)	21,300 (15,200)	33,700 (29,700)
3	Jengai/P. Raja	1,924 (–)	2,200 (–)	1,400 (–)
4	Sri Bandi/Tebak	11,516 (1,304)	14,100 (2,500)	12,400 (5,000)
5	Ceneh B/Jabor	9,661 (2,336)	14,600 (4,500)	19,300 (18,000)
COASTAL STRIP AREA		101,275 (54,440)	143,500 (83,800)	211,800 (131,300)
6	Dungun	42,192 (36,454)	51,200 (39,000)	75,600 (55,200)
7	Paka/Kerteh	16,376 (–)	24,400 (13,800)	36,000 (18,100)
8	Kemasik Kijal	9,953 (–)	10,400 (–)	15,300 (–)
9	Cukai	32,754 (17,986)	57,500 (31,000)	84,900 (58,000)
TOTAL		160,740	221,500	304,300

Source: The Study Team

Note: The figures in the parentheses show urban or new township populations.



Black circle indicates the population in the year 1983 and Dotted circle the year 2000.

Fig. 7.1 POPULATION DISTRIBUTION PATTERN IN 2000

In the KETENGAH area, the population in the planned new townships will account for approximately 58.4 thousand in 2000, which is equivalent to about 80% of the population to be ultimately settled in the planned new townships.

In the coastal strip area in 2000, the urban population will increase to about 55 thousand and 58 thousand in Dungun and Cukai respectively. The sizes of these two major towns will be similar.

Work Places Distribution Pattern:

Taking into account the economic productive potential in the Study Area, the demands of work places by sector in the coastal strip and in the KETENGAH areas were estimated on the economic framework studied in the Section 5.1.2 as shown in Table 7.1.

In the coastal strip area, about 36 thousand work places will be available in the year 2000, of which 17.9 thousand equivalent to about 50% of the total incremental demand are to be provided by the manufacturing sector, and about 20 thousand in the service sector. On the other hand, about 2.5 thousand work places are to decrease in the agricultural section.

In the KETENGAH area, about 9.5 thousand work places will be available by the year 2000, of which 6.3 thousand are in the agricultural sector and 1.6 thousand in the manufacturing sector. The service sector will provide 1.6 thousand work places as well.

Regarding this distribution pattern, the following should be taken into account for the development programme:

- The decreased work places in the agricultural sector in the coastal strip area will be transferred either to the other sectors in the same coastal area or to the agricultural sector in the KETENGAH area.
- The demand of work places in the KETENGAH area will increase by 2.6 percent per annum which is same as the population growth rate. This means that it is important to intentionally populate through immigration in order to fulfill the demand for labour force.

7.2.3 Spatial Framework

Residential Landuse Demand:

As a whole, the land demand of residential use in 2000 is computed to be about 175 km² under an assumption that average residential densities are 30 persons per hectare in the coastal strip area and 20 in the KETENGAH area excluding the allowance for infrastructures and public uses at 50% of the classified residential area. This area is equivalent to 3.3 percent of the Study Area.

Table 7.2 Work Places Distribution by Sector and By Area 1983, 1990 and 2000

Area	Major Sector	1983	1990	2000	Increase	
					1983 – 1990	1983 – 2000
Coastal Strip Area	Agriculture ¹⁾	6,079	4,900	3,550	-1,180	-2,530
	Mining	383	670	580	290	200
	Manufacturing	4,074	11,250	21,920	7,180	17,850
	Services	20,730	28,250	41,250	7,520	20,520
	Sub-Total	31,266	45,070	67,300	27,610	36,040
KETENGAH Area	Agriculture ¹⁾	15,262	18,830	21,600	3,570	6,340
	Mining	35	40	40	-	-
	Manufacturing	1,112	1,900	2,670	790	1,560
	Services	555	1,670	2,140	1,110	1,580
	Sub-Total	16,964	22,440	26,450	5,480	9,390
The Study Area	Agriculture ¹⁾	21,341	23,730	25,140	2,390	3,800
	Mining	418	710	620	290	200
	Manufacturing	5,186	13,150	24,590	7,960	19,400
	Services	21,285	29,920	43,390	8,630	22,100
	Sub-Total	48,230	67,510	93,750	19,280	45,520

Source: Study Team

Notes: 1) Agriculture includes agriculture, forestry and fishery.

Up to the year 2000, the area of about 80 km² should be newly developed for residential landuse in the Study Area, of which 55.2 km² or 70% should be provided for the residents in the coastal strip area and 24.8 km² or 30% in the KETENGAH area as shown in Table 7.3.

Table 7.3 Residential Landuse Demand

	1983	1990	2000	(Unit: km ²)	
				Increase	
				1983 – 1990	1990 – 2000
Coastal Strip Area	50.7	71.8	105.9	21.1	55.2
KETENGAH Area	44.6	58.5	69.4	13.9	24.8
The Study Area	95.3	130.3	175.3	35.0	80.0

Industrial Landuse Demand:

The area for industrial locations depends mainly on the type of process. Generally the landuse demand is calculated based on the number of work places or employment provided for this sector by using the unit of 30 work places per hectare in the case of a capital intensive type to 250 per hectare in a labour intensive type of industry excluding the area for infrastructures and other needs.

According to this method, the demand for industrial landuse is calculated to be about 610 to 820 hectares for about 25 thousand work places under an assumption that a mixed type of industry is to be formed in the Study Area.

In the meantime, this study carefully examined the possibility of industrial locations focused on industrial development policies and investment aspects shown in the Section 8.2. As indicated by the outcome of that study, the total industrial land demand is summarized to be as follows:

Land Area Requirement	
a) Integrated ethylene complex	200 ha
b) Integrated steel complex	200 ha
c) All other manufacturing processes	100 – 400 ha
<hr/>	
Total land area requirement:	500 – 800 ha

Judging from the results derived from the above two methods, the landuse demand for the industrial development in the year 2000 is likely to be less than 800 hectares.

7.3 SUB-REGIONAL STRUCTURE PLAN

7.3.1 Industrial Development Structure

A basis of the sub-regional structure is obtained by organizing an integrated industrial activity system with diversified industries in a proper manner spatially as well as functionally. In the Study Area there are several potential industries to be encouraged and strengthened such as:

- Off-shore mining of petroleum and gas;
- Primary processing or upstream industries of mineral resources;
- Basic material production like steel;
- Energy generation;
- Fishery and related primary processing industries,
- Agriculture and agro-based industries engaged in primary processing of palm oil, latex, lumber and cocoa;
- Forestry and related primary processing industries;
- Inland mining and related primary processing; and
- Commercial and urban services industries, etc.

Besides these, the downstream industries of petroleum/gas and steel and the related service industries are potential for inducement into the Study Area. Furthermore, tourism is a promising industry.

A spatial structure into which all the industries are incorporated is delineated in Fig. 7.2. This figure conceptually shows interrelationship between industries, major flow of products and the characteristics of the KETENGAH and the coastal strip industries.

For the industrial development scenario, the petrochemical complex, the viability of which is sensitive, will function as a key for further industrial development. Location of the petrochemical complex affects the development pattern of the Study Area. There are two options for its location: one is the Kerteh industrial estate and another is the Telok Kalong industrial estate.

The two options were examined from four aspects, i.e. land acquisition cost, feedstock supply, transportation of materials and environmental impact on the surrounding areas.

The following is the conclusion after the examination:

- In terms of land acquisition cost, no clear difference is apparent between the two options. In Kerteh I.E., the land has not been prepared, but if the estate is constructed the cost is similar to that in Telok Kalong, according to SEDC. Telok Kalong I.E. already started to be constructed.
- In terms of supply of feedstock, Kerteh I.E. is superior to Telok Kalong I.E. Kerteh I.E. has an gas separation plant in its own estate, while Telok Kalong I.E. does not have one and, a new pipe line of 20 km will be required.
- In terms of transportation of petrochemical projects and input materials, Telok Kalong is preferable. In the case of Kerteh I.E., the complex requires the construction of a large scale breakwater, jetty and dredging of channels with a large amount of construction cost. Whilst at Telok Kalong I.E., only a new wharf or jetty is necessary at Tanjung-Berhara Port.
- In terms of environmental impact, Telok Kalong I.E. is more advantageous. In the case of Kerteh, products will be transported to the west coast via Kerteh new town and Cukai and will increase traffic volumes. Consequent location of petrochemical complex in Telok Kalong can minimize negative impacts against the residential environment.

Decision of the location should be made from various viewpoints based on further study. From a theoretical locational point of view, it can be said that:

- If the petrochemical complex will be export-oriented in long run, Telok Kalong I.E. is more suitable for the location because of an effective/efficient international transport of products by using the existing industrial port; but
- If the petrochemical complex is not aimed at an export-oriented complex but at the domestic market, Kerteh I.E. is advantageous because of

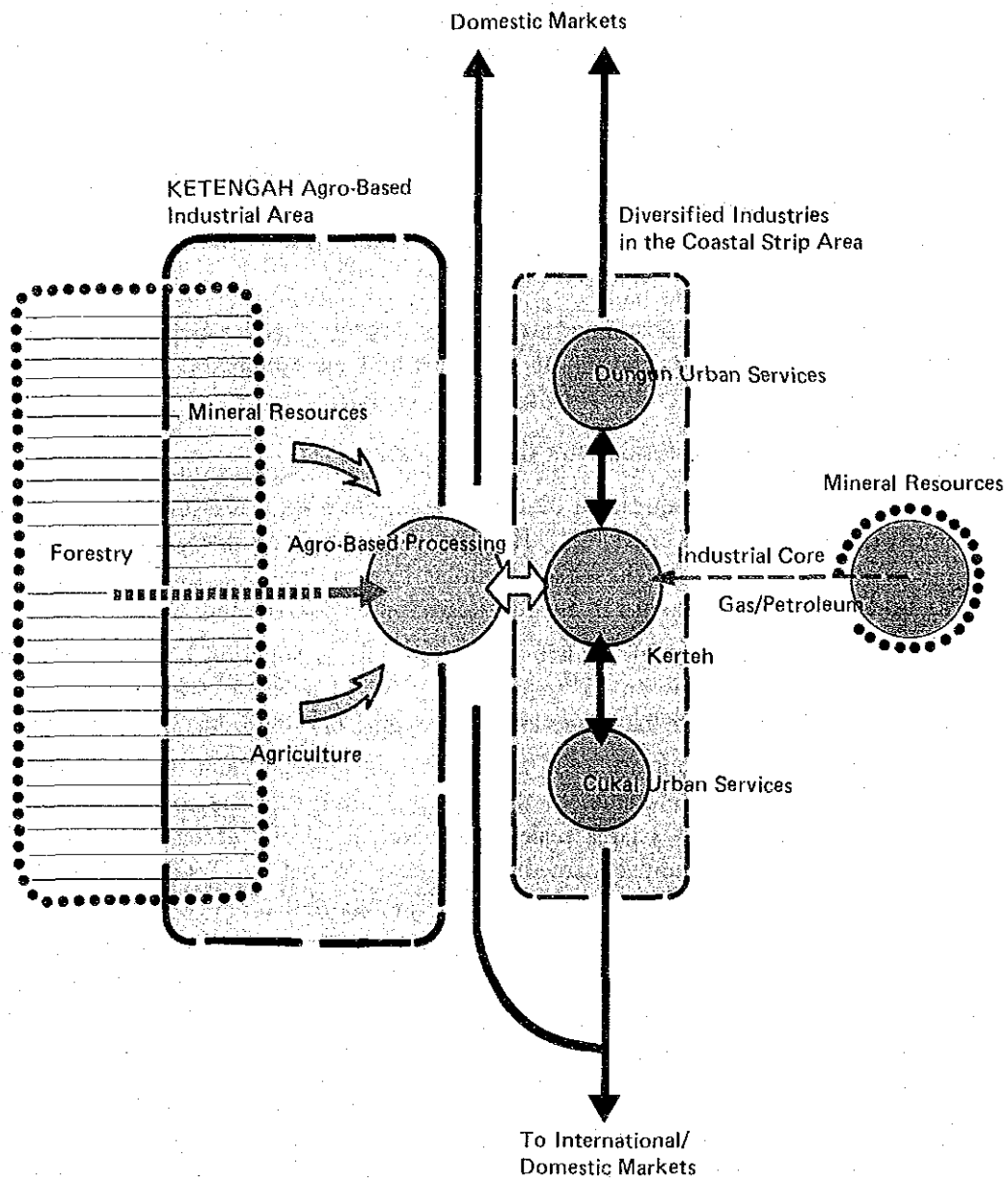


Fig. 7.2 CONCEPT ON INDUSTRIAL DEVELOPMENT STRUCTURE

economical transport of the raw material without large initial investment for pipeline construction.

The best option should be determined on the market which is to be supplied.

7.3.2 Human Settlement Hierarchy

Terengganu Master Plan Study (TMPS) proposed a settlement hierarchy system. Reviewing the system, the Study Team basically follows the same proposal. The proposal is a spatial development system with a five-tier settlement hierarchy as shown in Table 7.4.

TMPS also pointed out that the close linkage between centres is a significant factor for development, and setting up of an adequately organized public transportation network is strongly recommended.

Proposed settlement hierarchy in 2000 is shown in Table 7.5 and Fig. 7.3 and schematic road network after 1985 are shown in Fig. 7.4.

In this settlement hierarchy system, Dungun, Kerteh and Cukai are classified as sub-regional centres. The study team proposes the "Growth Corridor" as a metropolitan function formed by integrating these three centres. The level of services to be provided by the "Growth Corridor" will be high enough to support expected industrial development as well as basic urban functions.

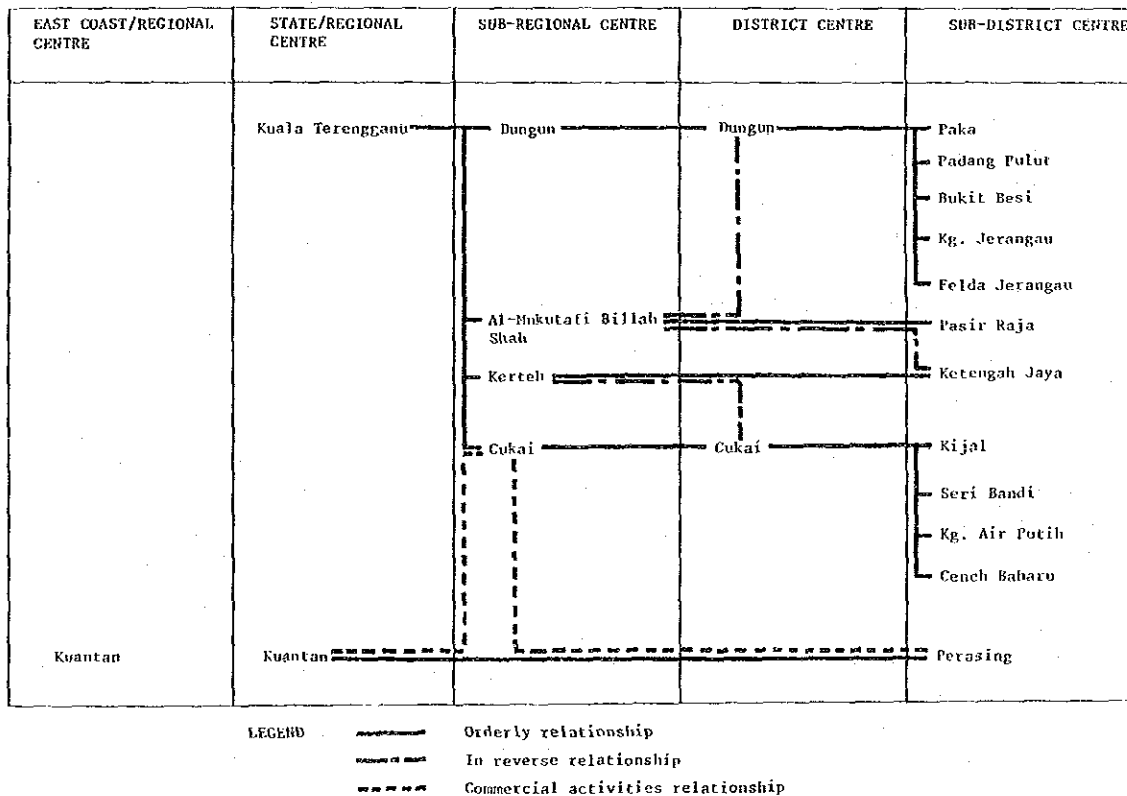


Fig. 7.3 SETTLEMENT HIERARCHY AND INFLUENCE RELATIONSHIP OF CENTRES

Table 7.4 Recommended Double-Tier Hierarchy

Policy Rational	Level within Hierarchy (No. of Centres)	Main Function	Area of Influence	Action Emphasis	
State's Economic and Social Goals	I. State/Regional Centre (1)	Promote Regional/Sub-regional Economic Growth	Whole State/Region	Development of Specialized Services	
	Economic Growth	II. Sub-regional Centre (2-5)	Sub-region	Industrial Infrastructure	
				Housing	
	Equitable Service Provision	III. District Centre (6)	Administration. Some Tertiary Services	District	Administration Coordination
		IV. Sub-district Centre (23/28)	Secondary-level Services	12-20 km Radius	Coordinated Planning for Government Administration
V. Local Centres (48)		Primary-level Services	1-5 km Radius	Provision of Minimum Services	

Source: TMPS, Nov. 1983

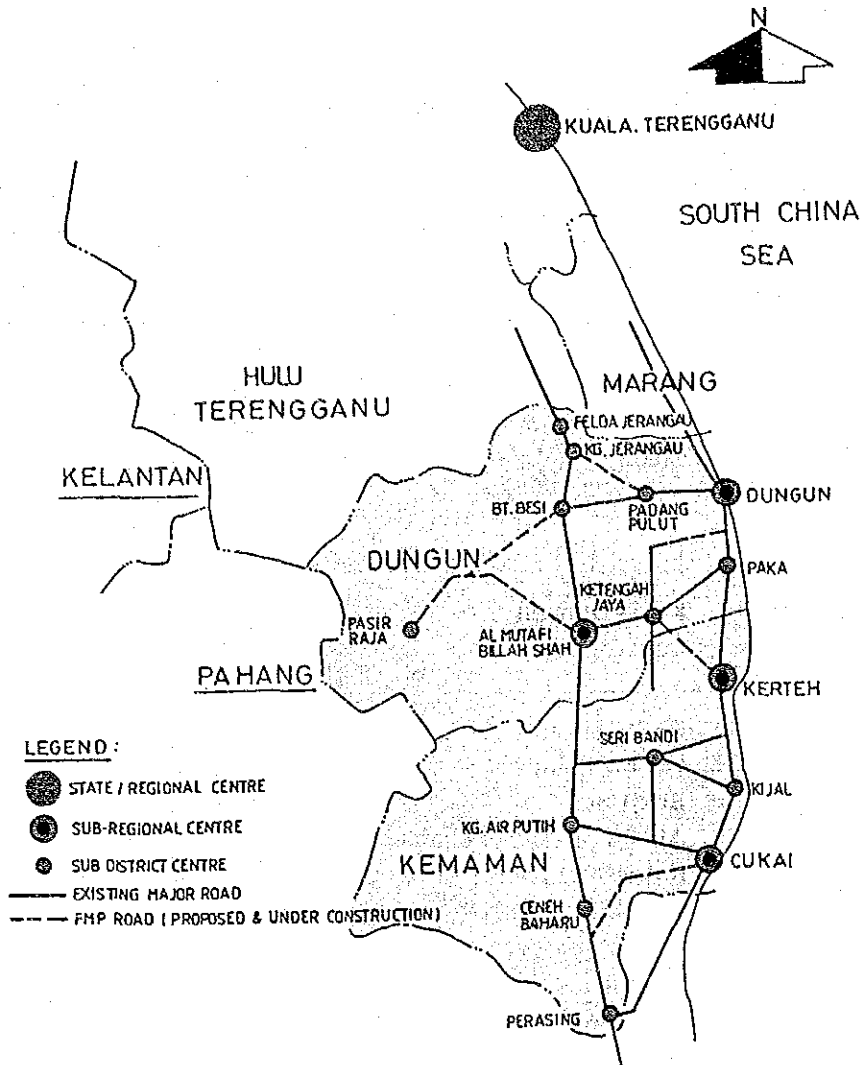
Table 7.5 Proposed Settlement Hierarchy 1980 and 2000 in South Terengganu

Level in Hierarchy	1980 (Population)		2000 (Population)	
1. State/Regional Centre	Kuala Terengganu	(186,608)	Kuala Terengganu	(365,000)
2. Sub-Regional Centre	Kuala Dungun	(29,569)	Kuala Dungun	(58,000)
	Cukai	(16,059)	Cukai	(39,000)
			Kerteh	(36,000)
			Al Mukatafi Billah Shah	(15,000)
3. District Centres	Kuala Dungun Cukai		Kuala Dungun Cukai	
4. Sub-District Centres	Kg. Jerangau*		Kg. Jerangau	
	Padang Pulut (2)		Padang Pulut	
	Bukit Besi		Bukit Besi	
	Al Muktafi Billah Shah (1)		—	
	Ketengah Jaya (2)		Ketengah Jaya	
	Paka (2)		Paka	
			Felda Jerangau (3)	
	Kerteh		—	
	Kemasik		—	
	Kijal (2)		Kijal	
	Seri Bandi (2)		Seri Bandi	
	Kg. Air Putih*		Kg. Air Putih	
	Ceneh Baharu		Ceneh Baharu	
			Perasing (3)	
		Pasir Raja (3)		

Possible priority centres

- (1) KETENGAH population projections gives Al Muktafi Billah Shah a revised 1990 population of 8,000. The projection adopted here assumes later development and a lower growth rate, although designated as a sub-region centre within KETENGAH, Al Muktafi Billah Shah is considered unlikely to fulfill that role for several years.
- (2) The role of these centres should be re-examined in view of recent developments in the sub-region.
- (3) These local centres may assume sub-district centre status.

Source: TMPS, Nov. 1983



Source: TMPS, Nov. 1983

Fig. 7.4 SCHEMATIC OF ROAD NETWORK IN THE STUDY AREA AFTER YEAR 1985

While Al-Muktafi Billah Shah located in the KETENGAH area is ranked at another sub-regional centre, the population of Al-Muktafi Billah Shah is about 2,120 at present and is projected at 13.3 thousand. As long as the magnitude of population is noted, it seems to be difficult for Al-Muktafi Billah Shah to function as a sub-regional centre in the initial phase of the planning period. However, its locational significance should be taken into account.

From a locational viewpoint, the two centres of Ketengah Jaya and Seri Bendi which are ranked at sub-district centre level are evaluated to be significant because of their intermediate locations between the KETENGAH agricultural area and the coastal strip area. These two centres are promised to accommodate various urban service functions including agro-based processing and some transport service industries. Ketengah Jaya and Seri Bendi will have population of about 20 thousand and about 7 thousand in 2000 respectively.

7.3.3 Urban Function

Enlarging one urban town such as Cukai or Dungun is not realistic because land suitable for an expanded urbanization is not sufficient and under the circumstances the cost of land development will be high.

An encircled linkage of the towns such as Cukai, Kerteh, Seri Bandi, Ceneh Baharu, etc. was studied. The original purpose of the towns in the KETENGAH area was to develop a community for those whose majority are engaged in the estate production system. If they are transformed into an urban community to support the development of manufacturing sectors, the provisions of infrastructure and urban amenities necessary for the location of plants will require a high cost. In addition, physical conditions must be adjusted accompanying also a high cost to accept a rapid and large scale urbanization.

The development of the coastal area, using the existing towns of Dungun, Kerteh and Cukai has the following advantages.

- Although the urban size is small at population less than 30,000 respectively in 1983, there are already built up infrastructure and urban amenities.
- Land availability is not sufficient. However, difficulty for urban expansion will be quite less when the expansion is spread over these towns, if compared with other plans.
- Kerteh is under construction inbetween Cukai and Dungun to built a new modern township specifically related to PETRONAS production activities. In addition, it can expand spatially further to accept new plant locations.

Basically the Team recognizes that the growth corridor consisting of the three major towns of Dungun, Kerteh and Cukai functions as one urban centre to serve the whole hinterland of the Study Area with population of 304 thousand in 2000 at basically high functional level. However, at middle or low functional levels, each town is to possess its own urban service functions in response to the magnitude of its hinterland designated in the settlement hierarchy system, namely both Dungun and Cukai are the centres of about 100 to 150 thousand populated community and Cukai is the centre of a 50 thousand community in 2000.

Regarding high level urban functions, the Study Team proposes the establishment of an allocation system for basic urban functions to be encouraged by taking into account the characteristics of each town's endowment.

High level urban functions are classified into 7 categories as below:

- (Public) Administration function;
- Commercial and business functions;
- Education function;
- Medical care function;
- Recreation function;
- Distribution function; and
- Production (Industry) function.

The allocation of urban functions among the three core towns is proposed as shown in Fig. 7.5 and summarized as follows:

Function	Dungun	Kerteh	Cukai
1. Administrative	***	—	**
2. Commercial/Business	***	**	***
3. Education	***	*	*
4. Medical Care	**	**	**
5. Recreation	***	**	*
6. Distribution	*	*	***
7. Industrial	*	**	***

Note: *** Sub-regional level
 ** Intermediate
 * Town level

Fig. 7.5 HIGH LEVEL URBAN FUNCTIONS ASSIGNMENT

Dungun:

It is recommended that Dungun town is fostered as a commercial/business centre with a wide variety of urban services such as administrative, educational and recreational functions. Recognizing the significance of human resource developments to cope with the forthcoming industrialization, a higher educational function including vocational system should be enhanced especially in the potential town of Dungun.

Kerteh:

Kerteh, a new modern township, under construction between Cukai and Dungun, is to be built specifically with a relationship to PETRONAS production activities. In addition, it can be expanded spatially to accept new plant locations.

Kerteh is a promising town characterized by a petroleum/gas-related industry. By using this predominant characteristic, Kerteh town should be deliberately developed to be a comprehensive new town with residential, recreational and commercial functions.

Cukai:

Cukai town is located strategically for the best accessibility to Kuantan International Port and the gateway to the major domestic markets such as Kuala Lumpur, Johor and Penang via Kuala Lumpur. An emphasis, therefore, should be placed on a strengthening of the industrial development potentials to a maximum. A goods-distribution function is recommended to be fostered in this town,

considering the locational advantage. Commercial, business and financial services to support industrial/distributional activities will inevitably be developed. Tourism promotion based on the natural assets is also an important factor to stimulate the urban activities in this town.

It is needless to say that these towns should be well related to each other by developing an infrastructure free from floods and providing a public transportation system. At the same time, on formation of an integrated sub-regional structure, the following should be kept in mind:

- 1) Due to the limited urban land availability and flood problems, development of the urban area should be kept compact. This will permit better accessibility to working places, better housing environment, and less cost for unproved infrastructures than a dispersed urban area.
- 2) A public transportation network to maintain sufficient mobility for less travel time is a most important factors.
- 3) Improvement in accessibility between the coastal strip and sub-district centres in the inland is also significant for integrating activities between the coastal strip and the hinterland.

7.3.4 Communication System

A communication system in the Study Area should functionally ensure the proposed settlement hierarchy system, i.e., the communication between the settlement centres with the higher level functions is provided with the higher ordered infrastructure. This is the so-called "Ordering System Approach", which is a common method used in planning a communication network system.

For application of this method, the functional level for communication is classified into three categories, primary, secondary and tertiary connectors.

Each connector responds to hierarchy system of settlement centres and, road, public transportation and other infrastructure network system. Based on this concept, the Study Team defines a communication hierarchy system as shown in Table 7.6.

This system is based on a recognition that the development/design level should be effectively decided in response to the magnitude of required functions as well as of needs.

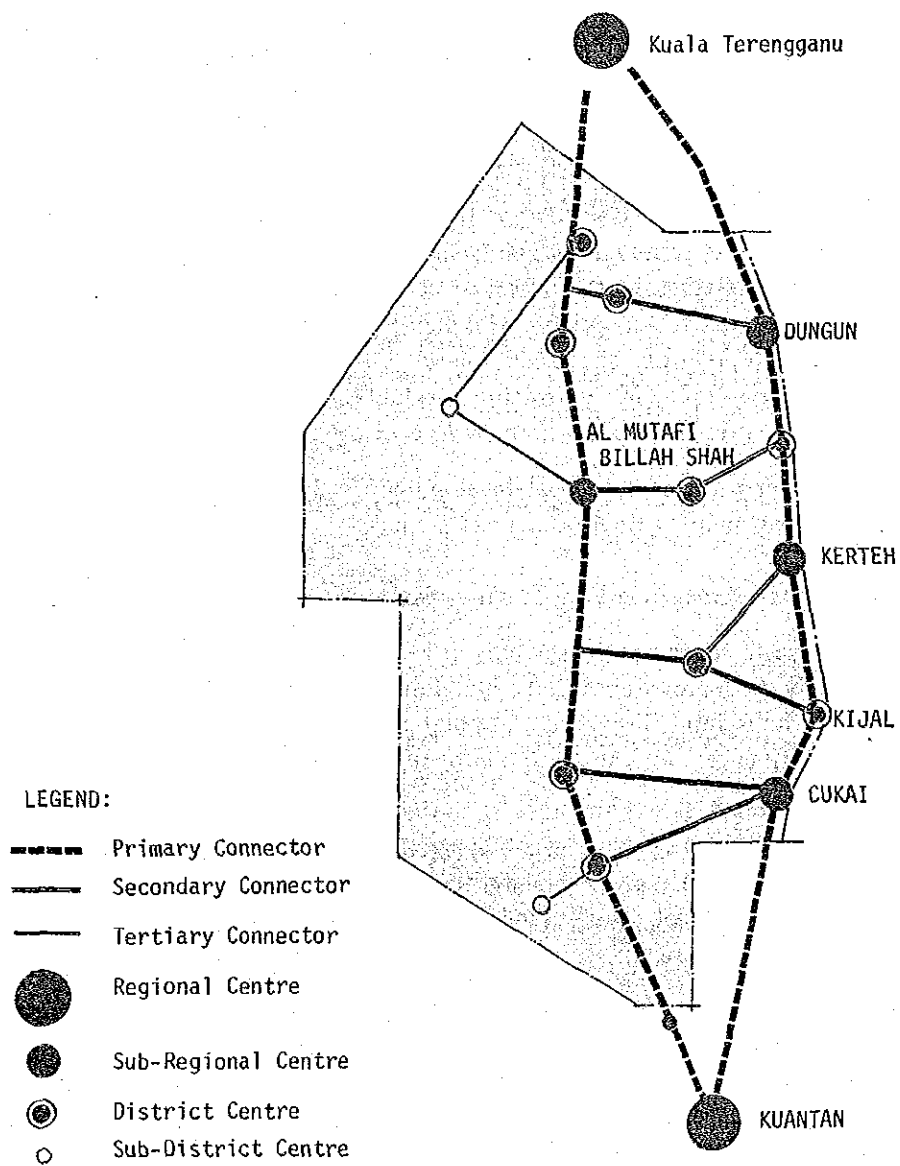
Fig. 7.6 conceptually shows the proposed communication network system in accordance with the above. A dual axis and ladder pattern can be delineated as a basic sub-regional structure in the Study Area. This structure is recommended to be the basis of planning all the infrastructures.

Table 7.6 Communication Hierarchy System

	I Primary Connector	II Secondary Connector	III Tertiary Connector
Relation with Settlement Hierarchy System			
-- Regional Centre			
-- Sub-Regional Centre			
-- District Centre			
-- Sub-District Centre			
Road Network System	Inter-regional Major Road	Regional Major Road	Regional Road
(Function)	(Arterial)	(Collector)	(Local)
-- Responsibility --	-- Federal --	-- State --	-- Local --
Public Transportation Network System	Inter-regional Service Route	Intra-regional Service Route	Community Service Route
Other Infrastructure	Stem Line	Sub-Stem Line	Feeder Line

7.3.5 Environmental Aspect

Together with industrialization and urbanization, the environment changes. A development imposes a load on the environment by emitting waste substances and energy into the common property of the people. When the load exceeds the limit of environmental purificative and restorative capacity, co-existence of the people with the environment would be seriously damaged. Compared to the remedial cost and effort, the prevention of environmental deterioration in advance is recognized as a more effective and cost-saving method. Thus, environmental planning of industrialization and urbanization is needed beforehand to achieve an overall enhancement of the living environment and the balanced development of the region.



Source: Study Team

Fig. 7.6 SUB-REGIONAL BASIC SPATIAL STRUCTURE IN SOUTH TERENGGANU

Environment Planning in Industrialization:

The environmental planning in industrialization should give great attention to conservation of nature so as not to deteriorate the attractiveness of the natural resources such as Rantau Abang, famous for egg-laying by the giant turtle.

In the construction stage of industrial plants, provision of green belts between the industrial area and the residential area should be considered based on the guidelines for establishment of industrial complex and Town and Country Planning Act as well.

The procedure and guidelines for environmental impact assessment in Malaysia have been developed in line with the government policy statements contained in the Third Malaysia Plan 1976 -- 1980 (TMP). It is recognized that development and environmental conservation should be kept in balance so that the benefits of development are not negated by environmental damage and disruption.

The guidelines recommend preparation of the Preliminary Assessment in the pre-feasibility study, and the Detailed Assessment in the feasibility study. The Environment Impact Assessment Handbook prepared in 1979 shows a list of projects which require the Preliminary Assessment. The list shows that all manufacture processes for petroleum products, and all of the basic metal industries are required to prepare an Environment Impact Study.

For the further study of industrial development in the study area, close coordination with the Department of Environment is needed.

Environmental Management in Town Areas:

The solid waste management systems in Dungun and Cukai, and the water quality in the Study Area are discussed. To maintain a good quality of life, the management systems of household discharges cannot be neglected. The water quality of rivers is largely influenced by the discharge of individual households as well as from the industries.

The municipal waste in Dungun is collected daily except on Friday by lorries, and dumped at Bukit Lat landfill site and burned in the open air. The other dump site is along the Santon Road, about 6 km west of Route III. This site receives the waste from the Paka area as well.

The municipal waste in Cukai is also collected daily except on Friday by lorries, and dumped at Paya Geliga landfill site, and burned in the open air. But as this area is being developed as a residential area, the site will be changed to Bukit Takat. The Town Council of Cukai also covers the Kerteh area. The construction waste at Kerteh is, however, managed by the private sector.

The waste discharge from both towns is mostly left over fruit and paper. Both Districts have a programme to install an incineration plant in the near future to burn especially the wet waste during rainy season, because burning of the waste in the open air is difficult during this season. The solid waste management of Dungun and Cukai will be strengthened by the installation of an incineration plant

at some future date. The collection system should be upgraded so that the waste is not left on the street or thrown into the river.

Regarding the waste water management, the Study Area is drained by 4 major river systems: Sg. Kemaman/Cukai, Sg. Kerteh, Sg. Paka and Sg. Dungun classified as 38, 39, 40 and 41 respectively under the Water Quality Control Regions (WQR). According to the data obtained at the monitoring stations set up in these regions, most of the rivers in the Study Area are clean in terms of Biochemical Oxygen Demand (BOD) except the two tributaries of Sg. Kemaman, the Sg. Raansan and Sg. Neram. These small rivers suffer most severely from the discharged wastes from palm oil mills.

As to suspended solids, a large portion of the rivers were found to exceed 50 mg/l which is a limit for drinking water as indicated in the Environmental Quality (Sewage and Industrial effluents) Regulations 1978. This is probably due to soil erosion from township and agricultural developments and others in the upstream areas. The soil erosion and siltation of rivers necessitates flood control, regulation of stream flows and purification of water supplies.

Municipal wastes affects the water quality in the towns when these enter the water bodies. These are garbage and sewage from households, public markets and industries. The absence of sewage treatment systems is the main cause of the city-type water pollution.

These industrial and urban activities influence the water quality when not managed properly, thus quality control should be pursued properly in conformance with the related regulations.

7.4 DEVELOPMENT PHASING

The strategies above are proposed to be implemented in a phased manner to correspond with changing roles of the South Terengganu sub-region in meeting the challenges of industrialization, urbanization and regional integration. Three principles of sub-regional development to be used are (1) maximization of resources utilization, (2) integration of on-going projects and (3) optimum distribution of human resources. Fig. 7.7 shows such phased strategies toward the year 2000.

The sub-regional development is initiated by strategies to maximize the existing resource utilization. Upon completing the on-going projects/programmes, the next strategy will be to integrate them into a maximized resource utilization system of medium term, when a horizontal and vertical diversification of industry will be realized in the sub-region. The ultimate stage is aimed at establishing an optimum distribution system in terms of human resources, income and capital in an equitable manner.

Fig. 7.8 describes the breakdown of such phased strategies by element for short, medium and long term projections.

Basically the Study Team proposed that for the KETENGAH agricultural development great emphasis should be placed upon full-operation in the short term. This performance will form a sub-regional economic/industrial base.

The coastal strip area development based strategically on the petroleum/gas and steel related industries should be intensively encouraged next through agro-based industries development in the medium term. This dual economic basis of the inland and the coastal industries is an indispensable condition to ensure the sound integrated sub-regional socio-economic system.

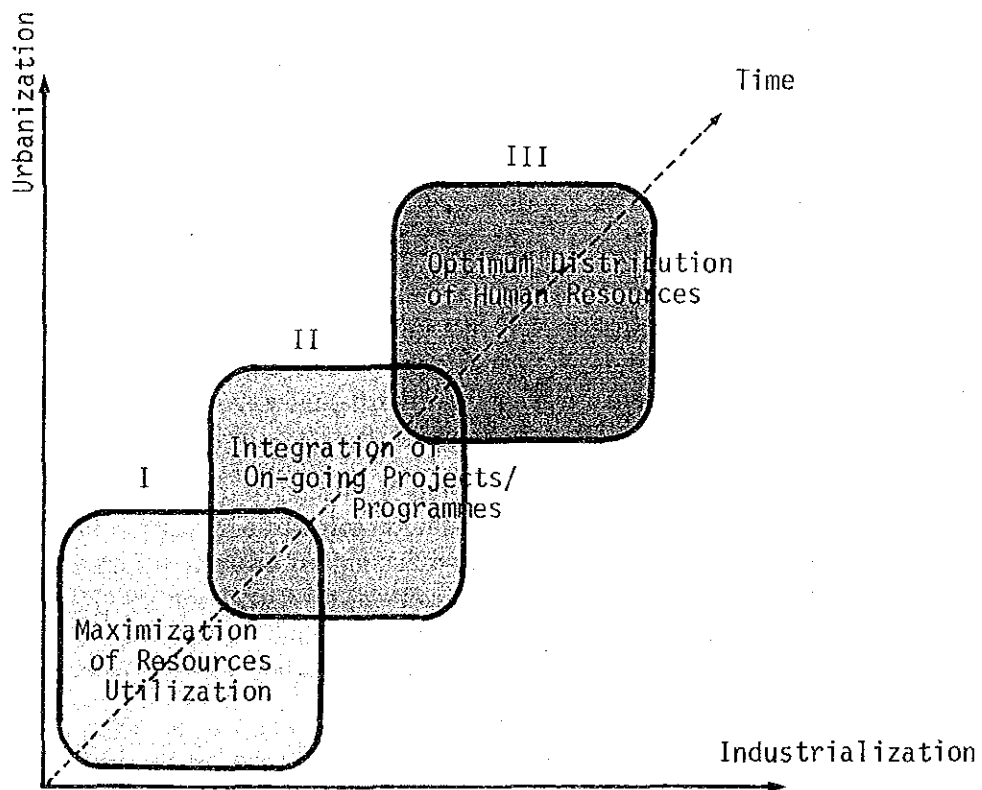


Fig. 7.7 CONCEPTUAL SCHEME OF PHASED DEVELOPMENT STRATEGIES

	SHORT TERM	MEDIUM TERM	LONG TERM	
Strategies:	Maximization of Resources Utilization	Integration of On-going Projects/ Programmes	Optimum Distri- of Human Resources	
Industriali- zation Based on:	KETENGAH Agro-Based Industry Petroleum/Gas and Steel Bases Development	Downstream Industry Diversified Industry Development		
Integration through:	Human Settlement System Social Infrastructure Development	Human Resources Development		
Urbanization Based on:	Flood Mitigation	Major Infrastructures Formation Urban Functions Encouragement	Urban Expansion	

Fig. 7.8 PHASED STRATEGIES FOR SOUTH TERENGGANU DEVELOPMENT

PART III

PROJECTS AND PROGRAMMES



CHAPTER 8 DEVELOPMENT PROSPECT ON SELECTED THEMES**8.1 GENERAL**

As fundamental components to support the regional development, the following four elements have been noted.

- 1) Production activities to support the regional economy, especially industries in the South Terengganu coastal strip;
- 2) Urban areas as settlement centres to support the production activities of industries;
- 3) Social system which corresponds to the required educational level and training of skills for the modernization and industrialization of the society;
- 4) Physical infrastructure which supports all regional activities in sufficient service levels.

As all these components described above are closely related and none of them can exist independently, a coordinated development programme is indispensable. The theme of rivers and river basin drainage as a significant viewpoint of physical infrastructure is selected because they are considered to be the largest constraint against coastal strip development of the infrastructures. Environmental aspect is also taken into account in the scheme of the industrial and urban developments.

The Sub-Regional Development Plan 2000 in which all considerations and proposals are summarized is shown in the figure attached at the head of this report, and the major projects/programmes are delineated as shown Fig. 8.1.

8.2 INDUSTRIAL DEVELOPMENT**8.2.1 General**

The industrial development strategies and development programmes applicable to the South Terengganu area in line with the contents of the Terengganu Master Plan Study (TMPS) are studied here. Although Kuala Terengganu is designated, in TMPS, to be the regional centre with central administrative and commercial distributional functions, no clarification is given as to which town should bear the function of industrial growth pole for the State. The objectives of the industrial development in the South Terengganu region are:

- Promotion of industrialization as the large-scale 'model' or 'prototype' venture of success for the hitherto less developed east coast area;

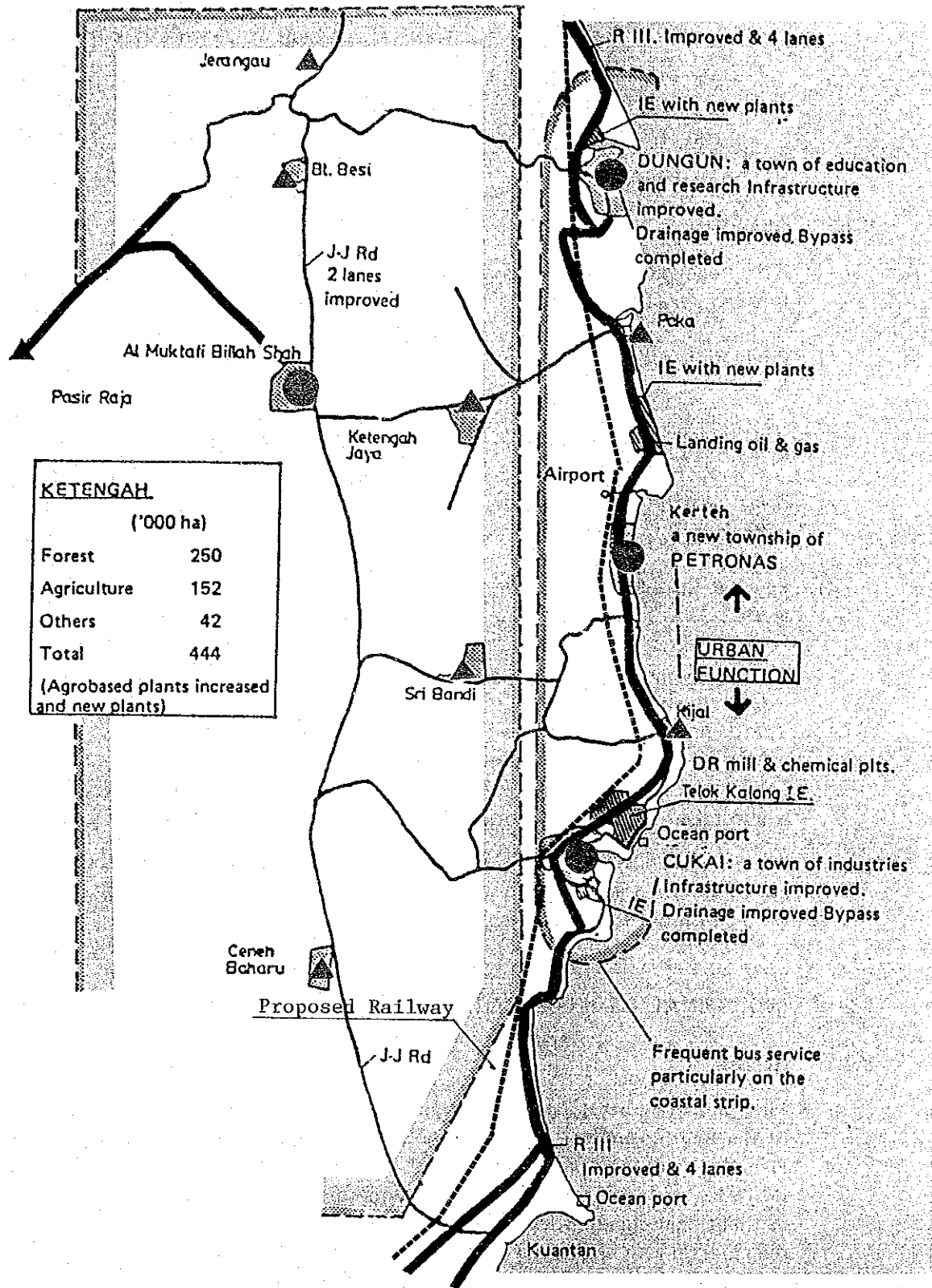


Fig. 8.1 PROJECTS AND PROGRAMMES FOR SUB-REGIONAL DEVELOPMENT IN SOUTH TERENGGANU IN 2000

- Securing the sustained industrial growth of the region in the long term perspective, capable of perpetually giving impetus for industrial development over the State.

8.2.2 Problems and Constraints

Adequate identification of problems and constraints can imply a direction for future development as well as projects/programmes to be undertaken. The following are crucial problems/constraints of the industrial development in South Terengganu Sub-Region:

- 1) The region's extent of industrial accumulation is still embryonic, though large scale industrial bases are about to be formed very soon.
- 2) Quantitatively the size and number of manufacturing establishments are small in absolute terms. Qualitatively the region's manufacturing industrial structure still has to evolve into a solid interdependence between the establishments through intrasectoral transaction.
- 3) The areas already constructed and designated for industrial use are large enough when compared to the demand forecast. However related services are not satisfactory as yet.
- 4) The serviceability of some supporting infrastructures for the industrial estates in Terengganu is relatively poor as viewed from the national average. The indicative figures as of December 1982 from MIDA are shown in Table 8.1:

Table 8.1 Comparison of Industrial Supporting Infrastructure Serviceability between Terengganu and National Average

Infrastructure	Indicators	Serviceability (End of 1982)	
		Terengganu	National Average
Power	Power supply capacity surplus (in average MVA/ha)	0.053	0.534
Telecommunication	No. of telephone lines still available (in average lines/ha)	1.61	5.68

Source: MIDA

8.2.3 Development Strategy

Industrial development strategies should take note especially the following two aspects:

1) Establishment of Effective Location System

The State's manufacturing industrial growth is hitherto contributed by both the growth of existing manufacturing firms and by the establishment of new manufacturing firms locating into the State. In applying location policies, the 'mix' policy to be applied for the next stage should be undertaken under the following conditions:

- Existing factories and plants wherever they are located in the State may continue to occupy the same site;
- Agro-based industries engaged in the primary processing of lumber, palm oil, rubber and other indigenous resources may operate and/or expand their operations at their present site;
- Of the total number of manufacturing factories and plants established each year, 25 – 50% of them are able to establish in south Terengganu, of which 70% are assumed to be guided into the predesignated industrial estates. Implementation of the State's own incentive scheme is implied in this estimate together with the provision of an industrial infrastructure with high serviceability; and
- A policy to promote locations during the initial and mid-term periods should be in a manner of concentration in consideration of economy of agglomeration. Distribution into the scattered districts should come in long run;

2) Inviting new enterprises and raising local enterprises.

- Enterprises operating outside of the State should be specifically invited to relocate in short term. Raising local enterprises into small and medium scale industries should be given priority in medium term. Raising of the medium sized plants within the State should be promoted by the coordinated efforts of financial, technical and marketing organizations.

8.2.4 Possibility of New Locations

Based on analysis of trend and potential of industrial investment activities, the possibility of new industrial establishments was projected in two cases: one is the case that an intensive effort to invite industrial investments is undertaken by improving the incentives as well as by provision of adequate infrastructure for industrial activities, and the other is the normal unsponsored investment trend.

This projection as shown in Table 8.2 shows some notable outcomes as follows:

- The South Terengganu sub-region is able to induce approximately 40% of the new establishments expected in the State.

Table 8.2 Incremental Number of New Industrial Establishments between 1984 – 2000

	South Terengganu			Other Regions	Total in the State
	KETENGAH	Coastal Strip	Total		
<u>LARGE SCALE</u>					
With Intensive Effort	19	62	81 (44)	104 (56)	185 (100)
With Normal Effort	11	33	44 (44)	56 (56)	100 (100)
<u>SMALL/MEDIUM</u>					
With Intensive Effort	41	140	181 (41)	265 (59)	446 (100)
With Normal Effort	23	76	99 (41)	144 (59)	243 (100)
<u>COTTAGE TYPE</u>					
	–	–	75 (37)	129 (63)	204 (100)
<u>TOTAL</u>					
With Intensive Effort	–	–	337 (40)	498 (60)	835 (100)
With Normal Effort	–	–	218 (40)	329 (60)	547 (100)

Source: The Study Team

Note: The figures in the parenthesis show the share of the total in the State.

- With an intensive effort, about 337 firms can be newly established in the Study Area, of which 81 firms are large scale ones, and 181 are small/medium scale.

On the other hand, with only the normal effort, only about 218 firms can be expected to locate in the Study Area.

Fig. 8.2 illustratedly shows the industrial location structure including the existing firms.

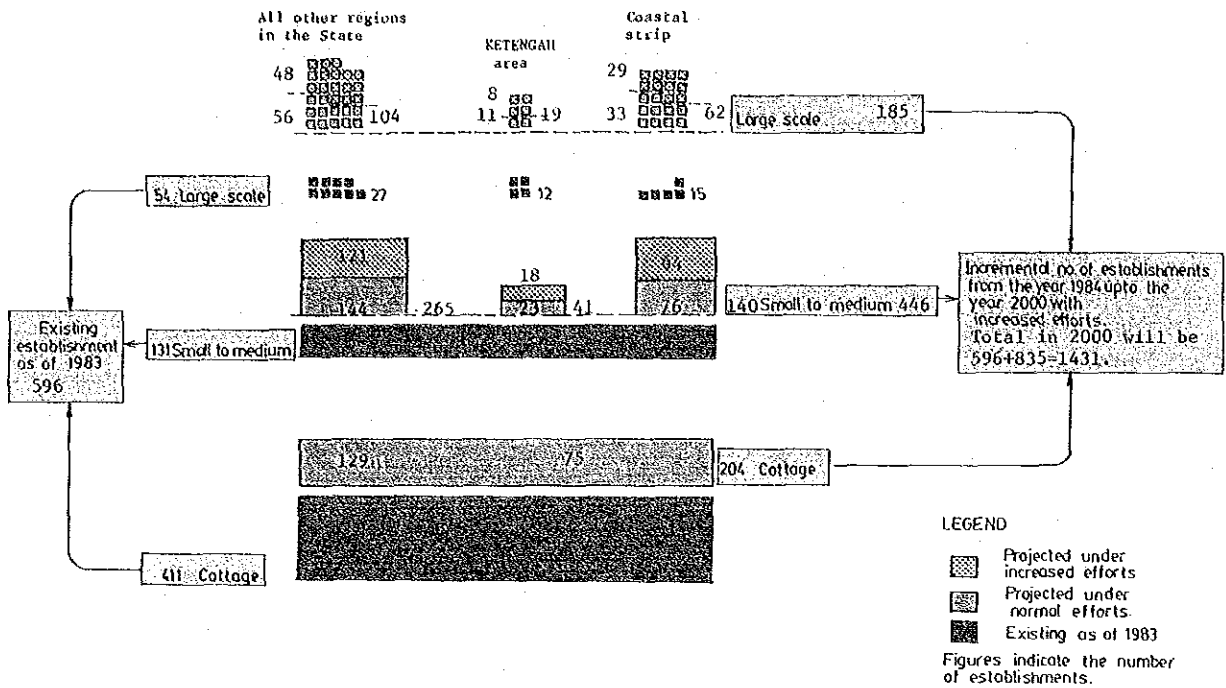


Fig. 8.2 PROJECTED NUMBER OF MANUFACTURING ESTABLISHMENTS BY SIZE AND BY REGION IN THE STATE OF TERENGGANU

8.2.5 Findings

The following are the notable findings identified during the Study:

- 1) The supply of industrial land is sufficient to meet the demand for industrial locations. If the incremental area requirements of gas-based downstream and steel downstream industries are added to the ongoing projects, the total will be 700 to 800 ha.

It is recommended that Telok Kalong industrial estate be the main supplier of industrial land as it can be developed to supply 700 ha. of saleable land.

- 2) The Telok Kalong industrial estate has the highest potential for an intensive industrial development amongst the industrial estates of the state. As it is to be given the highest priority for development, both investment promotion and provision of high standard supporting infrastructure should be concentrated together in the initial to mid-term perspectives. It will be developed under the growth pole concept.
- 3) Manufacturing industrial sub-sectors under the four digit industrial classification are reviewed in terms of application of selected location possibility criteria. The outcome shows that 28 manufacturing sub-sectors are identified to have higher potential for location in the study area besides the ongoing DR mill and basic petrochemical complex. This is shown in Table 8.3 together with an appropriate phased timing of location.

In this scheme, a diversified industrial structure is delineated towards the future from an agro-based in short run to new-technology based industries in the long run. However, in order to realized this feature, the performance at the initial stage is very important because the development potential at the subsequent stage strongly depends on capital and assets cumulated at the preceding stage such as technologies, capitals and especially human resources.

The types of manufacture expected to be established in the third phase will require a number of skilled workers.

Table 8.3 Manufacturing Types with Potential of Location by Phase

Item	Industrial Classification Number	Industrial Classification I-O Table	Description	Initial - 1990	Mid-term - 1995	Last - 2000
1.	3112	18	1 Dairy Products	•		
2.	3115	21	2 Palm Oil	•		
3.	3116	24	3 Rice Milling	•		
4.	3119	31	4 Canning and Preserving of Fruits and Vegetables	•		
5.	3122	33	5 Prepared Animal Feeds	•		
6.	3311	43	6 Wood Products	•		
7.	3412	49	7 Paper Products		•	
8.	3420	50	8 Printing and Publishing		•	
9.	3521	54	9 Paints, Varnish and Lacquers		•	
10.	3522	55	10 Drugs and Medicines			•
11.	3529	57	11 Other Chemical Products		•	
12.	3551	60	12 Tyre and Tubes		•	
13.	3559	59	13 Natural Rubber, Other than Latex	•		
14.	3560	62	14 Plastic Products		•	
15.	3620	64	15 Glass and Glass Products		•	
16.	3691	67	16 Other Non-Metallic Mineral Products	•		
17.	3692	65	17 Cement, Lime and Plaster	•		
18.	3699	66	18 Cement Products	•		
19.	3710	69	19 Iron and Steel	•		
20.	3819	72	20 Structural Metal Products and Other Fabricated Metal Products	•		
21.	3822	74	21 Agricultural Machinery and Equipment		•	
22.	2824	76	22 Other Non-Electric Machine		•	
23.	3831	77	23 Electrical Industrial Machinery and Apparatus		•	
24.	3832	79	24 Radio, TV, and Electronic Equipment			•
25.	3839	79	25 Cable/Wires, Dry Batteries, Lamps and Tubes			•
26.	3841	80	26 Ship Building & Repairing			•
27.	3843	82	27 Motor Vehicles			•
28.	3844	83	28 Motorcycles and Bicycles			•

8.2.6 Conclusions and Recommendations

The following three conclusions and recommendations are identified during the Study:

- 1) Reviewing industrial development prospects, the coastal strip has higher potential than the estates in the inland KETENGAH area, however, some selected types of manufacture are more suitable for location in the KETENGAH area. The resource-based industries engaged in primary processing of palm oil, latex, lumber, cocoa, clay for brick making etc. should continue to be located in the KETENGAH area and to be expanded in accordance with the planned agricultural and other production growth.

However, the location of downstream industries related to petrogas and steel should be concentrated around the existing core of those industries, particularly the Telok Kalong Industrial estate. They include manufacturing of paints, varnish and lacquers (Industrial Classification No. = 3521), industrial chemical products (I.C. No. = 3529), plastic products (I.C. No. = 3560), structural metal products (I.C. No. = 3819).

Assembly type industries such as agricultural machinery and equipment, etc. (I.C. No. = 3824) should be located in the well developed industrial environment during the later stage of the planning horizon, up to the year 1996 and onwards. This group of industries will also be located mainly around the coastal area. The timing of location by industry types and their representative products are shown in Table 8.4. The staged industrialization programme for raising local enterprises in the Study Area and for new enterprises coming from outside are also shown in the Table 8.4.

- 2) It is recommended for the State to provide State's own specialized incentives to attract new investors. Several incentives for more effective industry promotion, which is relevant to the south Terengganu development, are proposed as follows:

Investment Incentives:

- subsidies to the strategic types of newly located industries.
- provision of land at a discounted price.

Labour Assistance:

- aid for the transfer cost of imported workforce;
- provision of public commuter service; and
- labourer's training.

Subsidies:

- for company relocation costs.

Preferential grant of public purchase contract

Table 8.4 Industrialization Programme in the Study Area Up to 2000

	Initial	Mid-Term	Last
Leading Industries Petro-Gas & Steel	Develop the core sector	Develop the downstream industries	Develop further downstream Industries
Inviting Plants from Outside	Wider range in the types of industries	Metal & machines, chemicals, etc.	Subsectors with higher value added
Rearing Enterprises in the Area	Provision of well coordinated financial, technical assistance	Raising linkaged sub-sectors	Formation of industrial complex
Measures to be Executed	<p>Start the agglomeration</p> <p>A wide range of industry types are expected</p> <ul style="list-style-type: none"> • High growth • High cost ratio of transport • Less linkaged • Medium sized leading industries determined 	<p>Enlarge the agglomeration</p> <p>Selected types of industries</p> <ul style="list-style-type: none"> • Large linked impact • High growth • High added value • Linkage with local sector • Medium sized leading industries and downstream industries 	<p>Partial spreading</p> <p>Selected types of industries</p> <ul style="list-style-type: none"> • High Tech. • High added value • Increased industrial complex relationship • Medium and small sized downstream industries

The recommendable phasing of incentive provision is as shown in Table 8.5.

Table 8.5 Phasing of Incentives to be Granted

Types of Incentives	Initial 1985 – 1990	Mid-Term 1991 – 1995	Latter 1996 – 2000
Incentives			
– Investment subsidy	o	o	* Selective application
– Lower prices of land and building	o	o	o
– Subsidies for training	o	**	**
– Subsidies for relocation	o	o	o
– Preferential contract	o	o	o

Notes: o – Major effort
* – Less emphasized effort
** – Training should be in the institutes rather than by direct subsidies.

In addition, incentives/subsidies for state matters such as assessment fee, quit rent, water rate should be considered.

- 3) Upon completion of the existing development programme for industrial estates, the coastal strip area will have a total area of about 1,400 hectares and the KETENGAH about 300 hectares. This programme is evaluated to be sufficient in terms of provision of the land. No new I.E. is necessary.

Unless an intensive promotional effort is made at administrative/political levels, the significant assets will turn out to be a severe debt because of low land occupancy.

The industrial estate development should be carefully conducted so as to ensure the strategies of manufacturing development. A plan applicable in the study area pursuing the agglomeration effect is recommended as shown in Table 8.6.

Table 8.6 Industrial Estate Development Plan 1985 – 2000

	Initial	Mid-Term	Later
Plant location	Telok Kalong (Zone I)	Telok Kalong (Zone II) Kerteh KETENGAH	Telok Kalong (Zone II & III) Kerteh KETENGAH

8.2.7 Petrochemical Complex Development

Petrochemical complex development in the Study Area where the raw materials of petroleum and gas are landed is essential in the meaning that this will contribute greatly to the regional and also to the national economic growth. This will be a key to diversification of industrial activities.

The Study examined the viability of this project, based on an ethylene complex, in detail from market, feedstock and economic and financial aspects. The outcome indicates that the viability of this project is very sensitive under the present conditions due to oversupply in world market, limited demand in the domestic market and others.

The feasibility of a petrochemical complex was studied for three cases;

- A. Domestic-market oriented
- B. Export-market oriented
- C. An intermediate situation between cases A and B

Results of the financial and economic analyses show that in the present circumstances, the export-market oriented case B will be the most advantageous, followed by case C (the intermediate case). Case A (domestic market oriented case) would be the least advantageous.

However, the financial internal rates of return (after tax) on the basis of estimated current prices will be low. For the export-oriented case (B) which showed better results in the financial analysis is 10 percent.

Further, the results of an economic analysis indicate that the economic internal rate of return would be approximately 4 percent for the best case (B). These rates are low, and do not make the complex an immediate attractive investment.

The study is presented in Volume 4, Prefeasibility Study for Petrochemical Complex.

It is recommended that the development of petrochemical complex should be continuously kept in mind as a key of the regional development, but its feasibility and timing of project implementation should be more deeply considered based on a further study. Political assessments will be necessary taking into account the long-term national economic development programme.

8.2.8 Steel Industry Sub-Sector

Development Strategy for Steel Industry:

The objectives of development of the steel industry in Malaysia are:

- Import reduction of steel products in line with an import substitution policy.
- Maximum utilization of indigenous resources.

The steel industry is placed as one of the core industries which lead economic development through an inter-industrial agglomeration effect.

Development Programmes of Steel Industry:

Two approaches should be pursued for development of the steel industry: One is to develop an integrated steel manufacturing system. This approach places emphasis on the point that the steel industry is a system industry composed of many processes closely related with each other. The implementation of an integrated steel manufacturing system requires a large scale investment and a long formation period. Hence a long term national policy is necessary.

The other approach is to develop only the related industries. These industries are small in scale as compared with the integrated steel manufacturing system, but serve supplementary roles for steel making. The industries are developed as a regional industrial policy rather than a national point of view because of the smaller scale of investment.

The above two cases of steel industry development are delineated as follows:

Integrated Steel Industrial System Development Programme:

This programme needs a strong national push for its implementation.

1. Large Section Rolling Mill (Implementation: 1985–1990)

Production scale	:	150,000 to 200,000 ton/year
Investment	:	M\$200 to 300 million
No. of employees	:	200 to 300 persons
Main product	:	Large structure steel sections for construction materials
Area	:	15 – 20 ha.
Location	:	Telok Kalong

2. Expansion of Billet Plant (Implementation: 1985–1990)

Investment	:	M\$800 – 900 million
Production scale	:	DR/billet and sponge iron plant 600,000 ton/year addition (The current plant in billet 540,000 and sponge iron 80,000 tons per year)
No. of employee	:	Up to 700 persons (The current plant, 900 persons)
Main product	:	Billet
Area	:	70 ha
Location	:	Telok Kalong (Current DR plant)

3. Cold Rolling Steel Mill (Implementation: 1990–1995)

Production scale	:	320,500 ton/year
Investment	:	M\$300 – 400 million
Employees	:	550 persons
Area	:	15 – 20 ha
Main products	:	Cold coil

4. Expansion of the Cold Rolling Steel Mill together with the Construction of the Hot Rolling Steel Mill (Implementation: 1995–2000)

Production scale	:	800,000 ton/year
Investment	:	M\$400 – 500 million
No. of employees	:	700 persons
Area	:	30 – 40 ha in total
Main products	:	Hot coil and cold coil

Development Programme of Steel-Related Industries:

This programme is to be in line with the State's Industrial Policy.

1. Rerolling Mill (Implementation: 1985–1990)

Production scale	:	10,000 ton/year
No. of employees	:	Up to 100
Investment scale	:	M\$1 – 2 million
Raw materials	:	Scrap
Main products	:	Round Bar
Main facilities	:	Shearing, reheating, furnace rolling mill, cranes.
Area	:	0.5 – 1.0 ha

2. Maintenance and Support Service (Implementation: 1985–1990)

Capital	:	M\$0.5 million
No. of employees	:	50 – 100 persons
Investment	:	M\$2 – 5 million
Land requirement	:	1 ha
Main works	:	Maintenance and support service, mechanical processing, production of chemical equipment.

3. Production of Sections Using Electric Arc Furnace (Implementation: 1990–1995)

Capacity of Production	:	40,000 t/year
No. of employees	:	200 – 250 persons
Initial investment	:	M\$60 million
Land requirement	:	2.0 ha
Main products	:	Structural steel sections, round bar, flat bar

4. Production of Galvanized Plates, Tubes and Pipes (Implementation: 1995–2000)

Capacity of production	:	50,000 tons/year
No. of employees	:	100 persons
Initial investment	:	M\$3 – 6 million
Main products	:	Galvanized plates
Land requirement	:	1.0 ha

8.3 Human Resource Development

8.3.1 General

A human resource development which means the establishment of a sub-system of the comprehensive social system in an integrated organization involving education, research, vocational training schools and so on. Along with the forthcoming industrialization, it is necessary to expand the institutes and schools to supply sufficient manpower with the required knowledge and technology for the Area.

8.3.2 Locations

Institutes for human resource development are recommended to be invited to locate particularly in Dungun. Dungun is most suitable for the location of these institutes and is characterized as the town for education and research institutes.

8.3.3 Educational Institutes

Recommended institutes at the tertiary level of the education system are shown in Table 8.7. The possibilities of new locations were determined from the plans of the Federal Government and the current locations of these institutes. A teacher's training college, a polytechnic school and a university with faculties in technology and science are desirable in Dungun.

8.3.4 Vocational Training Schools

In addition to the above educational system, vocational training schools covering the local needs for re-adjustment and the newly required skills should be invited to the location. The subjects of these training schools should be closely related to the industries performed in the Study Area, including agriculture and fishery. There are some factories which have their own training schools within their organizations. Examples are PETRONAS and Perwaja, etc. Their activities should be strengthened.

Table 8.7 Recommended Location of Schools in the Tertiary Level in the Study Area

Schools	Students	Teaching Staff	Supporting Staff
1. Teacher training college (At present, the teacher training college at Pasier Panjang is too small. Ministry of Education considers relocation)	500	50	75
2. The above college should be expanded to a regular scale	1,000	100	150
3. Vocational training school (similar scale as ITM)	600	35	60
4. A polytechnic institute specialized in high level job training	2,000	170	400
5. A university specialized in technology and science	1,200	200	400

Source: Study Team

8.3.5 Research Institutes

Research and experimental institutes should be invited. Their subjects should be closely related to the industrial sectors and urbanization in the study area. They should be organized so that productive sectors and urban community can utilize advantageously the results of the research studies. In addition, there should be new research institutes which are independent of the conventional sectors, looking for new technology and development. Examples are those in the study of biochemistry, new materials, energy, etc. Location of these institutes for the future generation will strengthen the regional image of South Terengganu as the new complex for industries and research.

8.3.6 Community Activities

Industrial agglomeration, urbanization, research and education, and the primary industries will be located in the study area in the coming years. The scale of urbanization is quite modest, so each township will be endowed with a population

of 40,000 to 60,000. In a sense, it is within the policy of planning and implementable magnitude. There will be a good opportunity to explore means to realize an idealistic community in which activities will be organized and integrated. Research centres in conformance with policies and well suited to the communities should be established for this exploration.

8.4 URBAN DEVELOPMENT PLAN

8.4.1 Objectives

This urban development study is focused especially on the two major towns of Dungun and Cukai which are expected to function as key centres to provide a wide variety of urban services for the whole of the sub-regional socio-economic activities.

8.4.2 Urban Economy and Population

Industrial development especially in the coastal strip area will become gradually intensive. Along with this movement, encouragement of the urban functions to be performed becomes more important. The economic framework shows that the manufacturing sector's GRP in 2000 will increase to 30 times as large as that at present, and the urban population will be about 130 thousand, compared with 54 thousand in 1983. The socio-economic activities in all the sectors will greatly change in both quality and quantity. An urban development to correspond to the changes is required. Distribution of population in the three urban areas is estimated as shown in Table 8.8.

Table 8.8 Population in Urban Area 1983 – 2000

(Unit: thousand)

Year	Dungun	Kerteh ¹⁾ New Town	Cukai	Total
1983	36	–	18	54
1990	39	14	31	84
2000	55	18	58	131

Source: The Study Team

Note: 1) Low profile population forecast estimated by KERTEH NEWTOWN DEVELOPMENT PLAN is referred.

8.4.3 Urban Development Strategies

Creating a combination of high level urban functions along the coastal strip Growth Corridor is the main development strategy. Because of the shortage of land availability suitable for urbanized uses and of making use of the existing urban function characteristics, it is proposed to distribute the high level urban functions amongst the three towns in the coastal strip instead of developing one large core town. An allocation system of urban functions is discussed in the former Section 7.3.3. For maintaining these functions at a sufficient service level, improvement in mobility is a significant factor.

For the smaller townships in both the coastal area and the KETENGAH area, improvements in amenities and infrastructure should be carried out in line with the context of functional hierarchy of townships in the area.

8.4.4 Conceptual Development Plan of Dungun

Based on the development strategy, a conceptual structure plan in the year 2000 for Dungun is proposed briefly, as described below.

1) Spatial Composition

Dungun Town is divided into two areas by the Dungun River: the North and the South areas. The North area is recommended to be basically preserved because of the existence of natural and tourist assets such as Rantau Abang.

Urbanization is mainly promoted in the Southern area in a southern direction but an extensive expansion of an urbanized area should be avoided. The locations of high educational facilities to be developed are concentrated in the southern part where the I.T.M. is located.

The Dungun urban structure in future will be defined by the two major infrastructures i.e., the planned railway and the by-pass of Route III, both of which run in the western part of the town. Taking into account the impact of the planned railway station, urbanization in the surrounding area of the station should be strictly controlled in order to develop the area in deliberate manner, until a clear construction schedule is fixed. On the other hand the proposed by-pass will function as a new backbone for the town. As most through traffic on long distance trips will use this by-pass, the traffic within the town area will be purified into intra-urban traffic. This will contribute to alleviate traffic congestion in the busy area and to activation of commercial activities. Alongside the by-pass new transport-related service industries have potential locations.

The landuse framework in the Dungun town area in 2000 is projected as shown in Table 8.9, and a conceptual structure model is illustrated as shown in Fig. 8.3.

Table 8.9 Landuse Framework in Dungun Town Area in 2000

	North Area	South Area	Total
Commercial/Business/Service	—	100	100
Residential	—	1,800	1,800
Industrial	40	140	180
Recreation	30	220	250
Open Space/Preservation/Village	310	280	590
High Educational	—	100	100
River	—	40	40
Others (Roads, Railways, etc.)	20	220	240
Total	400	2,900	3,300

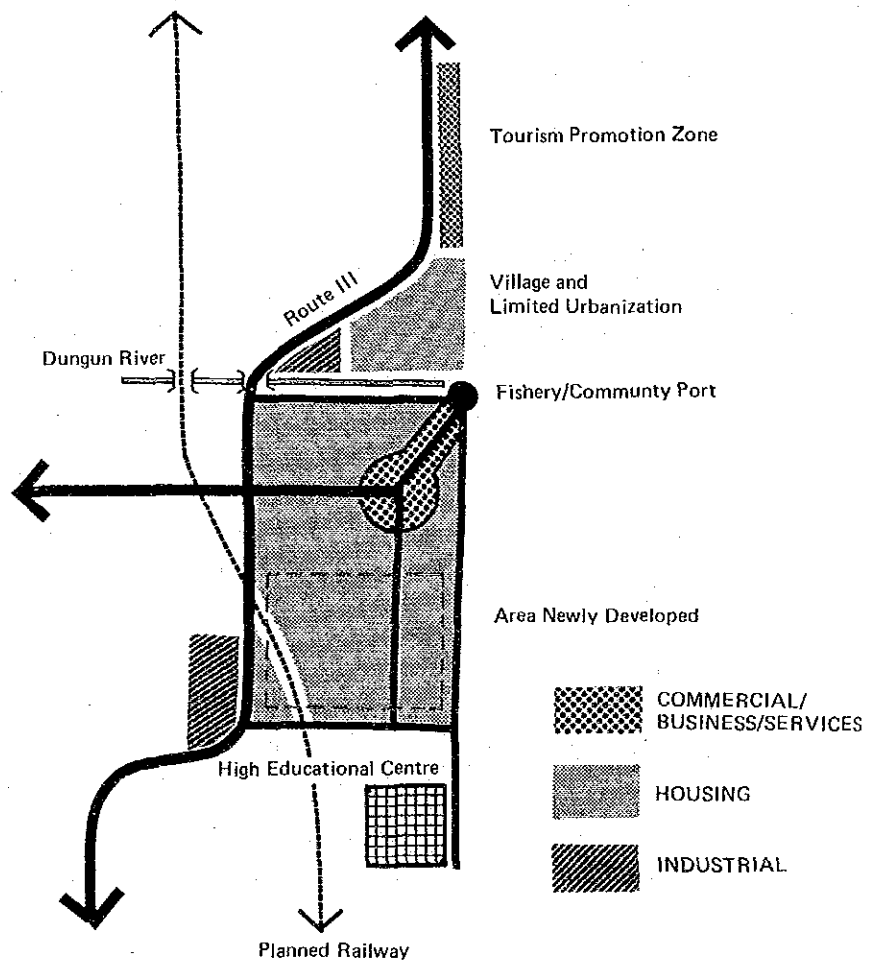
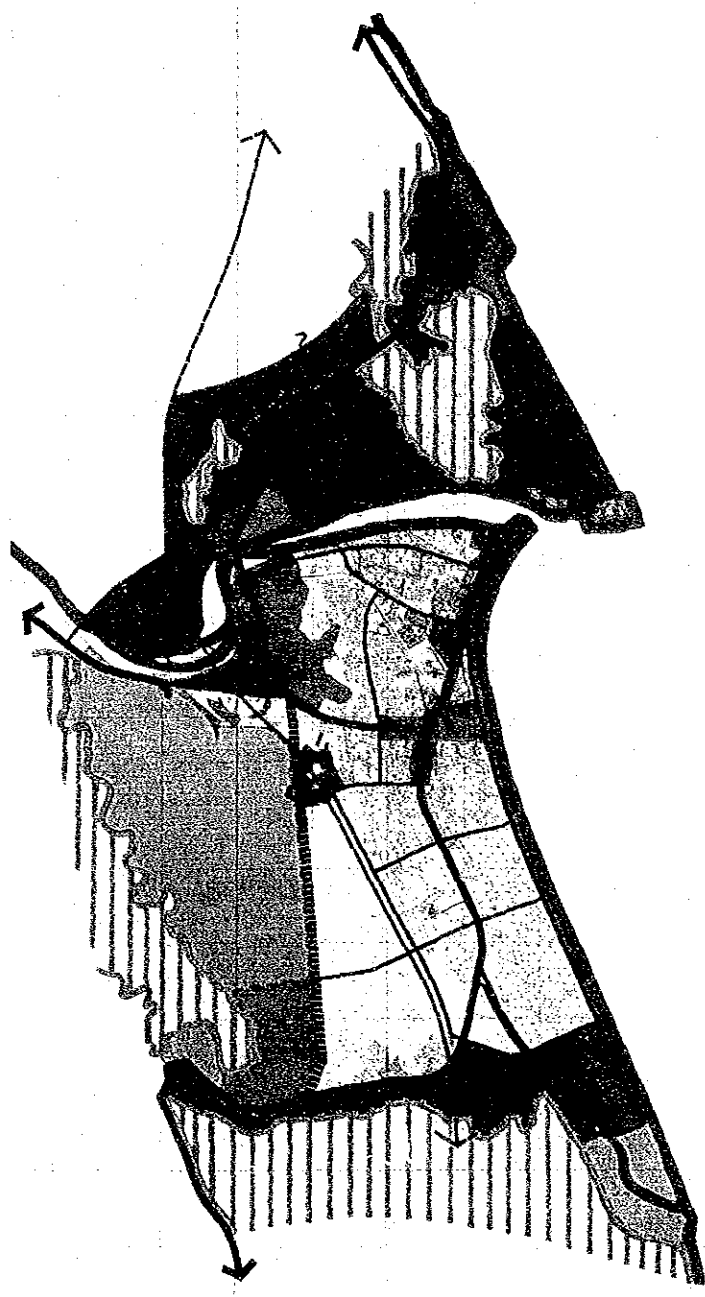
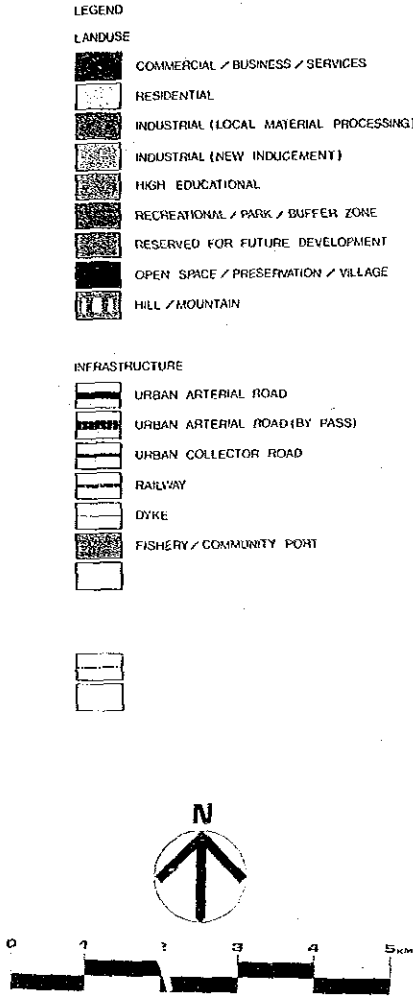


Fig. 8.3 CONCEPTUAL STRUCTURE MODAL IN DUNGUN TOWN AREA



DUNGUN URBAN DEVELOPMENT IN 2000

2) Zoning System

Landuse zoning is an effective tool for an orderly urban structure planning as well as the basis for administrative landuse control/management.

The following is a guideline of landuse zoning:

- Commercial/Business Area: It is recommended to strengthen the present accumulation of urban functions along the urban axis of Jalan Bandar.
- New Housing Areas: Private housing development is in progress at several sites. Technical and planning coordinations are necessary in order to incorporate them into a planned urban area. Plans for a large scale housing development is recommended and should be implemented in accordance with the demand for housing in order to form urban areas efficiently.
- Education/Culture Areas: This area spreads around the ITM and is secured for locations of other educational and research institutes.
- Industrial Area: The location of large scale industries is not recommended in the Dungun Town Area, taking into consideration the Dungun urban characteristics as a commercial/business and educational centre. However, an industrial zone should be provided especially for relocating local factories and warehouses existing in the town area, and for agro-based processing factories of the small/medium scale.

The area alongside the proposed by-pass is suitable for the location of the industrial zone because of transport convenience.

- Open Spaces: Bt. Chatok and its hilly area to the north-west of the urban area is planned to have various recreation facilities installed surrounded by green tree zones.
- Tourism Promotion Zone: The beach of Rantau Abang famous for turtle egg-laying should be preserved in relation with tourist promotion.

8.4.5 Conceptual Development Plan of Cukai

1) Spatial Composition

The Cukai town's growth potential is large compared with Dungun Town. The development of Telok Kalong industrial estate with the supply base port has a large impact on the urban structure as well as on the characteristic of the town. An industrial city is the target of Cukai urban development.

However, the Cukai Town located at the river-mouth, the same as the Dungun Town, has handicaps because of poor land conditions and limited flood-free land. The existing town area is rather compact but a ribbon development alongside the major roads is going on because of limited suitable land for housing. Elimination of these physical constraints is extremely important to encourage the development of Cukai.

The Cukai Town area is divided into three areas, by the Cukai River and the Kemaman River, i.e., the north, the central and the south areas. The north area centring on the Telok Kalong industrial estate is characterized as an industrial promotion area. The central area is to accommodate mainly urban service activities such as commercial, business and other various functions. The south area is for new urban development. Urbanization will be promoted mainly in the central area toward the western direction up to the line of the planned railway.

The flood control project, the change of alignment of the Kemaman River and the development of diversion canal, will have a great impact on the urban structure of Cukai, a new potential area for urbanization will be created in the eastern part of the town by this project.

The by-pass of Route III is proposed for Cukai Town as well. This will function as a new backbone for urban activities and contribute to expansion of the required urbanization area.

The railway station, if it is completed, will be another large impact on the urban structure. Generally this kind of facility is endowed with a capability to form a new commercial sub-centre. The eastern side of the planned station is recommended to be designated as a specific development area of about 200 hectares, and disorderly private developments in this area should be restricted until a definite development master plan in this area is completed.

A conceptual urban structure model is delineated in Fig. 8.4 and the landuse framework is estimated as shown in Table 8.10.

Table 8.10 Landuse Framework in Cukai Town Area in 2000

(Unit: ha)

	North Area	Central Area	South Area	Total
Commercial/Business/Services	—	120	—	120
Residential	250	1,270	280	1,800
Industrial	1,200	70	—	1,270
Recreation	80	130	10	220
Open Space/Preservation/Village	600	310	40	950
Industrial Port	80	—	—	80
Others (Road, Railway)	90	200	10	300
Total	2,300	2,100	340	4,740

2) Zoning System

A guideline of zoning system in the Cukai Town area is proposed as follows:

- Commercial/Business Area: The development of the commercial/business area should be promoted between Sulaiman Street and Ayer Street, and new sub-centres be located in the newly created area to the eastern part of the town, and at the vicinity of the railway station in the long term.
- Large Scale Housing Development: A large scale housing development is advantageous from the viewpoint of effective land use and investment. As favourable land area is available only to a limited extent in Cukai, a housing project should be developed in the western area for the formation of orderly residential area with the progress of the flood mitigation project.

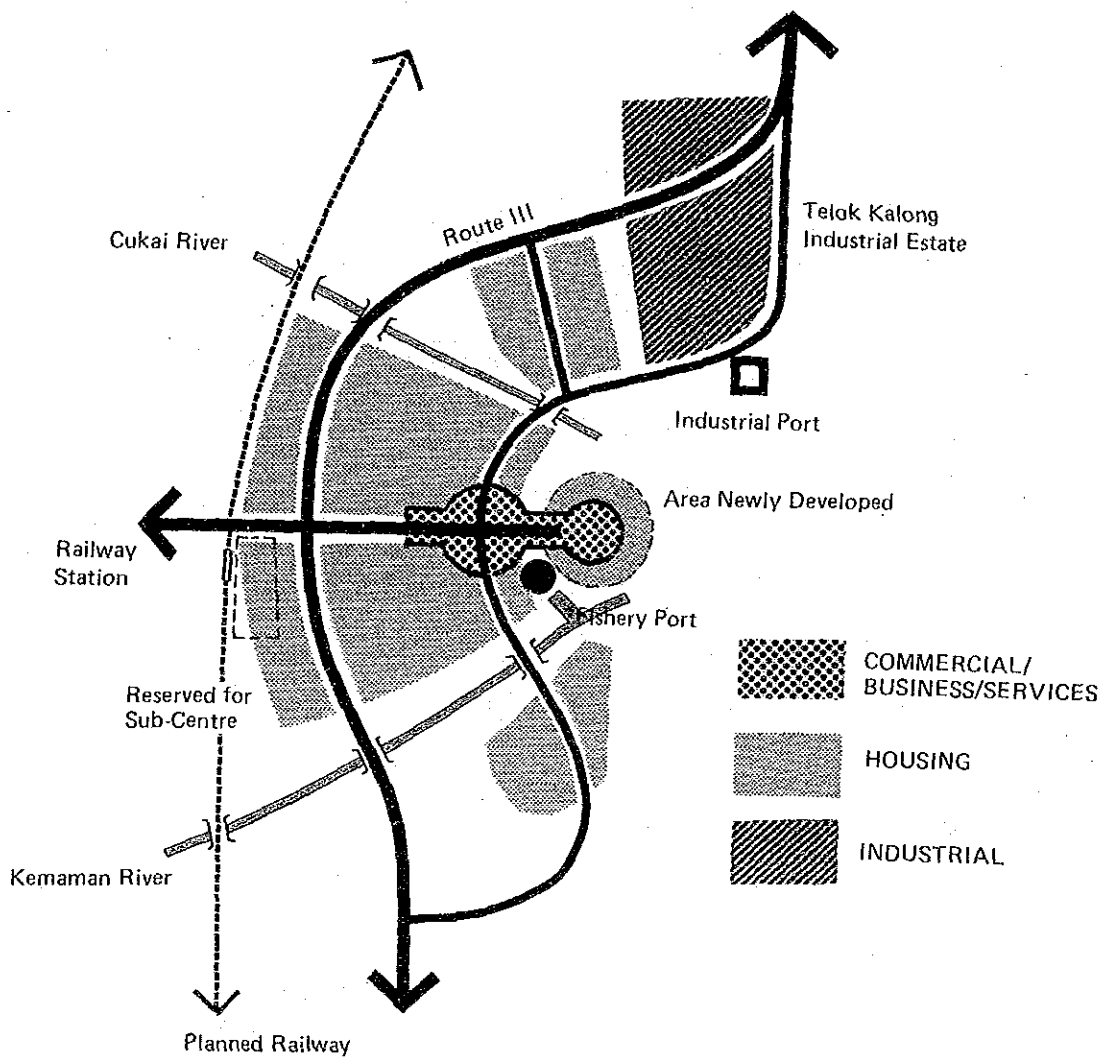

















Fig. 8.4 CONCEPTUAL URBAN STRUCTURE MODEL IN CUKAI

LEGEND


LANDUSE

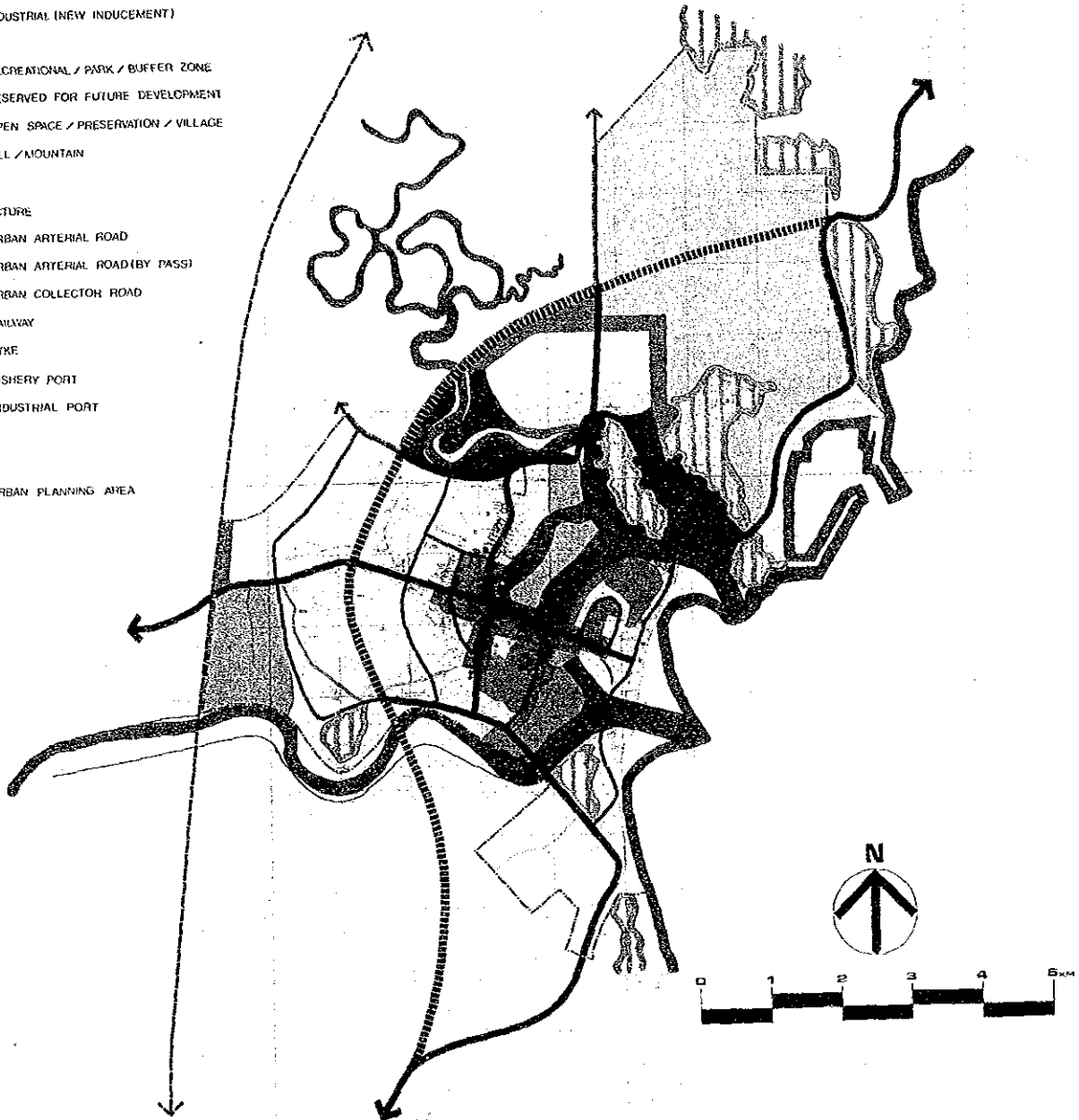
-  COMMERCIAL / BUSINESS / SERVICES
-  RESIDENTIAL
-  INDUSTRIAL (LOCAL MATERIAL PROCESSING)
-  INDUSTRIAL (NEW INDUCEMENT)
-  RECREATIONAL / PARK / BUFFER ZONE
-  RESERVED FOR FUTURE DEVELOPMENT
-  OPEN SPACE / PRESERVATION / VILLAGE
-  HILL / MOUNTAIN

INFRASTRUCTURE

-  URBAN ARTERIAL ROAD
-  URBAN ARTERIAL ROAD (BY PASS)
-  URBAN COLLECTOR ROAD
-  RAILWAY
-  DYKE
-  FISHERY PORT
-  INDUSTRIAL PORT

BOUNDARY

-  URBAN PLANNING AREA



CUKAI URBAN DEVELOPMENT IN 2000

8.4.6 Proposed Projects and Programmes

In accordance with development plans described in the preceding section, the following projects and programmes are proposed:

Table 8.11 Proposed Projects and Programmes

	DUNGUN	CUKAI
Promotion of Industrial Developments	<ul style="list-style-type: none"> • Introduction of higher level education facilities • Research and development institutes 	<ul style="list-style-type: none"> • Inducement of concentrated manufacturing industries
Urban Land Supply and Land Use	<ul style="list-style-type: none"> • Land use intensification in kampung area • Large scale land supply and development • Maintenance of commercial and business district, open space and recreational land 	
Road	<ul style="list-style-type: none"> • Construction of bypass of trunk road of Route III • Intra-urban road network system 	
Flood Control and Drainage	<ul style="list-style-type: none"> • River improvements • Construction of training dyke (river mouth improvement and protection of the beach erosion) • Drainage system in urban area 	<ul style="list-style-type: none"> • Construction of diversion channel • River improvement • Drainage system in urban area
Others	<ul style="list-style-type: none"> • Control and inducement of newly developed urban area • Conservation of natural resources 	

Of the above bypass plans for Dungun and Cukai, relative significance of benefits and disbenefits are identifiable. Generally, it can be said that the benefits exceed the disbenefits. The bypass construction will not kill-off the town.

- Benefits :
- : Separated and reduced traffic flow between the through traffic and the intra-urban traffic.
 - : Reduced congestion and accidents.
 - : Changes in landuse along the bypass and access roads. The changes will open additional economic opportunities and will accelerate the urban area in the vicinity of the bypass.

- Disbenefits :
- : Additional cost of road construction and associated infrastructure.
 - : Noise and pollution of vehicles will be reduced along the existing roads, but their influence area may become larger particularly along the new road.
 - : Economic activities along the existing roads may decrease in proportion to the diverted traffic. However,, they may recover and increase in the course of urban development.

8.5 FLOOD CONTROL AND DRAINAGE SYSTEM DEVELOPMENT

8.5.1 Objective

The South Terengganu area is exposed to heavy tropical rainfall during the monsoon season and the downstream areas of the river basins are low and flat. In the study area, the flood problem is more serious than that of water use. To pursue the method of solution of the flood problems is the main subjects in this Study.

8.5.2 Findings in Flood Problems

Flood Characteristics:

According to the flood level data of the Dungun and Kemaman Rivers, the highest flood levels are from 5 to 10 metres above ordinary water levels. In the low areas along the rivers, ground elevations are only 2 or 3 metres above ordinary water levels. Therefore, flood depths in the low areas are large, and in addition, flood durations are long.

Problems in Relation to Development:

In the process of the past development, insufficient consideration has been paid to the flood characteristics of the area. The reasons may be due to rapid development and insufficient information about the flood characteristics and the area drainage.

Major problems related to the flood area:

- Long periods of road closures;
- Increase of sediment run-off;
- Narrow width at the downstream of the rivers;
- Some low bridges and inadequate drainage culverts; and
- Town and industrial development in the flood prone areas.

8.5.3 Flood Control Strategy

The flood characteristics and the possibility of countermeasures give the following strategy for a smooth development implementation:

Dungun River:

- Improvements downstream in the main stream are important. The river improvements include river mouth improvement, dredging and dyke. In addition, countermeasures for the beach erosion should be taken into account.
- Upstream areas should not be developed without flood control countermeasures, such as dams and retarding basins.
- The town area near the river mouth, where is easily flooded, should be reclaimed by raising ground elevation above flood level of the river. If reclamation is not a realistic approach, land use and building construction should be guided away from the flood prone area.

Paka River:

River mouth improvement combined with downstream river improvement is important. Retarding basin in the swamp should be considered if necessary.

Height of the dykes may be lowered if the river mouth is improved.

Kerteh River:

River mouth improvement will become necessary if the surrounding area is widely developed.

Kemaman and Cukai Rivers:

Flood problems of the low town areas along the Kemaman and Cukai Rivers can be solved by surface drainage system together with river improvements. The plan accompanies the dredging of the river bed. The dredged soils can be used for reclamation of low town areas. Necessity of a retarding basin or dam is a subject for the further study for the development or improvement of the upstream areas.

8.5.4 Water Use

Water Supply:

Low flow discharge of the rivers in the study area is abundant. Programmes for the implementation of water supply for domestic and industrial use have been studied in detail (SCTWR) and works are being undertaken. The balance of supply and demand of water resources should be checked stage by stage as recommended in the TMPS.