1.3 The Future Social and Economic Conditions in the Project Area

1.3.1 The Existing Regional Development Plans

(1) The Fourth Malaysia Plan (FMP)

1) National Plan

In 1970 the Malaysian government announced the "New Economic Policy (NEP)". NEP was designed to promote national unity through the twin objectives of eradicating proverty irrespective of race and of restructuring society to eliminate the identification of race with economic functions. These strategies are to be implemented in the context of rapid economic growth. "The Outline Perspective Plan (OPP), 1971-90", was formulated to realize NEP. The OPP objectives are as follows;

① Annual growth rate of GDP during the planning period is to be 8.0% in real terms. Manufacturing is to be the main sector that will grow by the annual rate of 12.0%. But according to the mid-term review in March 1979, the targets for the growth rates of GDP and manufacturing were corrected downward to 7.9% and 11.7% respectively.

② Fulfillment of full employment through creation of employment opportunity for 1,900,000 persons.

③ Reduction of proverty incidence from 49.3% in 1970 to 15.0% in 1990.

④ Restructuring of ownership of capital to reserve 70% for Malaysians and 30% for foreign people.

⑤ Restructuring of employment in all economic fields so that there is a representative racial composition at all levels.

In order to achieve the above objectives, "the Second Malaysia Plan, 1971-1975 (SMP)" and "the Third Malaysia Plan, 1976-1980 (TMP)" were implemented. The period 1971-80 was one of rapid economic growth in Malaysia under the SMP and TMP, within which the annual average growth of GDP was 7.8%. Under these circumstances, "the Fourth Malaysia Plan" started in 1981.

The estimated public sector investment during FMP will amount to M$ 42,829 million and investments worth M$ 74,111 million are expected from the private sector. The GDP is projected to increase at 7.6% per annum in real terms.

The agriculture, forestry and fishing sector is projected to grow at 3% per annum, which will make the sector's contribution to GDP decrease from 22.2% in 1980 to 17.8% in 1985. The manufacturing sector will continue to be the leading sector during FMP with the rate of growth of 11.0% per annum and its share in total GDP will increase from 20.5% in 1980 to 23.9% in 1985, the largest in terms of its contribution to GDP (see Table 1.3.1).

The industrialization strategies during FMP are as follows;

① Creation of employment.

② Development of small-scale and medium-scale industries.

③ Development of heavy industries.

④ Participation of Bumiputera.

⑤ Development of resource-based industries.

⑥ Development of export-oriented industries.

⑦ Dispersal of industries to the less-developed state such as Kedah, Perlis and so on.

Table 1.3.1 Malaysia: Gross Domestic Product by Sector of Origin, 1970–90
(M$ million in 1970 prices)

Sector	1970	1980	1985	1990	Average annual growth rate (%)					Share of GDP (%)			
					1971–80	1981–85	1986–90	1981–90	1971–90	1970	1980	1985	1990
Agriculture, forestry and fishing	3,797	5,809	6,720	8,193	4.3	3.0	4.0	3.5	3.9	30.8	22.2	17.8	14.4
Mining and quarrying	778	1,214	1,607	1,863	4.6	5.8	3.0	4.4	4.5	6.3	4.6	4.3	3.3
Manufacturing	1,650	5,374	9,040	15,121	12.5	11.0	10.8	10.9	11.7	13.4	20.5	23.9	26.6
Construction	475	1,186	1,824	2,938	9.6	9.0	10.0	9.5	9.5	3.9	4.5	4.8	5.2
Electricity, gas and water	229	592	953	1,500	10.0	10.0	9.5	9.7	9.9	1.9	2.3	2.5	2.6
Transport, storage and communications	581	1,696	2,492	3,834	11.3	8.0	9.0	8.5	9.9	4.7	6.5	6.6	6.8
Wholesale and retail trade, hotels and restaurants	1,633	3,295	4,841	7,279	7.3	8.0	8.5	8.2	7.8	13.3	12.6	12.8	12.8
Finance, insurance, real estate and business service	1,036	2,155	3,079	4,629	7.6	7.4	8.5	7.9	7.8	8.4	8.2	8.1	8.2
Government services	1,367	3,398	5,228	8,044	9.5	9.0	9.0	9.0	9.3	11.1	13.0	13.8	14.2
Other services	306	657	948	1,459	7.9	7.6	9.0	8.3	8.1	2.5	2.5	2.5	2.6
Less: imputed bank service charges	117	308	1,092	1,900	–	–	–	–	–	–	–	–	–
Plus: import duties	573	1,120											
Equals: Gross domestic product at purchasers' value	12,308	26,188	37,824	56,760	7.8	7.6	8.5	8.0	7.9	–	–	–	–

Source: "Forth Malaysia Plan, 1981–1985", 1981.

Table 1.3.2 GDP of Perlis State Estimated at FMP (in 1970 prices)

	1971[2]	1980	1985	1990
GDP, Perlis[1] (M$ million)	828	172	260	415
Population (1000 person)	1,136.9	157.2	174.9	191.2
Per capita GDP (M$)	728.3	1,094	1,486.6	2,170.5
Ratio against national average	0.62	0.60	0.64	0.69
GDP, Malaysia[1] (M$ million)	13,016	26,188	37,824	56,760
Percentage of GDP, Perlis against GDP, Malaysia (%)	6.4	0.66	0.69	0.73

Notes: 1) at purchasers' value.
2) Added value of Perlis State plus Kedah State are dealt with.
Source: "Fourth Malaysia Plan, 1981–1985", 1981.

2) The Plan in Perlis State

Under FMP, the GDP of Perlis State is projected to increase to M$ 260 million in 1985, 1.5 times that of 1980 and to M$ 415 million in 1990, 2.4 times (see Table 1.3.2). From 1980 to 1985 and 1990, the ratio of GDP of Perlis State to that of the whole country is projected to increase from 0.66 to 0.69 and 0.73 respectively. In order to achieve this object, public sector investment of M$ 304.16 millions is projected in Perlis State, which amounts to 0.71% of the national investment. The vote followed by sector is shown in Table 1.3.3. Social development is given priority over economic development. Public investment of M$ 83.15 millions is projected for social development such as education and training, housing, culture, youth and sports. Public investment of M$ 181.05 millions is projected for economic development, in which agricultural development is given priority. In agricultural development, the "Perlis Integrated Area Development Project" (PIAD) which aims at the integrated agricultural development the outer MADA area is the major project, along with rubber replanting, agriculture credit, marketing, processing and cooperatives, drainage and irrigation. Public investment of M$ 14.88 millions is projected for transportation, of which M$ 14.68 millions is for roads and bridges and only M$ 0.4 millions is for ports. The Kuala Perlis Port Project is not inlcuded in the FMP.[1][2]

Table 1.3.3 Allocation under FMP, Perlis State (M$ million)

	Malaysia	Perlis	Perlis/ Malaysia (%)
I Economic	22,764.50	181.05	0.80
A. Agriculture and Rural Development	8,359.10	86.41	1.03
B. Mineral Resources Development	48.00	–	–
C. Commerce and Industry	5,433.05	49.68	0.91
D. Transport	4,116.07	16.22	0.39
E. Communications	1,523.52	4.76	0.31
F. Energy and Public Utilities	3,248.76	23.98	0.74
G. Feasibility Study	36.00	–	–
II Social	6,388.14	83.15	1.30
A. Education and Training	2,992.83	49.49	1.65
B. Health and Population	588.44	3.62	0.62
C. Information and Broadcasting	142.62	1.58	1.11
D. Housing	1,458.00	14.40	0.99
E. Sewerage	200.00	–	–
F. Culture, Youth and Sports	241.48	4.60	1.91
G. Local Councils, Welfare and Community Services	347.63	2.91	0.84
H. Kampung and Community Development	202.14	6.55	3.24
I. Purchase of Land	215.00	–	–
III Security	9,371.55	25.50	0.27
A. Defence	7,190.00	14.28	0.20
B. Internal Security	2,181.55	11.22	0.51
IV Administration	805.31	8.12	1.01
A. General Services	725.31	8.12	1.12
B. Ministry of Foreign Affairs	80.00	–	–
Total Federal Funds	39,329.50	297.82	0.76
State Funds	1,380.00	–	–
Statutory Funds	2,120.00	6.34	0.30
Grand Total	42,829.50	304.16	0.71

Source: "Fourth Malaysia Plan, 1981–1985," 1981.

(2) The Existing Regional Development Plan for Perlis State

There are already several regional development plans for Perlis State. Outlines of the major plans are as follows.

1) "PERLIS, A Study on Regional Planning & Development", Jabatan Perancang Bandar & Kampung Semenanjung Malaysia, 1975.4.

a) Population

The future population of Perlis State is estimated as follows.

Year	Population
1980	156,245 ~ 153,256
1990	192,941 ~ 185,703

b) Regional Planning and Development Alternatives

* Alternative 1 (Uncontrolled Growth)

The major characteristics of this alternative are:—

① Kangar will continue to function as the sole district center in the State;

② Arau will take over functions as the major educational center;

③ Simpang Empat will be stabilized as a local center to serve the population in the southern sector;

④ Beseri and Kaki Bukit are to be upgraded to local centers, in order to give adequate facilities to the population in the central and northern sectors; and

⑤ A new industrial center and housing estate is proposed in the mukim of Chuping.

* Alternative 2 (Metropolitan Kangar)

The major characteristics of this strategy are:—

① Kangar will be the dominant center in the State for all levels of activities;

② The industrial population of the sugarcane plantations and cement factories will be accommodated within the Kangar residential area;

③ Arau is the only other center allowed to grow to accommodate the ITM (Institut Teknologi MARA) establishment.

* Alternative 3 (Kangar-Arau Urban Corridor)

The major characteristics are:—

① To allow all development to concentrate within the defined corridor between Kangar and Arau;

② Other centres are to continue development following the existing trends.

* Alternative 4 (New Town Development)

The major characteristics of this alternative are similar to that of Alternative 1 (① – ④) except:—

① Growth is centered in and around existing urban settlements;

② Beresi is upgraded to a stronger center and will accommodate all the population from the Industrial Center.

Each of the alternatives presented has both merits and disadvantages, varying in extent according to the relative values placed on the criteria for future development. We have assumed, however, that the Government would wish to adopt a strategy which

combined maximum benefits with minimum costs. On this basis, we recommend the adoption of alternative 4 (New Town Development) with modifications as are necessary to ensure that regional disparity is reduced.

2) "Kedah-Perlis Development Study, Vol. 1, Main Report", Economic Consultants Ltd., 1978.9.

a) Study Area

The Study Area comprises the States of Kedah and Perlis. It is located in the north-west of the Peninsula between the parallels of 5 and 7 degrees north. The State of Kedah includes the Langkawi Islands. The land boundary of the Study Area is the frontier with Thailand in the north and east, and with Perak and Penang in the south and south-west.

b) Objectives

The aim of this report is to assist the Federal and State Governments to plan and implement accelerated economic and social development, primarily in order to reduce the incidence of poverty, but also to achieve other objectives in accordance with the guidelines of the New Economic Policy. The report, therefore, outlines a strategic framework for medium-term and long-term growth and identifies priority projects for further investigation and early implementation.

c) Population

The population of Perlis State is estimated as shown in Table 1.3.4.

Table 1.3.4 Estimated Population of Perlis State

Year	Population (person)
1970	122,670
1975	137,000
1980	154,000
1985	172,000
1990	192,000

d) Strategies

The first main strand in the strategy envisages faster growth of the manufacturing and service sectors. A rapid increase in manufacturing is the most important objective. While the main employment growth in Kedah and Perlis will be in the secondary and tertiary sectors, the two States will remain predominantly agricultural. The second main strand in the strategy is the increase of productivity and incomes, and where possible employment, in the primary sector.

3) "Taklimat, Perancangan dan Pambangunan, Negeri Perlis", Timbalan Pengarah, Unit Perancang Ekonomi Negeri, Pejabat Seitausaha Kerajaan, Perlis, 1981.8.23.

"Planning and Development of Perlis", Deputy Director, State Economic Planning Unit, Government Secretariat Office of Perlis.

a) Economic Problems

Economic problems in Perlis State are as follows.

① The annual growth rate of the population is high.

② The Unemployment rate is high, moreover many of the unemployed need vocational training.

③ The poverty incidence is high and had increased in 1977 as compared with 1970.

④ The poverty incidence of paddy farmers in the outer MADA area is high.

⑤ Perlis State lies on the frontier.

⑥ Perlis State does not have adequate port facilities.

⑦ Transportation cost is higher because of the distance to the market center.

⑧ Investors feel uneasy because the State lies on the frontier.

⑨ The Perlis government faces an increasing budget deficit.

b) Strategies for Development

In order to overcome the above problems and develop the state economy, the following strategies are proposed.

① Agricultural development after "Perlis Integrated Agricultural Development Project (PIAD".

② Modernization in the rural area through expansion and improvement of infrastructures and general facilities.

③ Encouragement of manufacturing industrialization.

④ Town development in Kangar, Beseri and other towns.

⑤ Encouragement of emigration to another states.

c) Conclusions

Eventhough Perlis State is a small country in Malaysia, its location is quite strategic to the National Security. So proper attention should be given by the Federal Government to development this State.

(3) Summary

Although all of the above plans aim at the conversion of the Perlis Economy from one based on primary industry to one based on secondary industry through manufacturing industrialization, port development is not adopted as a strategy.

(References)

1) "Fourth Malaysia Plan, 1981–1985", 1981.

2) Timbalan Pengarah, Unit Perancang Ekonomi Negeri, Pejabat Seitausaha Kerajaan, Perlis, "Taklimat, Perancangan dan Pembangunan, Negeri Perlis", 23rd August, 1981.

1.3.2 Estimating the Socio-economic Frame

(1) Population

Changes in the populations of Perlis State, Peninsular Malaysia and Malaysia are shown in Table 1.3.5. The population of Malaysia increased at the annual average growth rate of 2.7% between 1957 and 1970, but the annual average growth rate decreased to 2.56% between 1970 and 1980. Population of Perlis State increased at the annual average growth rate of 2.23% between 1957 and 1970, but the annual average growth rate decreased to 2.01% between 1970 and 1980. The ratio of the population of Perlis State to that of all Malaysia has been dropping.

The estimation of the future population of Perlis State are given in the following three documents.

① "Perlis, A Study on Regional Planning & Development", Jabatan Perancang Bandar & Kampung Semenanjung Malaysia, 1975.4.

② "Kedah-Perlis Development Study, Final Report", Economic Consultants Limited, 1978. 9.

③ "FMP", 1981.

The Estimation of future population of Perlis State in 1990 is shown in Table 1.3.6. as 1) 193,070 2) 192,000 3) 191,200. Among these values, we adopt the FMP estimation of 191,200 in 1990, because it is based on the most recent data. In this case, the annual average growth rate will be 1.98% between 1980 and 1980 (see Fig. 1.3.1).

The estimation of the population of Perlis State in 2000 was done using an annual average growth rate forecast by regression analysis of the actual annual average growth rate between 1957 and 1970, 1970 and 1980, and the FMP estimated annual average growth rate, as shown in Fig. 1.3.1. This results in a population for Perlis State of 229,200 in 2000.

Estimation of the Population of Perlis State

Population in 1990 191,200
Annual average growth rate between 1990 and 2000 ..... 1.83%
Population in 2000 229,200

Table 1.3.5 Population

	Population (person)			Average Annual Growth Rate (%)	
	1957	1970[2)]	1980[2)]	1957~1970	1970~1980
Perlis	90,885[1)]	121,062	147,726	2.23	2.01
Peninsular Malaysia	6,278,800[2)]	8,809,557	11,138,227	2.64	2.37
Malaysia	7,382,500[2)]	10,439,430	13,435,588	2.70	2.56
Perlis/Malaysia (%)	1.23	1.16	1.10		

Source: 1) Economic Consultants Limited, "Kedah-Perlis Development Study, Final Report, Volume 1, Main Report," 1978.9.
2) Department of Statistics, "Annual Statistical Bulletin Malaysia, 1981," 1982.11.

Table 1.3.6 Estimated Population

	Population of Basic Year (person)	Estimated Population (person)				Real Annual Growth Rate (%)					
		1975	1980	1985	1990	1970 ~ 75	1975 ~ 80	1980 ~ 85	1985 ~ 90	1970 ~ 1990	1980 ~ 1990
(1) Perlis, A Study on Regional Planning & Development, 1975.4	1970 125,836	140,286	156,075	173,774	193,070	2.20	2.16	2.17	2.13	2.16	2.15
(2) Kedah-Perlis Development Study, 1978.9	1970 122,670	137,000	154,000	172,000	192,000	2.23	2.37	2.24	2.22	2.27	2.23
(3) FMP, 1981	1980 Perlis 157,200			174,900	191,200			2.16	1.80		1.98
	Peninsular Malaysia 11,849,000			13,357,000	14,820,000			2.42	2.10		2.26
	Malaysia 14,261,200			16,179,500	18,143,000			2.56	2.32		2.44
	Perlis/Malaysia 1.10 (%)			1.08	1.05						

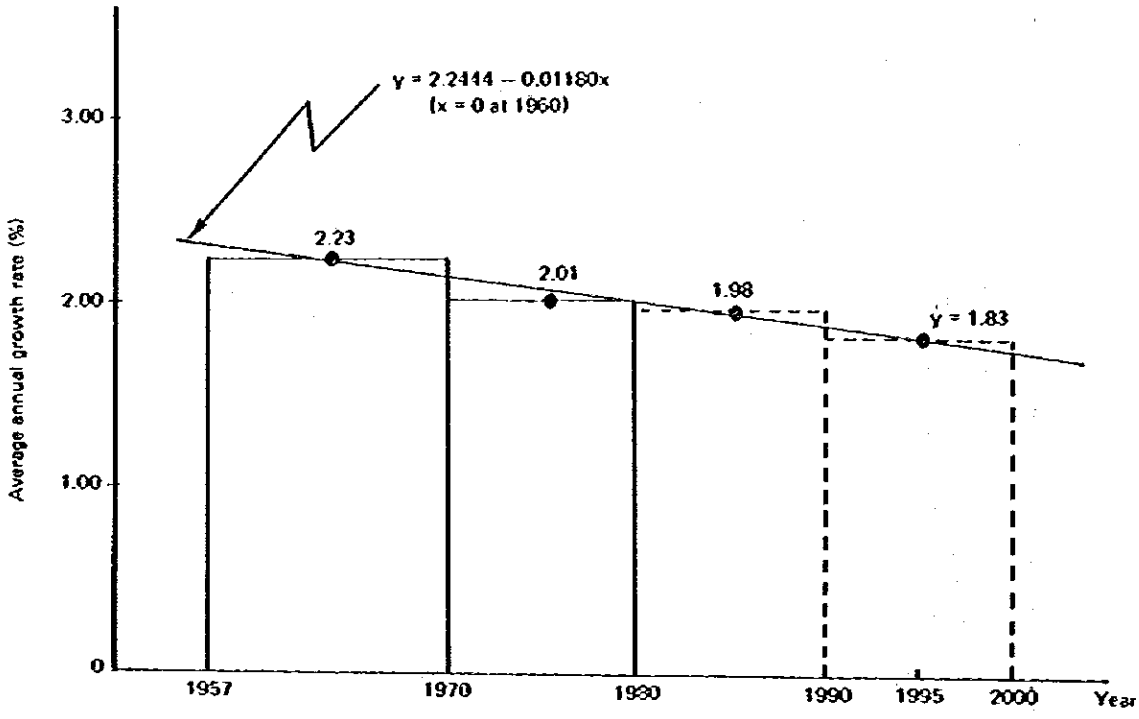


Fig. 1.3.1 Average Annual Growth Rate of Population

(2) GDP

The actual annual average growth rate of the perlis State GDP between 1971 and 1980 was 6.5% in real terms, resulting in a Perlis State GDP of M$ 172 million, 0.66% of the Malaysian total. In FMP, the estimation of the Perlis State GDP for 1985 and 1990 were forecast at M$ 262 and M$ 415 respectively, representing 0.69% and 0.73% of the Malaysian total in the corresponding years. On the other hand, the annual average growth rates of Perlis State's per capita GDP in real terms will be 6.3% between 1980 and 1985 and 7.9% between 1985 and 1990, thus averaging 7.1% between 1980 and 1990 (see Table 1.3.7).

The annual average growth rate of Perlis State's per capita GDP in real terms between 1990 and 2000 is projected at 7.1%, the same as between 1980 and 1990. Per capita GDP in 2000 is estimated using this rate 7.1%. The Perlis state GDP in 2000 is estimated by multiplying the per capita GDP by estimated population, which results in M$ 987.8 millions. In this case, the annual average growth rate of GDP between 1990 and 2000 in real terms becomes 9.1% (see Table 1.3.8).

Table 1.3.7 GDP, Actual and Estimated Values at FMP

		GDP (in 1970 prices)					Actual Average Annual Growth Rate (%)					
		Actual		Estimated			Actual	Estimated				
		1971	1980	1985	1990	2000	1971~1980	1980~1985	1985~1990	1980~1990	1971~1990	1990~2000
Perlis (MS million)		828[1]	172 (1,463[1])	262	415 (3,287[1])		6.5[1]	8.6	9.8	9.2	7.5[1]	
Peninsular Malaysia (MS million)		11,191	22,344	32,267	48,344		8.0	7.6	8.4	8.0	8.0	
Malaysia (MS million)		13,016	26,188	37,824	56,760		8.1	7.6	8.5	8.0	8.0	
Perlis/Malaysia (%)		6.4[1]	0.66	0.69	0.73							
Per Capita GDP (MS)	Perlis	728.3[1]	1,094 (1,101[1])	1,486.6	2,170.5 (3,287[1])		4.7[1]	6.3	7.9	7.1	8.3[1]	
	Peninsular Malaysia	1,189.9	1,886	2,415.7	3,262.1		5.3	5.0	6.2	5.6	5.5	
	Malaysia	1,172.2	1,836	2,337.8	3,128.5		5.1	5.0	6.0	5.5	5.3	
Ratio of Per Capita GDP, Perlis Against National Average		0.62	0.60	0.64	0.69							

Note: 1) Added value of Perlis State plus Kedah State.

Source: "Fourth Malaysia Plan, 1981–1985," 1981.

Table 1.3.8 Estimation of GDP of Perlis State (in 1970 price)

Item		Value
1990	Population (person)	191,200
	GDP (M$ million)	415
	Per Capita GDP (M$)	2,170.5
Average Annual Growth Rate of Per Capita GDP, 1990–2000 (%)		7.1
2000	Per Capita GDP (M$)	4,309.8
	Population (person)	229,200
	GDP (M$ million)	987.8
	Average Annual Growth Rate of GDP, 1990–2000 (%)	9.1

1.3.3 The Prospects for Industry

(1) Perlis State

1) Agriculture

a) General

Today's Perlis State is a land of paddy. Perlis State forms part of Malaysia's granary, producing about 90,000 tons of rice annually in paddy fields covering about 24,000 ha, 10% of the national production.

Most of Perlis' land area is cultivated, consisting of paddy, sugar cane, rubber, coconut, fruits, vegetables and others, accounting for 60% of the state's land, while forest accounts for 30% (see Table 1.3.9).

The climate of Perlis State is marked by relatively uniform air temperatures through the year, high humidity and distinctly seasonal rainfall. Perlis State has a mean annual rainfall of 1,920 mm, which shows that the natural conditions are suitable for agriculture, particularly for paddy. But it has a dry season every year during the period from December to April, when there is no rain. How to cope with the dry season is a problem for the agricultural development of Perlis State.

b) Development Plan

The Muda Agricultural Development Authority (MADA) was established in July 1970 and the Muda Irrigation Project started. The Muda Irrigation Project aimed to cultivate paddy in the dry season also, by the construction of irrigation facilities, and was the first large-scale irrigation project in Malaysia. Two dams, Pedu dam on the Pedu River and Muda dam on the Muda River were constructed in 1968 and 1969 respectively as Muda Phase I. From these two dams, water is released to the Muda Project canal system and carried to 94,800 ha of paddy field in Perlis and Kedah States, making double cropping possible.[1] The rice crop in the MADA area in 1980 was 554,240 tons, 42.6% of the national crop of 1,302,500 tons[2]. Following Muda Phase I, Muda Phase II is now

ongoing. Muda Phase II designs to construct and improve the secondary channels and drains, including 9 blocks in Perlis State.

From the viewpoint of agricultural development, Perlis State is divided into two areas, the MADA area and the outer MADA area. Two million gallons of water (75,700 m^3) per day are supplied to MADA area and 20,243 ha of paddy fields are irrigated, 70% of all paddy fields in the State. In the MADA area, Muda Phase II is now ongoing. In the outer MADA area, "Perlis Integrated Agricultural Development Project (PIAD)" is now ongoing. PIAD is scheduled for implementation during the period from 1982 to 1986 and involves both in-situ and new development of agriculture, aquaculture and livestock. The Project area is to cover the entire Perlis State but exclude the sugarcane area operated by Perlis Plantation Berhad (PPB) and FELDA (8,502 ha), the MADA area (20,243 ha) and the Mata Air area (2,024 ha). The Project area comprises the cultivated area of 47,045 ha, as shown in Fig. 1.3.2. The Project area can generally be divided into two broad cropping/development regions based on rainfall distribution, that is, those areas above Beseri and those areas below it, which are roughly separated by the 1,900 mm rainfall isohyet. The areas north of Beseri have an average rainfall of 1,700 – 1,900 mm. In these areas, crops like rubber, mangoes, jack-fruits, citrus and coconuts are suitable, because of precipitation and topographical features. The areas south of Beseri have an average rainfall exceeding 1,900 mm. Soils here have a heavier texture and are mainly riverine. These are good paddy soils. The objective of the Project is to achieve double cropping of the paddy in this area. In order to achieve this object, it is necessary to implement existing DID (Department of Irrigation and Drainage) schemes and to construct the Timah-Tasoh and Arau dams on the Perlis River. In Perlis State, DID schemes in 24 regions of the outer MADA area have been ongoing since 1978, of which the schemes in 17 regions of 4,462 ha have been under taken using Asian Development Bank funds. Schemes in 4 more regions of 1,113 ha are scheduled to begin in near future using IBRD funds.[3)]

The future land use of Perlis State will be, as a result of the above development, as shown in Table 1.3.10.[1)]

Table 1.3.9 Present Area under Agriculture in Perlis State (1980)

Category	Area (ha)	%
Paddy	27,387	52.8
Rubber	8,068	15.5
Sugarcane	8,502	16.3
Mixed Horticulture	6,450	12.4
Diversified Crops	1,249	2.4
Coconut	140	0.3
Agricultural Station	57	0.1
Sago	80	0.2
Total	51,933	100.0

Source: KPM Khidmat Sdn. Bhd., "Perlis Integrated Area Development Project," 1982.3.

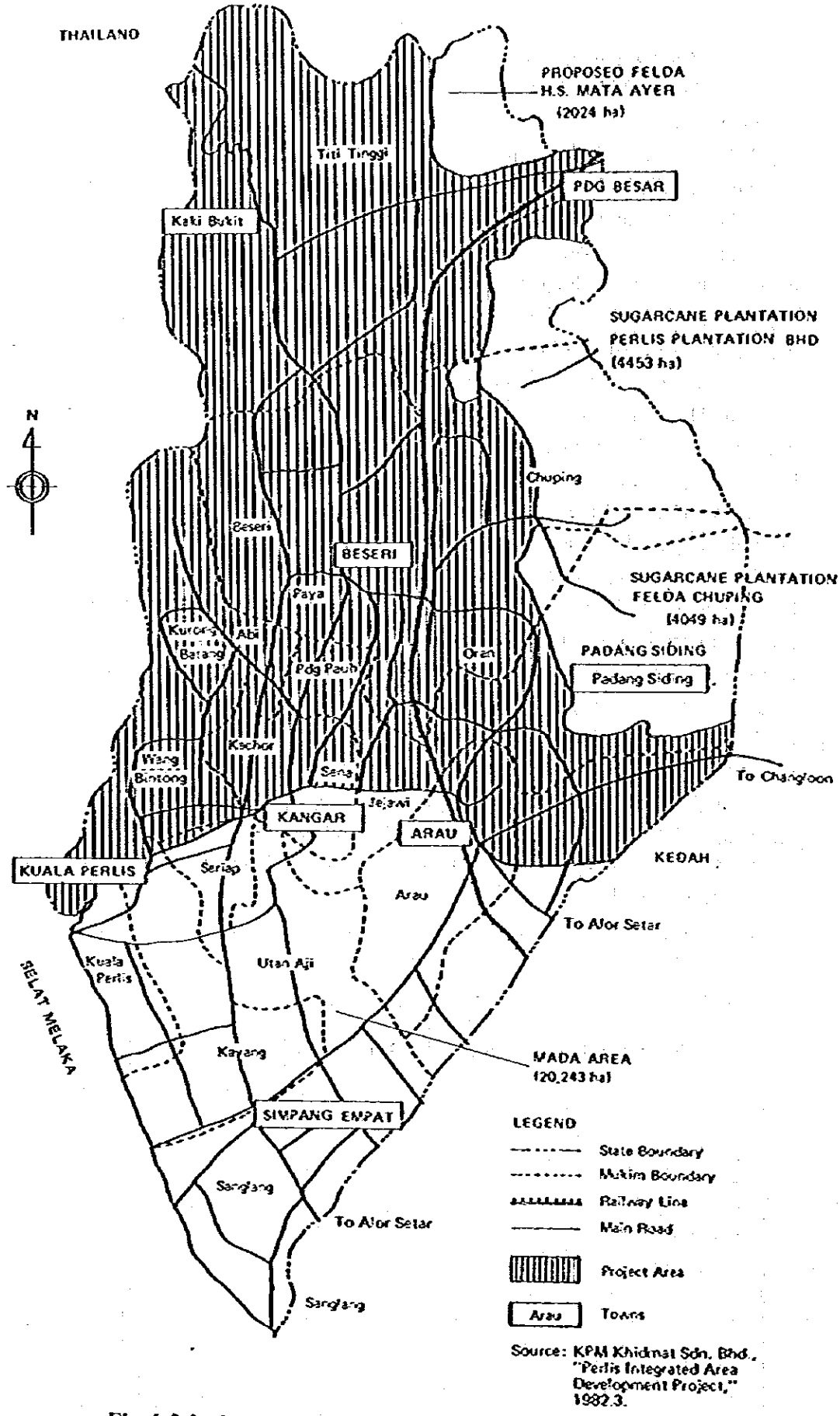


Fig. 1.3.2 Area Excluded from the Perlis Integrated Area Development Project (ha)

Table 1.3.10 Future Land Use of Perlis (ha)

Crops	Outside Project Area	Within Project Area
1. Paddy		
MADA Areas	20,243	
Intensification Areas		3,377
Other Schemes		1,329
Non-Scheme Areas		1,110
Sub-Total		5,816
2. Sugarcane		
FELDA/Perlis Plantation Bhd	11,741	
3. Rubber		
Estate	625	
FELCRA	851	
FELDA H.S. Air Mata	2,024	
Rimba Mas Mas	1,134	
Smallholders		
Registered		4,078[1]
Unregistered		2,514
New Planting/Conversions		5,202
Sub-Total	4,634	11,794
4. Guava-Coconut		
Converted Paddy Lands		1,328
New Areas		697
Sub-Total		2,025
5. Dusuns		6,454[2]
6. Pastures		500
TOTAL	36,618	26,589

Notes: 1) 1,913 ha have been replanted with RISDA aid. It is assumed that 50% of these acreages are due for second round replanting. 2,164 ha are due for first round replanting.
2) Including 829 ha which have already been rehabilitated by the DOA.
Source: DPM Khidmat Sdn. Bhd., "Perlis Integrated Area Development Project," 1982.3.

c) The Prospects for the Major Agricultural Crops

i) Rice

There were 27,387 ha of paddy fields in Perlis State in 1980, of which 20,243 ha were in the MADA area. The rice crop in Perlis State was 88,999 tons in 1980, and 61,849 tons in 1981, of which 10% is for consumption within the State.[4)5)]

The average yield in Perlis State was 3.24 ton/ha in 1980. An annual increase in the rice crops of 9,000 ton is expected as a result of PIAD.

ii) Sugarcane

Sugarcane was first cultivated at the Perlis Plantation Berhad (PPB) in 1969. After that, the Federal Land Development Authority (FELDA) began to cultivate it and there were 8,502 ha of sugarcane fields in Chuping in 1980, of which 4,453 ha were cultivated by PPB and 4,049 ha by FELDA. This sugarcane is single cropped. It is planted in the wet season and cut down in the dry season using tractors or manpower. For the cultivation of sugarcane, water supply is the important problem. Presently 20% of these areas are irrigated by pumping up groundwater. The changes in the production of sugarcane are shown in Table 1.3.11, which shows that production of sugarcane has been decreasing in recent years. The decreasing sugarcane yields have been attributed mainly to the extreme water shortage experienced by the crop during certain periods of the year. FELDA has no expansion plan because of lack of expansion land, but designs to raise the land productivity by irrigation.[1)6)7)]

Table 1.3.11 Production of Sugarcane and Sugar in Perlis State

Year	Sugarcane	Sugar
1973	146,000 t	9,000 t
1973～74	310,000	26,000
1974～75	510,000	37,000
1975～76	473,000	42,000
1976～77	341,045	32,158
1977～78	445,083	37,715
1978～79	339,000	33,000
1979～80	330,000	33,000
1980～81	294,000	30,000

Source: Perlis State

iii) Rubber

The areas in Perlis State where rubber is cultivated amounted to 8,068 ha in 1980. Rubber replanting in the existing plantations is projected, as well as new plantation. FELDA plans development of Mata Air Project (2,024 ha) and Rimba Mas Project (1,134 ha). Including these, the area of rubber cultivation will increase to 11,794 ha by 1986.[1)]

iv) Other Crops

In the area south of Beseri, totals of 2,024 ha and 6,454 ha of farm holdings have been earmarked by PIAD for the cultivation respectively of coconuts and fruits.

The Department of Agriculture in Perlis State says that a total of 1,600 ha of plantation are planned for the cultivation of mangoes in the area north of Beseri during the period from 1983 to 1989, which will yield about 2,400 tons of mangoes per annum.[4)]

d) Marketing of Agricultural Products

i) Rice

The rice marketing system is shown in Fig. 1.3.3.[5)]

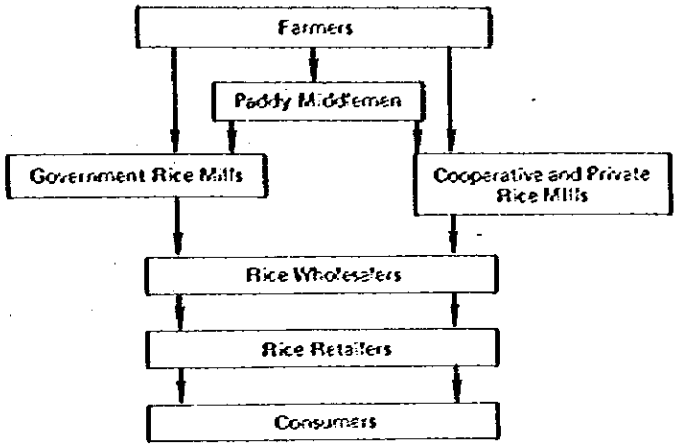


Fig. 1.3.3 Rice Marketing System

Rice is bought and sold trough the above routes, but the price of rice is under governmental control.

ii) Other Crops

Other crops except rice are under free prices, but the Federal Agricultural Marketing Authority (FAMA) plays a role to some extent in marketing, in order to protect farmers. The marketing system is shown in Fig. 1.3.4.

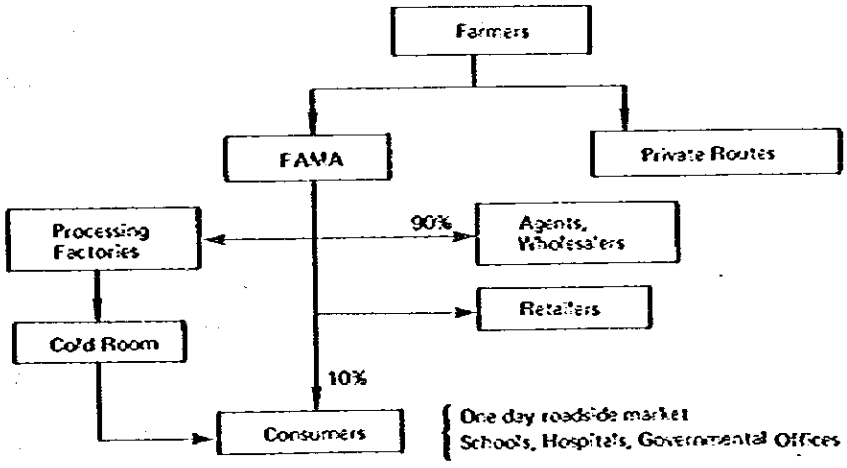


Fig. 1.3.4 Marketing System for Other Crops

The quantities of commodities arranged by FAMA, Perlis State in 1982 are shown in Table 1.3.12, of which about 300 tons are consumed inside Perlis State and about 145 tons are transported outside Perlis State. The quantity handled by FAMA accounts for about 40% of all products.[8)]

Table 1.3.12 Quantities of Commodities Arranged by FAMA, Perlis State in 1982

Commodities	Quantity (Kg)	
	Inside Perlis	Outside Perlis
Watermelon	94,780.5	23,781
Yellow Sugarcane	29,853	35,751
Dry Coconut	69,962	–
Mango	9,694	601
Long Bean	7,820	–
Meat Hen	1,811.5	6,812.5
Maize	49,791	26,408
Sweet Potato	9,361	–
Fresh Water Fish	1,182	–
Duck Egg	20,564	40,000
Miscellaneous	5,645	12,132
Total	300,464	145,484.5

Source: FAMA

e) Domestic Export of Agricultural Products

About 10% of the rice yield in Perlis State is consumed within the state and about 90% is outbound to another states. The destinations for this rice are shown in Table 1.3.13.

Table 1.3.13 Domestic Export of Rice from Perlis State

Destination	(%)
Penang State	10.0
Perak State	10.0
Kuala Lumpur	10.0
Johor State	70.0
Total	100.0

Source: LPN.

Other agricultural products are exported to other states as shown in Table 1.3.14. All of them are exported daily and weekly. Mangoes and chickens are transported to Singapore, Penang State, Kuala Lumpur and Kota Bharu by lorriies.

Table 1.3.14 Domestic Export of Major Agricultural Products from Perlis State

Commodities	Quantity	Remarks
Copra	10 ton/year	weekly, to factories in Penang.
Egg	20,000 eggs/year	daily
Chicken	10,000 head/year	
Maize	100,000 piece/year	

Source: FAMA, Perlis.

2) Forestry

Perlis State does not have abundant forest resources. Therefore, forestry is not undertaken extensively.

Data concerning forestry in Perlis State in 1978 derived from "Forest Statistics Peninsular Malaysia" are shown in Table 1.3.15.

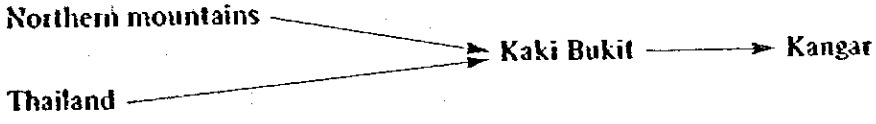
The percentage of non-forest land in Perlis State is 1.5 times that for Peninsular Malaysia as a whole.

Production of logs, poles, firewood and charcoal in Perlis State accounts, respectively, for only 0.20%, 0.19%, 0.41% and 0.41% of Peninsular Malaysia totals, showing that forestry is not active. As well, the production of sawn timber and the annual log consumption by sawmills account for only 1.02% and 1.01% of Peninsular totals. Only the production of bamboo shows a high percentage of 4.31%, reflecting the characteristics of the land.

In the various regional development plans for Perlis State, encouragement of forestry is not stressed. In FMP, public investment of only M$ 330,000 is projected for forestry in the period from 1981 to 1985. But, some efforts are ongoing for encouragement of forestry, such as experimental planting of teak and cidar.

"Forestry Statistics" show that 75,000 – 182,000 feet^3 (2,120 – 5,150 m^3) of logs per annum were transported from Kedah State to Perlis State during the period from 1971 to 1978 and nothing from other states. This means that logs consumed in Perlis State are mainly supplied from Kedah State.

On the other hand, the major transportation route for log into Perlis State is as shown in the following figure, according to the information in the state, which shows that logs are carried in by road from Thailand.



Besides this, mangrove backer piles are carried by ship from Thailand, coming in through the coast of Kuala Perlis.

Table 1.3.15 Forest Statistics in 1978

	Perlis State	Peninsular Malaysia	Perlis State/ Peninsular Malaysia (%)
Non-Forest Land	73.4%	48.0%	152.9
Production of Logs	659,000 ft³	352,582,000 ft³	0.20
Production of Poles	23,529 ft³	3,317,709 ft³	00.19
Production of Firewood	5,505 ft³	1,334,626 ft³	0.41
Production of Charcoal	66,847 ft³	16,442,088 ft³	0.41
Production of Bamboo	3,239 ft³	75,124 ft³	4.31
Production of Sawn Timber	194,000 ft³	189,312,000 ft³	1.02
Annual Log Consumption by Sawmills	289,595 ft³	286,784,212 ft³	1.01
Annual Log Consumption by Plywood/Veneer Mills	0	41,488,287 ft³	0

Note: 1) $1ft^3 = 0.0283\ m^3$
Source: IBU Pejabat Perhutanan Semenanjung Malaysia, "Forest Statistics Peninsular Malaysia, 1971-1978."

3) Mining

a) General

Perlis State does not have abundant mineral resources. It produces only a small quantity of tin. It does not produce gypsum, so that gypsum used in the cement factory is imported from Thailand. But limestone is so abundant in the State that they are used as raw material for crushed stone, as well as at the CIMA cement factory in Bukit Keteri. In this section, we will investigate about quarries, sand and phosphates which are estimated to be closely related to port activities.

b) Quarries

The following 4 quarries presently exist in Perlis State. All products are consumed within the State and none of them are carried outside the State.[9)]

QUARRY OWNERS IN PERLIS STATE

① Kang Giap/Chua Kua Keng
② En. Rahman Sdn. Bhd.
③ Quarry Jalan Abi/Tan Kim and Tan
④ Quarry JKR, Batu 1, Jalan Kuala Perlis

Building stones and crushed stones are made of quarried limestone and used for building, road construction and other public works. In the case of A-Company, one of the above mentioned quarries, the quarry site is in Kurong Batang, where building stones and crushed stone from 3/8 inch in diameter to 6x9 inch are made of limestones and supplied as materials for building and road construction. Production in 1982 was about 420 m^3 (1,124 ton) per day and about 130,000 m^3 (350,000 tons) per annum.[10)]

Production capacity is larger, but the actual production in 1982 was as above mentioned. As production of the other 3 quarries is estimated as to be same as A-Company, production of building stones and crushed stone in Perlis State is estimated as follows.

Production per day 420 m^3 x 4 = 1,680 m^3 (4,500 ton)

Production per annum 130,000 m^3 x 4 = 520,000 m^3 (1,400,000 ton)

All of these products are presently transported by lorries.

c) Sand

A certain amount of river sand is taken at Perlis River and used in building and construction works. But sand is mainly supplied from Kedah State. Besides, some quantity of sand are carried in from Langkawi Island and Thailand.

d) Phosphate Rocks

In the fertilizer material factory near Berembang, phosphate rocks are crushed and bagged and transported to a fertilizer factory in Kuala Lumpur by lorries. Raw materials are mainly taken in the mountains near Kuala Perlis and transported into the factory by lorries, but sometimes raw materials are transported from Thailand by ship. Production is 200 ~ 300 ton per month and 2,400 ~ 3,600 ton per annum.

As the same kind of factory is in Kaki Bukit, production of two factories is estimated as 6,000 ton per annum.

4) Fisheries

Current profiles of fisheries in Perlis State are follows.

a) Production

The total fisheries production in Malaysia as a whole in fiscal year 1981 was 766 thousand metric tons, a growth of 3.1% over the previous year.

When reviewed by area, however, the only remarkable growth was along the east coast of Peninsular Malaysia, while production in other sea areas showed a decline from the peak reached during the fiscal year 1979-1980 period (refer to Table 1.3.16).

Despite the decline in the fisheries along the west coast of Peninsular Malaysia fisheries production in Pelis State is growing at a rapid pace, having recorded 40 thousand metric tons in fiscal year 1982 which is 2.7 times the 1978 production of 14 thousand metric tons and a growth of 22% over the previous year. Production in the neighboring Kedah State is also growing yearly, recording a production of 150 thousand metric tons which is a growth of only 1.5% over the previous year (see Table 1.3.17).

The fisheries production of both states combined represents close to 30% of the total landing of Peninsular Malaysia as a whole, or over 40% of the total landing on the west coast of Peninsular Malaysia. These two states, therefore, are extremely important states in Malaysia insofar as fisheries are concerned.

Because Perlis State borders on Thailand coastal areas, its fisheries are inseparably related to the Thai fishery. Peninsular Malaysia imports approximately 140 to 155 thousand metric tons of fish annually, amounting to M$150 thousand, while is exports about 120 thousand metric tons amounting to M$250 thousand. In terms of quantity, imports exceed exports, but in terms of monetary value, exports exceed imports, which indicates that the Malaysian fishing industry exports the more expensive fish while it

imports the more popular fish. It is thus contributing greatly to the Malaysian economy by earning foreign currency through exports, and by supplying inexpensive fish to the general public (see Table 1.3.18, 1.3.19).

More than 80% of the imported fish come from Thailand. Some are imported by road transport, and some via sea by Thai fishing boats and fish carriers. The majority of the fish imported by sea are landed at Kuala Perlis. The landings in fiscal 1982 are estimated to have exceeded 40 thousand metric tons and is still increasing.

Production and imports combined, the amount of fish handled in Perlis State in fiscal 1982 is believed to have exceeded 80 thousand metric tons, of which about 90% is presumed to have been handled by the Kuala Perlis Port alone (see Table 1.3.20, 1.3.21).

Table 1.3.16 Trend of Fish Landings, 1977 – 1982

(Metric Ton)

		1977	1978	1979	1980	1981
Total Landing		618,643	684,944	696,329	743,678	766,588
Marine Fishes	Peninsular Westcoast	377,867	410,774	432,347	493,495	433,371
	Peninsular Eastcoast	120,085	154,124	138,558	130,403	215,944
	Sabah	34,900	40,100	40,200	32,700	38,000
	Sarawak	83,295	77,512	82,293	77,069	68,043
Fresh-water Fishes	Peninsular	1,196	934	1,231	8,211	9,230
	Sabah	1,300	1,500	1,700	1,800	2,000
	Sarawak	–	–	–	–	–

(Source: Annual Fisheries Statistics of Malaysia 1977 – 1981)

Table 1.3.17 Trend of Perlis Fisheries

	1977	1978	1979	1980	1981	1982
Landing in Metric Ton ( ): Kedah	14,333 (71,616)	14,543 (66,491)	18,194 (86,199)	26,732 (99,500)	32,881 (148,028)	40,292 (150,198)
Number of Fishing Boats						
Inboard-Powered	284	350	392	424	496	493
Outboard-Powered	75	106	136	186	195	163
Non-Powered	89	138	164	112	38	18
Total	448	594	692	722	729	664
Number of Fishermen						
Malay	1,238	1,504	1,793	1,708	1,642	1,349
Chinese	202	207	201	213	127	135
Thai	505	692	704	1,132	1,278	1,519
Total	1,945	2,403	2,698	3,053	3,047	3,003

(Source: Annual Fisheries Statistics of Malaysia 1977 – 1981)
(Source: Annual Fisheries Statistics of Kedah/Perlis 1982)

Table 1.3.18 Annual Series of Fishery Commodities Export from Malaysia

	1977		1978		1979		1980		1981	
	Metric Ton	M$ 1000	Metric Ton	M$ 1000	Metric Ton	M$ 1000	Metric Ton	M$ 1000	Metric Ton	M$ 1000
Fish, Crustaceans and Molluscs	101,002	86,592	115,388	92,621	125,292	114,520	108,759	114,467	114,931	142,280
Not for Human Consumption	17,634	8,646	34,576	17,148	33,063	16,716	31,060	15,751	26,916	13,100
Total	118,636	95,238	149,964	109,769	158,355	131,236	139,819	130,218	141,847	155,380

(Source: Annual Fisheries Statistics of Malaysia 1981)

Table 1.3.19 Fishery Commodities Import to Malaysia

	1977		1978		1979		1980		1981	
	Metric Ton	M$ 1000	Metric Ton	M$ 1000	Metric Tons	M$ 1000	Metric Tons	M$ 1000	Metric Tons	M$ 1000
Fish, Crustaceans and Molluscs	72,070	156,136	105,546	197,081	106,528	306,971	93,547	239,716	108,259	251,022
Not for Human Consumption	35,962	3,562	18,566	3,074	19,035	3,039	21,659	3,646	15,171	3,491
Total	108,032	159,698	124,112	200,155	125,563	310,010	115,206	243,362	123,430	254,513

(Source: Annual Fisheries Statistics of Malaysia 1981)

Table 1.3.20 Trend Import/Export of Fishes from Thailand

	Import		Export	
	Quantity Metric Ton	Value M $	Quantity Metric Tons	Value M $
1976	86,610	45,911,928	16,442	2,005,216
1977	93,049	49,909,083	13,596	2,068,052
1978	116,269	62,485,640	18,686	3,612,317
1979	136,416	73,794,973	25,352	4,908,622
1980	107,476	62,160,171	25,275	5,890,954
1981	114,854	76,784,648	29,040	6,202,881

(Source: Annual Fisheries Statistics of Malaysia 1981)

Table 1.3.21 Import/Export Fishes from Thailand to Kedah/Perlis (1982)

(Metric Ton)

Import			Export		
Fresh Fish	Fresh Prawn	Total	Fresh Fish	Fresh Prawn	Total
89,727	28,692	118,419	87	--	87

(Source: Annual Fisheries Statistics of Kedah/Perlis 1982)

b) Trends of Fishing Boats

The total number of fishing boats in Perlis State in 1982 was 664, which is a decrease of 65 boats from the previous year. Breakdown of the decrease is that 52 were non-powered or outboard powered boats, mostly owned by poor fishermen, and 13 were inboard powered boats. This shows that there has been a remarkable decrease of small boats. The same tendency prevails in Kedah State, where the number of boats decreased by as many as 744 from the previous year, chopping to 2,256 boats in fiscal 1982. Most of the attribution is among small fishing boats, which suggests that the devastation of the coastal fishing grounds is making the operation of small fishing boats economically difficult and compelling them to go out of business.

The probable reasons why fisheries production in Perlis State is sharply rising despite the decrease in the number of fishing boats are, for one, that the fishing boats are becoming larger in size, as indicated by the fact that while small fishing boats with inboard engines up to 10 gross tons decreased by 24, those in the range of 10 to 25 gross tons increased by 19 and those above 25 gross tons by two, and also that both fishing gear and fishing methods have been improved and are still advancing.

The largest fishing boat is a 70 gross ton boat, of which there is only one, while many of the purse seine boats are 25 gross tons or above, and most of the trawl boats, 25 gross ton or smaller (see Table 1.3.22, 23 and 24, Fig. 1.3.5).

The number of Thai fishing boats that enter or leave Kuala Perlis is 5,600 a year, in terms of extended total, most of them being purse seine boats (see Table 1.3.25).

c) Major Types of Fishing Operations (Fishing Gear and Methods)

i) Trawl Fishing

Pursuant to the Fishing Law of Malaysia, the operable sea area for trawl fishing is regulated by the type of boat and the size of the engine horsepower. Trawl boats of the Perlis State are mostly less than 25 gross tons in size and operate in adjacent waters more than 3 miles away from the shore line. The yield was 6,996 metric tons in fiscal 1982. The average duration of a voyage is three to five days. The catch in 1982 consisted mainly of 1,445 tons of prawns (50% were small shrimps) and the balance, miscellaneous and trash fish.

ii) Purse Seine Fishing

Purse seiners are mostly large boats of 25 gross tons or more which are operated daily except on moonlit nights. The yield was 27,805 tons in fiscal 1982, accounting

for 70% of the total fish production. The duration of a voyage is about five to seven days.

iii) Gill Net Fishing

Gill net fishing is carried out by small boats of 10 gross tons or less which make 1-day voyages to the fishing grounds within three miles of the shore line. Due to devastation of the fishing grounds, however, fish catches are poor and the number of boats is decreasing remarkably.

Table 1.3.22 Number of Licensed Fishing Boats (Perlis State, 1981)

	Non-Powered	Out-board Powered	In-board Powered	Total
Kuala Perlis	7	62	379	448
Kuala Sanglang	2	16	58	76
Sungai Baru	2	39	22	63
Sungai Berembang	3	20	–	23
Kurong Tengar	4	26	24	54
Total	18	163	483	664

(Source: Annual Fisheries Statistics Kedah/Perlis 1982)

Table 1.3.23 Size, Type and Number of Fishing Boats of Perlis State (1982)

Fishing Gear / Fishing Boat	Trawl Nets	Purse Seines	Grill/Drift Nets	Traps	Hook and Line	Barrier Nets	Total
< 10 Ton	67	1	90	3	15	–	176
10 – 25 Ton	162	3	7	–	11	–	183
25 – 40 Ton	23	48	3	–	10	–	84
40 Ton >	2	38	–	–	–	–	40
Total	254	90	100	3	36	–	483
Out-board	–	5	153	–	3	2	163
Non-Powered	–	2	5	–	11	–	18

Table 1.3.24 Number of Fishing Boats Licensed in Perlis State

Type / Year	Total	Non-powered	Outboard Powered	Inboard – Powered								
				Sub-Total	0-4.9 tons	5-9.9 tons	10-14.9 tons	15-19.9 tons	20-24.9 tons	25-49.9 tons	50-99.9 tons	above 100 tons
1976	288	65	40	189								
1977	448	89	75	284	43	72	58	21	9	81	2	–
1978	594	138	106	350	55	95	74	26	11	87	2	–
1979	692	168	136	392	89	89	76	26	9	100	3	–
1980	722	112	186	424	89	95	82	27	12	114	5	–
1981	729	38	195	496	107	103	118	33	13	110	12	–
1982	664	18	163	483	176		183			84	40	–

(Source: Annual Fisheries Statistics, (1976-1982) Fisheries Division, Ministry of Agriculture Malaysia, Kuala Lumpur.)

Table 1.3.25 Number of Thail Fishing Boat Coming to Kuala Perlis (1978 – 1983)

Month / Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1978	398	313	316	356	263	381	303	224	148	193	216	289	3,400
1979	238	307	445	364	442	681	668	482	542	680	583	305	5,737
1980	511	449	570	475	465	573	573	451	513	442	490	436	5,948
1981	472	351	593	475	472	473	486	423	370	389	446	516	5,466
1982	478	568	552	403	511	505	381	455	461	396	449	449	5,608
1983	467	396	479	262	274	237							

(Source: Statistics of Immigration K. Perlis 1983)

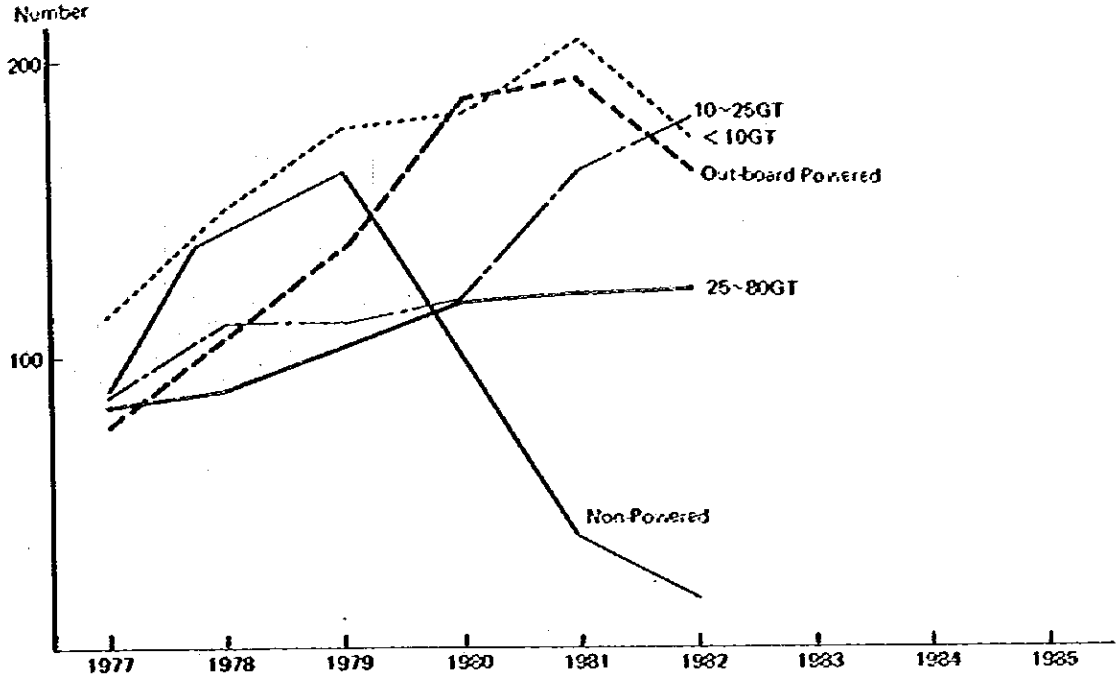


Fig. 1.3.5 Number of Types of Fishing Boats by Tonnage in Perlis State 1977–1982

d) Fishermen

Recently total number of fishermen is 3,000, which means that the figure has hardly changed despite the decrease in the number of fishing boats. When analyzed by race, however, the Malayans have decreased while Thai fishermen have increased. In fiscal 1982, Thai fishermen exceeded Malay fishermen by as many as 200 persons.

The small boats are mostly operated by the Malay fishermen, but because of being unable to cope with the devastation of their coastal fishing grounds or with the active, larger fishing boats, it is becoming increasingly difficult for them to continue operating. The number of small boats, as a result, is decreasing which, in turn, is prompting a decrease in the number of Malay fishermen. The fishing boats, on the other hand, are becoming larger in size mainly for purse seine fishing with which the Thai fishermen are familiar. Not only is the wage rate for Thai fishermen lower but boat owners prefer to employ them because in some seasons fishing is carried out in fishing grounds within Thai territorial waters. All these factors have contributed to increasing the number of Thai fishermen (see Table 1.3.26).

Table 1.3.26 Number of Fishermen Working in Licensed Boats, 1982

	Malay	Chinese	Thailander	Total
Kuala Perlis	823	33	1,495	2,351
Kuala Sanglang	158	51	–	209
Sungai Baru	208	51	24	283
Sungai Berembang	43	–	–	43
Kurong Tengar	117	–	–	117
Total	1,349	135	1,519	3,003

e) Fishing Grounds and Fish Resources

As shown in Fig. 1.3.6, the fishing grounds of Parlis State are the same as those of Kedah State, and they are enclosed within a quite limited sea area.

Despite this, the growth of fisheries production in Perlis State is remarkable as compared to that of Kedah State.

This is believed to be attributable to the unique circumstances in Perlis where many of the fishing boats from Kuala Perlis with a normal Malaysian fishing license as well as with an implied permit from Thailand operate in both sea areas. The Thai fishing boats likewise operate with dual licenses as above and their marine fish landings at Kuala Perlis are counted as the Malaysian fish yield.

While trawl fishing is the mainstay in Kedah State, fishing in Perlis State is mostly by purse seine, and the fact that it still has greater pelagic fish resources than demersal fish resources seems to be contributing to the growth of its yield.

Fishing resources in Malacca Straits and Andaman Sea area seem to become more abundant toward the north that is, richer in Thai sea area than in Malaysian sea area, and in Burmese sea area than in Thai sea area, although, of course, fishing efforts also contribute to increasing the yields.

Perlis State and Kedah State which are located in the north on the west coast of Peninsular Malaysia still boat fishing resources that are more abundant than in other states, but many reports point out that the current fish catches of these two states have already far exceeded the MSY (the Maximum Sustainable Yield) and that fishery production in Thailand is also decreasing yearly at a rate of 8% or more per year since its peak catch in 1977. It is questionable, therefore, that Perlis State would be able to sustain its growth of production for long. Exploration and development of offshore fishing grounds, effective utilization of unutilized resources, regulation of fishing, reinforcement of administrative control system and establishment of definite fishery policy measures are therefore strongly desired (see Fig. 1.3.7, 8 and Table 1.3.27).

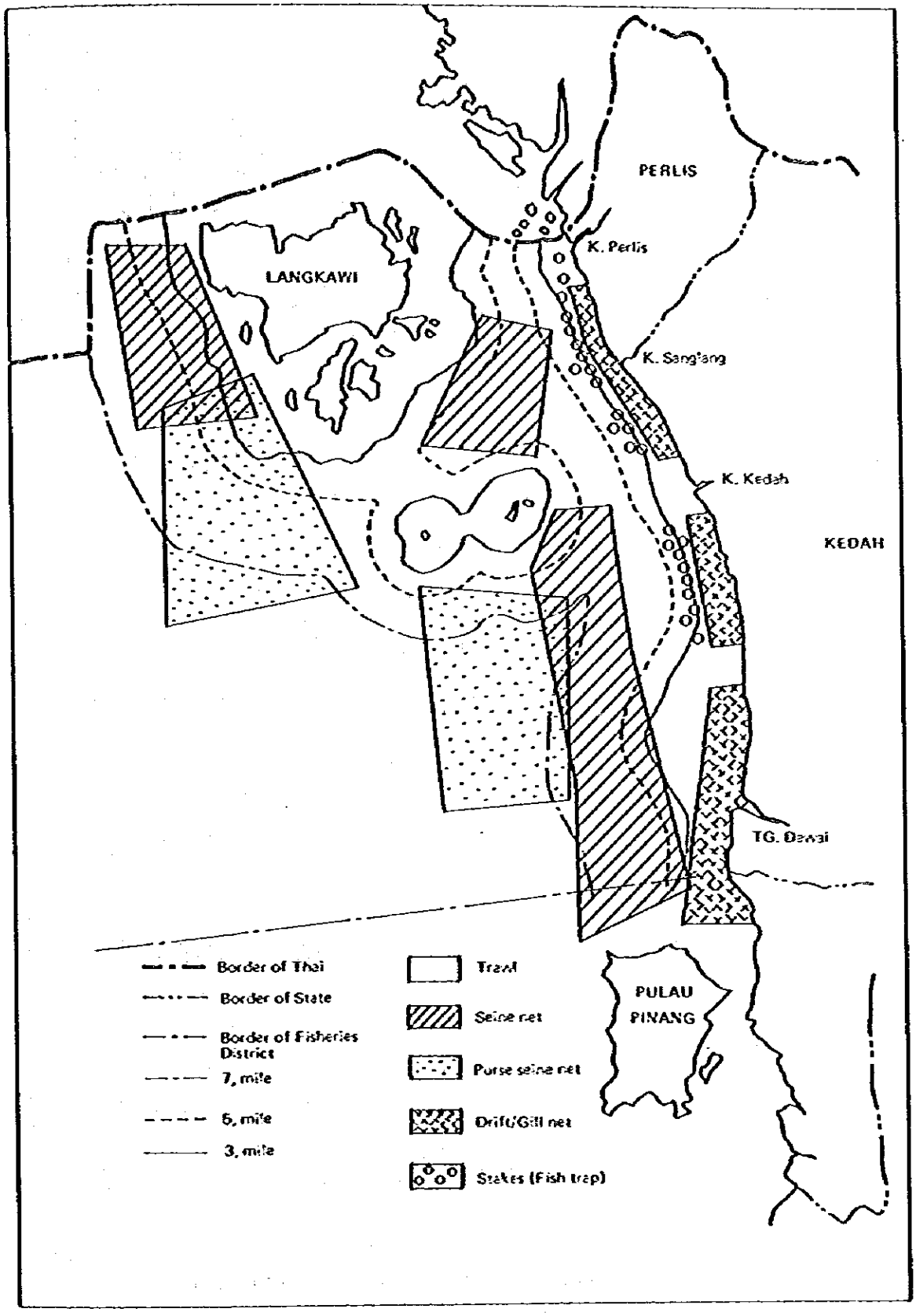


Fig. 1.3.6 Fishing Ground (Kedah/Perlis)

West Coast

The West Coast fisheries are dependent on the fish resources of the Malacca Straits. This stretch of water, though narrow, is reasonably abundant in fish resources easily accessible to fishermen throughout the year, and has a long coastline along which good infrastructure and numerous urban markets are located. This combination of factors has contributed to the tremendous growth of the fishery here from the mid-1950's to the present time. Both mechanization of the fishing industry, as well as the advent of the trawler during this period, have expedited growth of the fisheries on the West Coast. The total fish landings rose from 234 000 tons in 1970 to around 493 500 tons in 1980 or an increase of 111 percent. However, when the total landings are analyzed by type of fish resource (Fig. 1 and Table 2) the picture that emerges gives rise to serious concern to both fisheries planners and managers.

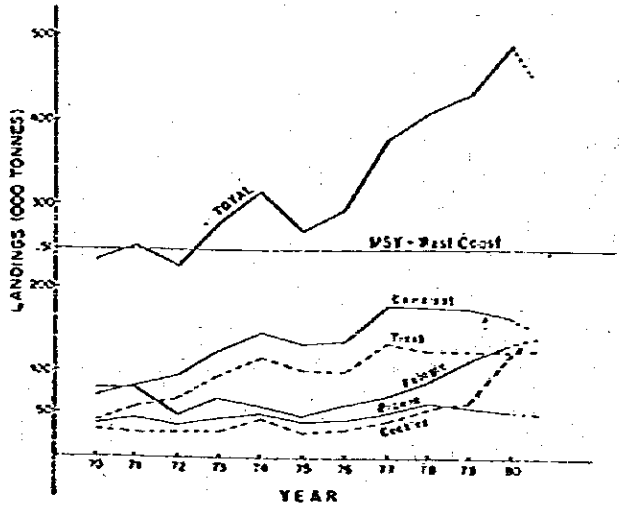


Fig 1 The trend of fish landings by major taxa in the West Coast of Peninsular Malaysia for the period 1970-1980

Table 2.
Fish landings by major taxa and estimated coastal fisheries resource potential in Peninsular Malaysia[1]

	MSY ('000 tons)	1983 landings ('000 tons)	Potential ('000 tons)	Comments
WEST COAST				
Demersal	110	167	—	Coastal fisheries are confined to the coastal waters within 60 nautical miles around the shores of Malaysia
Pelagic	81	143	—	
Prawn	40	50	—	
Others	20	130	—	
Sub-total	251	490	—	
EAST COAST				
Demersal	100	45 + 65*	15	*Approximately 40 000 tons are currently being fished by foreign nationals
Pelagic	75	65	—	
Prawn	6	4	—	
Others	5	16	—	
Sub-total	186	130 + 40* = 170	22	
Grand total	437	620	22	

[1] Extracted from the Malaysia Annual Fisheries Statistics, 1982

: Source
SCS/GEN/82/43
Report of the workshop on the Development of Rural Coastal Fisheries.
(Country Situation Paper- MALAYSIA).

Fig. 1.3.7 Reference of Fisheries Resource in the West Coast of Peninsular Malaysia

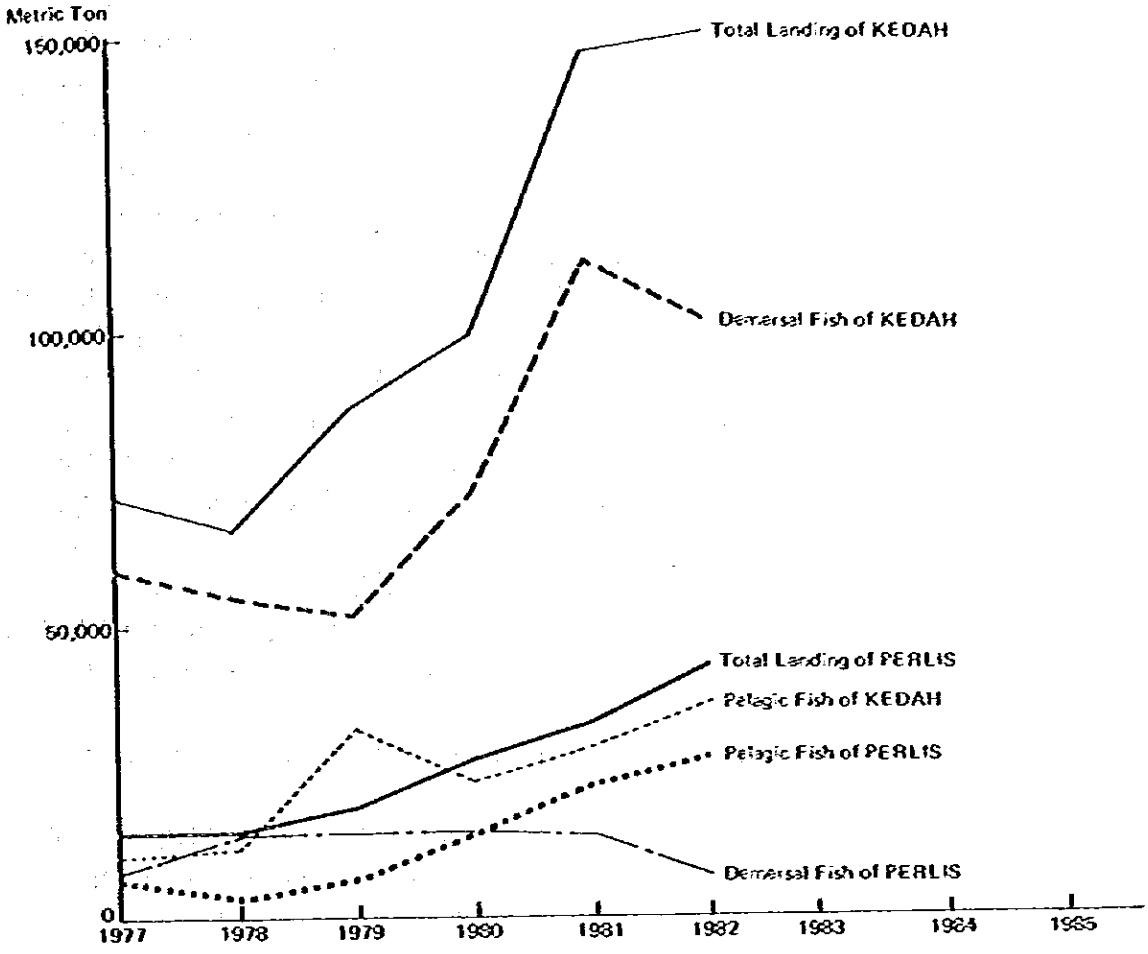


Fig. 1.3.8 Landings of Marine Fish (Kedah/Perlis, 1977 – 1982)

Table 1.3.27 Trend of Fisheries Production of the Thailand, 1976 – 1981

(Metric Ton)

	1976	1977	1978	1979	1980	1981
Freshwater Fishes	144,244	119,503	138,438	129,909	141,332	146,205
Marine Fishes	974,193	1,430,568	1,511,561	1,392,174	1,304,942	1,185,266
Crustaceans	141,440	170,786	179,799	167,362	171,878	156,954
Squid, Cuttlefishes	63,952	93,694	93,654	80,142	72,313	65,773
Molluses	168,562	291,485	111,673	119,485	99,263	92,828
Jellyfishes	22,738	82,439	62,600	54,952	2,166	1,959
Aquatic Invertebrates	15	17	1,556	2,310	1,054	1,015
Total	1,515,144	2,188,492	2,099,281	1,946,334	1,792,948	1,650,000

(Source: Yearbook of Fishery Statistics 1981, Vol. 52 FAO)

f) Distribution of Marine Fish Landings

Ninety nine percent of the fish landed in Perlis State are distributed within and of Perlis State as fresh fish. The fish caught by the fishing operators in Malaysia are normally channeled through assemblers, wholesalers and retailers before they reach the consumers, but in the case of Perlis State, the owners or investors of the larger sized fishing boats are usually Chinese merchants, and most of these owners are also operators of landing yards and distributors of fresh fish, concurrently serving as assemblers and wholesalers. In Kangar, the state capital, the fish wholesale market is juxtaposed with the public central market. Two tons of fish are supplied daily to this wholesale market and another five tons in total to the retail markets at Koki Bukit, Arau Simpang Empat and Kuala Perlis for consumption within the State. Consumption in Perlis State is small compared to other states, and the majority of the landings are shipped outside of the state to Alor Setar in Kedah State and to the cities in the south such as Butterworth, Ipoh and Kuala Lumpur of Peninsular Malaysia.

As for the method of shipment, 60kg of fish are packed in ice in a fish box (90cm x 50cm x 50cm) and transported to various destinations by open truck. Chilled box trucks are used only for long distance transportation, but there are only a few such trucks.

As for processing facilities, the State Government has invested in a joint venture with modern facilities for processing prawns and fish at Kuala Perlis, but its operation has been suspended because of a decrease in the landing of object fish, particularly prawns, due to diminishing resources. There is no other commercial processing facility (see Table 1.3.28).

Table 1.3.28 Disposition of Marine Fish Landings, 1981, Kedah/Perlis

Disposition Channel	Perlis	Kedah
Disposed fresh	32,837.26	38,372.26
Disposed for freezing	–	–
Disposed for canning	N.A.	N.A.
Disposed for curing		
Dried/Salted/Smoked	44.03	33,296.48
Steamed/Boiled	–	–
Fermented	7.56	76.96
Others	2.69	11.45
Disposed for reduction	–	69,880.96
Disposed for others	–	6,390.20
Total (Metric Tons)	32,891.54	148,028.28

(Source: Annual Fisheries Statistics of Malaysia 1981)

g) Consumption Trends (Demand and Supply of Fishes)

Perlis State is a fish supply base but as the State itself consumes only a small amount, the market is mainly influenced by the trends of demand in the big cities in the south. Fish accounts for two-thirds of the Malaysians' total protein intake. Their preference for fish may be attributed to the fact that it is the least expensive of animal proteins, being only about a third of the price of meat. The per capita supply of fishes in Peninsular Malaysia is 55 kg/person/year (volume of landings/total population), which is actually about 30kg net per capita, and accounts for about 14% of the total household expenditure, an amount by no means small by comparison to other nations who like to eat fish.

When fish resources are declining as they are today, it would be difficult to expect any large increase in fish yields. As fish consumption, on the other hand, increases with population growth and economic growth of the nation, it is believed that it will come to depend, much more than now, on imported fish to cover whatever shortage. Until 1975, fish exports had exceeded fish imports and the domestic demands for fresh fish had been amply satisfied, but since then, fish consumption has increased with the rapid growth of the Malaysian economy, and imports have come to exceed exports. This trend is likely to continue.

h) Fishery-related Facilities

i) Fish Landing Facility

There is no public fish landing facility in Perlis State other than MAJUIKAN facilities, and fish are mostly landed at private pier-style jetties made of wood. There are altogether 16 such jetties at Kuala Perlis Port and 10 at Kuala Sanglang Port. The largest is the one with a quay width of 32m while the rest are mostly about 10m wide. Fish landed from fishing boats are sorted on the spot, packed with ice in wooden fish boxes and shipped out by lorries. The floor of the fish handling yard is also wood, and the fish leave without being washed properly.

The facilities are compactly integrated, even allowing for loading of materials and equipment, ice and fuel oil onto the fishing boats all at the same place. However, there are no stevedoring facilities, everything is done manually and, therefore, inefficiently.

The total extended length of the 16 landing quays at Kuala Perlis is about 210m, where more than 1,000 fishing boats land and load in a month. The congestion, therefore, is quite heavy.

ii) Ice Plant and Refrigerator

There are two ice plants, one owned by MAJUIKAN and another privately owned. The combined daily ice making capacity is 150 tons, and the ice storage capacity, 700 tons, but as these capacities are insufficient to satisfy fully the demand, any ice is hardly being stored at these ice plants. Instead, individual jetties are equiped with refrigerators for storing 5 to 10 tons of ice, in all 11 refrigerators totaling 92 tons.

For storing fish, 10 to 20 ton fish refrigerators are provided at 7 places with the combined total storage capacity of 100 tons.

iii) Oil Tanks

As for fueling facilities, nine horizontal cylindrical tanks (2.10m dia. x 5.30m high), each with a capacity of about 15 tons, are installed near individual landing yards at Kuala Perlis Port and two more are at Kuala Sanglang Port, from which fuel is directly fed to fishing boats through pipe. Water is fed directly from the city waterworks.

iv) Repair Facilities

As for repair facilities for fishing boats, there is only one shop for overhauling and repairing engines. Hulls and large sized engines are repaired at the repair dock located at Ban Mi Lang in Thailand.

Although MAJUIKAN had drafted a plan for building repair facilities next to MAJUIKAN Ice Plant located at Kuala Perlis, it ended up only as a paper plan because the planned site was located upstream of the footbridge that crosses over to the opposite shore, making the passage of large size fishing boats impossible.

i) Fisheries Administration and the Fisheries Promotion Program

The major government organizations that have influence over the progress of fishery are the Fisheries Division, Ministry of Agriculture and MAJUIKAN (Fisheries Development Authority of Malaysia)

The Fisheries Division is an administrative organ of the government that handles overall fishery problems. The works of Fisheries Division are followings.

① Formulates policy measures to promote fisheries.
② Supervises technical duties of relevant institutions and training of fishermen.
③ Appraises aquatic resources and conducts surveys and research.
④ Prepares statistical data.
⑤ Distributes data and informative materials.

MAJUIKAN was established (in 1971) pursuant to the laws for the purpose of improving the social and economic status of fishermen, expanding production and employment opportunities, improving productivity by modernizing fishing and fish distribution, correcting economic inequality among fishing operators and promoting related industries.

For accomplishing the above objectives, the law provides MAJUIKAN with a broad authority over distribution, sales, processing, storage and transportation of aquatic products.

There is no Federal fisheries branch office in Perlis State. State is therefore placed under the jurisdiction of the branch fisheries office in Kedah State. MAJUIKAN has a branch office at Kuala Perlis where it has one ice factory, it opperates wooden fish landing facilities at the ports of Kuala Perlis, Kuala Sanglang and Kuala Sungai Baru, and is guiding and assisting the activities of the Association of Fishermen's Cooperation (AFC) in each region in an effort to improve the social and economic status of the fishermen.

However, the small-scale fishing in which most of the Malay fishermen are engaged in is in a crisis caused by the devastation of their fishing grounds. Programs intended for their relief have often been hampered in the past because of poor lateral coordination among the fisheries-related government agencies, public corporations and government

supported banking institutions. However, at last, the scheme for a regional fisheries development center has been worked out with plans to operate the center by dispatching personnel from the Fisheries Division, MAJUIKAN, Agricultural Bank of Malaysia and the Ministry of Social Environment to consolidate the linkage between the respective field of specialization and other relevant fields to improve the small status of fishermen. It has been informally decided that the center would be built on Langkawi Island.

Other government fisheries promotion programs include the rebuilding of the fish handling and processing factory with equity participation by the government, a fish cultivation farm program, and others, but none of them are making any headway.

j) Problems

i) Trends in Fisheries Production and Fishermen

As the fisheries production in Perlis State greatly affects the supply of fish to the people, a stable supply is to be hoped for.

However, the fish resources today are judged to be considerably diminished and the size of the fish become smaller due to over-fishing. Therefore, the exploitation of offshore resources in previously unutilized waters is desired all the more. Although immediate development of offshore fishing might be difficult as it involves many problems such as of converting to larger size fishing boats, improving the fishing gear and methods, acquiring the necessary techniques and procuring the necessary funds, it is important that measures be taken step by step to modernize the fishing industry.

Perlis State being geographically located as it is, the increase in the employment of Thai fishermen may be an inevitagle action for maintaining friendly relations with Thailand and also for economic and technical reasons in operating the fishing boats. Countermeasures such as extending relief or aiding the small Malay fishermen to shift to other occupations, or creating new job opportunities for them must be taken urgently, but as they are fishermen, it is hoped that some secondary processing of fish, or a fish processing industry which enhances the market value of the fresh fish before distribution, might be developed. As there is no repair facility for fishing boats in State while there are more than 3,000 fishing boats in operation including those of Kedah State, it is hoped that repair facilities for these fishing boats might be installed at some suitable location within State which would also have the benefit of creating employment for the small scale fishermen. In any event, the infrastructure segment must be developed so that the foundation of the fishing industry be well established.

ii) Fishing Facilities

None of the fishing ports in Perlis State were installed systematically or deliberately, all of them having emerged spontaneously in the estuaries with each port providing its own landing yard. The water depth is shallow at the estuary of every port, and as many fishing boats enter and leave them when high tide fills the waterways made naturally by the flow of the rivers, the ports are crowded and the landing yards congested.

As the entry and departure of the boats are affected by the ebb and flow of the tide, working hours at the ports are irregular, which greatly restricts the operation of the fishing boats and greatly affects production efficiency.

Landing jetties are only quays without adequate stevedoring facilities. Everything is done manually and takes a long time. Fish handling and sorting, ice crashing, ice supplying, boxing, shipping, water feeding, fueling and loading are all performed at the same small and crowded place, so that it takes time even to take care of a few fishing boats.

iii) Ice Plant

With the growth of fish production, the demand for ice today tends to exceed supply. Ice is needed by the fishing boats and for shipping the landed fish, and because the fish in Perlis State, which is in the tropical zone, are all disposed of as fresh fish, the requirement of ice for a ton of fish is believed to exceed one ton. Accordingly, the annual ice requirement for 32,000 tons of fish landed at Kuala Perlis and 40,000 tons from Thai fishing boats (imported fish), totalling 72 thousand tons during fiscal 1982 assuming that ice is used for only 80% of the fish landed is about 50 thousand tons. The ice is produced by two factories with a combined total capacity of 150 tons per day, but actual production is believed to be 60% to 70% of the installed capacity due to inadequate supply of water (even with occasional use of river water), inadequate supply of electric power, and repair and maintenance of ice-making machines, etc.. If we assume the operating rate to be 70% on the average, the annual production of ice is about 40 thousand tons. Even if the Thai fishing boats were to use their own ice aboard, they would still need ice for shipping the landed fish. Assuming that the volume of ice required is half of the amount of the fish landed by the Thai fishing boats, the annual shortage of ice, even by conservative estimation, would be 12 thousand tons. This shortage of ice is currently filled by import from Kedah State or from Thailand. What are urgently required, therefore, are ice-making facilities, more spacious fish landing and handling yards and repair facilities for fishing boats.

5) Manufacturing

a) General

Manufacturing in Perlis State accounts for only 9.3% of the GDP (1980) and only 4.0% of the employment (1976) of the State.

The "Census of Manufacturing Industries", 1972 & 1973, Department of Statistics, shows that there are 11 manufacturing establishments in Perlis State and the value of their output was M$ 8,543,000 in 1972, while in 1973 the number of establishments was 86 and the value of output is M$ 23,218,000 in 1973.

The "Industrial Survey, 1979", done by the Department of Statistics, also concerned with manufacturing in Perlis State shows that the number of establishments was 17 and the value of output M$ 108,107,000.

b) Problems

Present problems of manufacturing in Perlis State are as follows.

① The transportation costs are quite high because Perlis State is far from the main markets such as Kuala Lumpur.

② The lack of natural resources such as tin and rubber.

③ The lack of ancillary industries.

④ The lack of infrastructure. Electric supply and water supply are not sufficient. As well there are not sufficient port facilities.

⑤ There are not enough industrial estates.

c) Organizations for the Encouragement of Manufacturing

The following organizations are engaged in activities to encourage manufacturing in Perlis State.

i) Malaysian Industrial Development Authority (MIDA)

MIDA was established in 1965 in order to encourage industrial development. It passes to the state governments useful advice for industrial development. But, its subject of activities is limited to establishments with more than 25 employees and more than M$ 200,000 in capital.

ii) Perlis State Economic Development Corporation (SEDC)

SEDC was established in 1973 to implement NEP, being subsidized by the State Government. It has promoted the expansion of the CIMA cement factory, the construction of a ready-mixed concrete factory, building of low cost housing and investigation concerning the feasibility of a breed food factory, a paper board factory using paddy-straw, a chemical factory based on limestone, a clay building-brick factory and so on.

d) Strategies

The following stragegies have been investigated by SEDC and MIDA for the encouragement of Perlis manufacturing.

① Development of infrastructure such as the construction of an electric transmission station, the construction of dam on the Perlis River for water resources and so on.

② Five years of tax holiday for new factories.

③ Encouragement of agro-based small scale industries.

④ Development of industrial estates.

e) Industrial Estate

SEDC is presently constructing Jajawi industrial estate, which has an area of 13.2 ha. Twelve small and mid-scale factories such as a textile factory employing 1,000 persons, a chemical limestone factory and so on are scheduled to locate here. The cost of land is M$ 27.8 per m^2.[12]

f) The Prospects for Major Factories

The prospects for major factories that will have a large effect on port activities is as follows, based mainly on information obtained by inquries at the factories.

i) The CIMA Cement Factory

<u>The Present Situation</u>

The cement factory of Cement Industries of Malaysia Berhad (CIMA) is in Bukit Keteri. It started operation in August 15, 1968. Investment by the State Government accounts for 69% of the capital. The present number of employees is 260. The present production of cement is 1,200 ton per day and 400,000 ton per annum. The factories fuel base was converted from petroleum into coal at May 1983 and coal is exclusively used at present. Price of cement is under governmental control, and is

set at M$ 8.8 ~ 9.6 per 50 kg. Because the price of cement is controlled and cement is presently in short supply in Malaysia, cement can be sold as fast as it is produced. Cement produced in this factory is shipped all over Malaysia.

Transportation of cement is as follows.

Cement is transported to Kota Bharu on the east coast along the following route, because the transportation cost becomes cheaper by using trains via Thailand.

CIMA —train→ Thailand —train→ Kota Bharu

Cement is transported by train to the central and southern parts of Malaysia, such as Penang State and Kuala Lumpur. Bagged cement accounts for a large percentage and bulk cement for about 10%.

180 tons of fuel coal per day are transported to the factory along the following route.

Australia, India —ship→ Butterworth —train→ CIMA

Expansion Plan I

Expansion Plan I with an investment of M$ 250 million is ongoing, and will complete by 1985. The projected cement production is 600,000 tons per annum and the projected volume of coal is 300 ton per day.

Expansion Plan II

Expansion Plan II is presently planned with the target year in 1995. According to this plan, production of cement will become one million tons per annum and the volume of coal 450 tons per day in 1995. About 25% of this cement is planned to be shipped to the central and southern parts, such as Kuala Lumpur, Johor and so on.

ii) FELDA Sugar Factory

Present Situations

The FELDA sugar factory is in Chuping. It makes sugar from sugarcane harvested on 8,502 ha (1980) of sugarcane plantations, of which 4,453 ha belongs to PPB and 4,049 ha belongs to FELDA. There are 1,000 workers on the PPB plantation, 1,000 on the FELDA plantation and 1,000 in the FELDA factory.

Sugarcane is planted in the wet season and cut down in the dry season. During the harvesting season, 4,000 ~ 5,000 ton of sugarcane per day are cut and 200 ~ 400 ton of sugar per day are produced. Sugar production is about 30,000 ton per annum as shown in Table 1.3.11. The price of sugar is M$ 60 per 50 kg and is under governmental control. The major markets are Perlis State, Kedah State and Penang State.

Problems

In Perlis State, sugarcane is harvested once a year in the dry season and supplied to the sugar factory, but in the wet season the sugar factory has no source of sugarcane, and is compiled to stop operation for half the year. To correct this situation, 21,000 tons of raw sugar were imported during the period from 1981 to 1983, of

which 14,000 tons were from Australia and 7,000 tons were from Formosa and the Philippines, and using this raw sugar the factory continued operations all year long. Raw sugar was landed at Penang Port, and transported to the factory by lorries. The managers of the factory hope to 21,000 tons import raw material every year from now on.

iii) Cement Product Factory

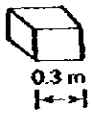
In Perlis State, there are more than 40 small-scale cement product factories around Kangar.[6] One of them is as follows.

Raw Materials

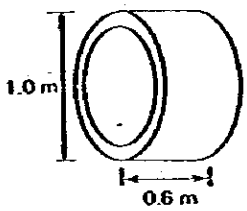
Cement is carried in from the CIMA cement factory in Bukit Keteri by lorries. Sand is carried in from Alor Setar.

Products

The following cement products are produced in this factory.



Concrete brick ····· used for building houses.



Concrete pipe ····· used for sewage.

{ Diameter ····· about 1.0 m
{ Length ····· about 0.6 m

Market

Cement products are sold all over Perlis State.

Future Plan and Demand

Development of Kuala Perlis Port is desired in connection with the factories expansion program.

iv) Wood Product Factory

In Perlis State, there are 3 sawmills, with a total of 45 employees and a total production of about 5,000 tons per annum. The raw wood is cut down in the mountains of Bukit Bintang and Hutan Simpanan Mata Air in Perlis State, and the sawn timbers are all consumed inside the State. Transportation is all by lorries.[9]

Besides, there are more than 10 small-scale woodworkings in Perlis State.

(2) The Development of Langkawi Island

1) General

Langkawi Islands consisting of 99 islands, lies 30 km to the west of Perlis State. Langkawi Island (Pulau Langkawi) is the cneter of islands, has an area of 526 km^2 and a population of about 27,000. The economy of Langkawi Island has traditionally been based on agriculture, forestry and fishing, but now the Kedah Cement Factory is under construction. Furthermore, tourism is expected to grow rapidly in the future.

2) Agriculture, Fishing and Mining

The conventional industries on Langkawi Island are agriculture and fishing. The major agricultural products are rice and rubber. Furthermore, Langkawi Islands are blessed with marble resources. On the main island, there is a quarry, a processing factory and a wharf that handles quarried marbles. Form this wharf, marbles quarried on the main island and neighboring islands are sent to the mainland of Malaysia. Marbles are marketing all over Malaysia and cannot meet the demand.[18]

3) The Cement Factory

The cement factory of Kedah Cement Co., Ltd. is under construction on Langkawi Island, and will be completed by August 1984. This will become the largest cement factory in Malaysia having a site area of about 21.8 ha, and a production capacity of 4,000 tons per day and 1,200,000 ton per annum. As to raw materials, limestone and clay are to be mined on the island, coal is to be imported from Australia by 10,000 D/W ships, petroleum is to be imported from the east coast by oil tanker and gypsum is to be imported from Thailand by 6,000 D/W ships. About 80% of the cement production will be used to meet domestic demands and about 20% is to be exported to the Middle East. A wharf with 2 berths – 9.0 m deep is now under construction for the handling of raw materials and products.[13]

4) Tourism

a) Present Situation and Problems

Langkawi Island currently has approximately 200 hotel rooms, of which 100 are located in the Langkawi Country Club (completed in August 18, 1971), and 20 are located in the Merlin Hotel in Tanjung Rhu. The facilities of the Langkawi Country Club and the Marlin Hotel are considered to be international standard hotels.

In 1975, total number of overnight visitors to Langkawi Island was estimated to be approximately 7,400, of which Malaysians represented 56% followed by Singaporeans (23%) and unidentified foreigners (21%). The average length of stay was 1.9 nights and the number of guests per room was estimated to be 1.8.[14]

Presently, Malaysian visitors, many of them from Perlis and Kedah State, represent 60% of all visitors, followed by foreigners. The overall average stay is 4 days, with foreigners staying longer than Malaysians. The Malaysian visitors (local people) are increasing in number and tend to stay 3 or 4 days along with their family. Currenty the largest problem is the access transportation to the Islands.[15]

b) The Tourism Development Plan

The Tourist Development Corporation (TDC) says that a large-scale resort development plan on Langkawi Island named "Langkawi Tourist Resort Concept Plan (LTRCP)" has been made (see Fig. 1.3.9). This plan proposes to construct a large-scale seaside resort in the northern part of Langkawi Island to be one of the large-scale seaside resorts in South Asia, comparable to Penang or Pattaya, expecting visitors from Europe, Japan and America. This resort is planned near Tanjung Rhu where approximately 600 ha areas of land are designated for development. In this area, many hotels totalling 3,000 rooms, golf courses, tennis courts and other recreational facilities are to be constructed. Furthermore, 800 ha of surrounding forest to be reserved as a natural reserve. The total

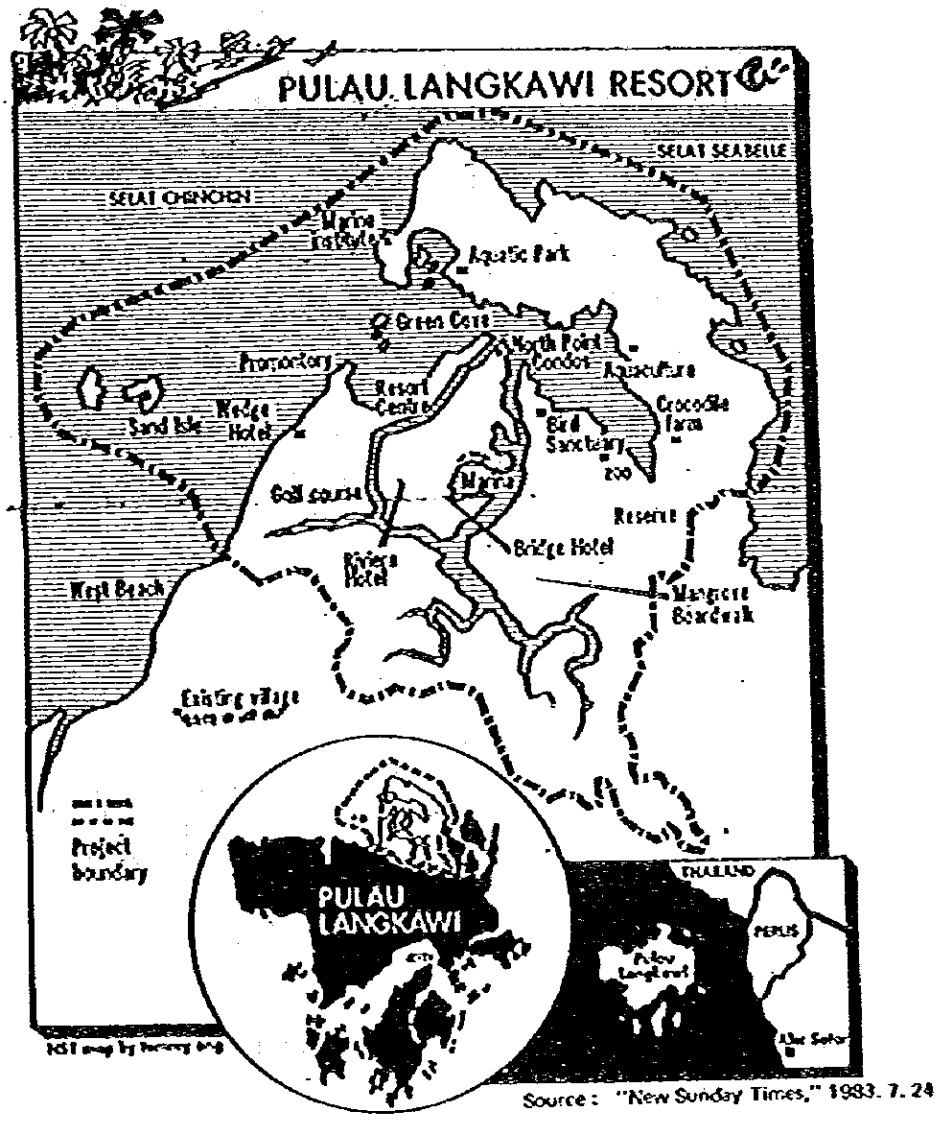
land area required for the Langkawi Resort, therefore, is approximately 1,400 ha. Investment in this project is estimated to be MS 3,000 millions. PROMET, a private enterprise, is to become the managing body of this project, and is already building a hotel in Tanjung Rhu that will be completed by 1984. The whole project is to be completed within ten years, when five million visitors per annum will visit this Island. But, this project is designed to be made by the private sector according as tourist demands, so that it is not certain whether all of the development will be done in the scheduled period or not.[15][16]

5) Visitor Access

a) Ferry Boat Service and Port Facilities

Eight passenger ferries under three companies ply between Kuah Port on Langkawi Island and Kuala Perlis Port. Almost all of the visitors to Langkawi Islands are transported by this ferry boat service. The size of the largest ferry boat is approximately 130 G/T. The ferry trips are approximately one hour and 40 minutes long. The sailing times vary slightly according to the tide in Kuala Perlis Port, but boats leave Kuah Port at about 8:00 a.m. and 1:30 p.m. returning from Kuala Perlis Port 10:30 a.m. and 3:30 p.m.

The ferry wharf in Kuah Port is to be expanded to a – 5.5 m depth in the future.[17]



Source : "New Sunday Times," 1983. 7. 24

Fig. 1.3.9 Pulau Langkawi Resort

b) Air Port

There is no scheduled air service to Langkawi Island but a charter company operates a small 18-passenger aircraft six days a week. Although the present capacity is small, the Federal Government has made an expansion plan for the airport that calls for a 2,400 m airstrip. The expansion is scheduled to begin in 1983 or 1984 and to be completed in 1986. When the expansion is completed, large-sized aircraft will go into commission between Langkawi Island and Hongkong, Singapore and Bangkok as well Penang and Kuala Lumpur, in connection with the above-mentioned "Langkawi Tourist Resort Concept Plan."[15]

(3) Thailand

1) General

Satun Province lies in the southernmost part of Thailand, close to Perlis State. The area of Satun Province is 91,328 ha, slightly larger than Perlis State (81,800 ha). Most of the land is cultivated, amounting to about 80,000 ha. This shows that the Province is mainly based on agriculture. The population was 169,119 as of December 31, 1982, slightly larger than Perlis State. The population consists mainly of paddy farmers and fishermen, and the workers in the rubber plantations.

The Province's major products are rice, rubber, fish, wood, charcoal, cattle, pigs and phosphate rock. Manufacturing is mainly based on these primary products. The major manufacturing industries are 227 charcoal factories, 17 sawmills, 135 small rice mills, as well as 4 ice factories, 3 dockyards, 3 feedmill factories and 3 clay brick factories.

2) Port Activities in Satun Province

Port activities in Satun Province center around Satun Port (Tamelang Port). Products in the Province such as rice, fish, cement, pork and charcoal are collected at Satun Port and shipped to various parts of Thailand, Kuala Perlis and Penang Port (see Fig. 1.3.10). Cargo boats and passenger boats by between Satun Port and Kuala Perlis Port every day. Cargoes amount to about 3 tons per day and passengers are transported by small boats having a 40 person capacity. About 50 passenger boats are in commission.[18]

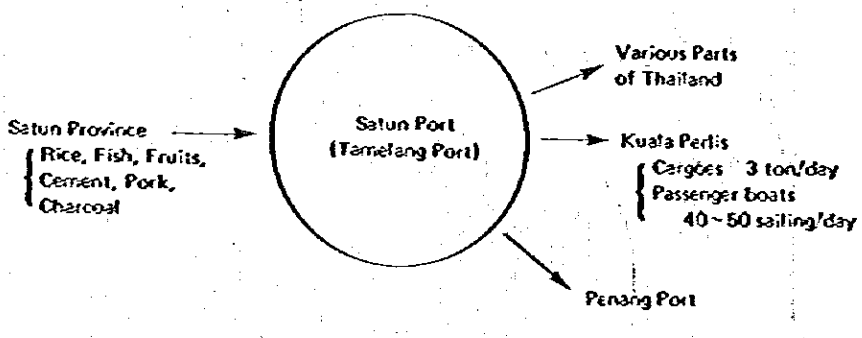


Fig. 1.3.10 Port Activities in Satun Port

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1) KPM Khidmat Sdn. Bhd., "Perlis Integrated Land Development Project", 1982.3.
2) Obtained from MADA, Perlis.
3) Obtained from DID, Perlis.
4) Obtained from Agricultural Department, Perlis.
5) Obtained from LPN, Kedah.
6) "Laporan, Badan Petugas Pembangunan Perindustrian, Negeri Perlis", 1981.4.
7) Obtained from FELDA, Sugar Factory.
8) Obtained from FAMA, Perlis.
9) Obtained from SEPU, Perlis.
10) Obtained from a company.
11) Obtained from a factory.
12) Obtained from SEDC.
13) Obtained from Kedah Cement Co., Ltd.
14) PMM & Co., "Langkawi Visitor Destination Plan, Summary Report", 1977.10.4.
15) Obtained from TDC.
16) Yaco & Associates Consultants, "Langkawi Tourist Resort Concept Plan".
17) Obtained from Marine Department, Kedah.
18) Obtained from residents.

CHAPTER 2
THE BASIC PLAN FOR PORT DEVELOPMENT

2. The Basic Plan for Port Development

2.1 The Basic Policy of the Perlis Port Plan

2.1.1 Considerations about Port Development in Perlis State

The following basic considerations have been taken up in the study of port development in Perlis State.

① To maximize the impact of port development on regional development

The individual income level, as indicated by the Perlis GDP, is about 60% of the national average and 27% behind that in the Federal Territory, which is the most affluent state.

Development of Perlis State will be mostly along the lines of agriculture and fishery, which have been its main industries, however the promotion of the manufacturing industry or industrial development is a must. The present unindustrial condition of Perlis State is said to be due to the lack of the elements which promote industry such as abundant resources, proximity to large consumer cities, and well developed industrial infrastructure.

It is necessary to give a new incentive in order to promote regional development in Perlis State. Developing efficient port facilities increase the use of the port, improve trade and produce new production activity, making it an effective means for regional development. Therefore the purpose of port development in Perlis State is not to develop ports to cope with an apparant increase in port demand, but to construct ports in advance as a lead to promote regional development.

② To select which port functions should be developed, in light of the geographic and socio-economic characteristics of Perlis State.

Perlis is a small state located in north Malaysia on the Thai border and is surrounded by Kedah State on the east and south. Its population is 80% Malay, 16% Chinese, and 4% others. Historically, Perlis was briefly a part of Thailand several times and has had strong connections with that country. There are many Islamites in the south part of Thailand who are related to people living in Perlis, resulting in heavy daily traffic across the border, and together they make up a single society straddling different nationalities.

The major resources of Perlis State are those of fishery and agriculture, which produces rice, sugarcane and rubber as its main crops. It is thus necessary to study the development of industries that can make use of the state's limited resources or those of the surrounding areas, including Southern Thailand. It is necessary to select port functions for development that are most suitable to these regional characteristics.

③ To allocate the port functions for further development among the ports in Perlis State.

The Perlis State coast line is about 20 km long. There are fishery ports such as Kurong Tengar, Sungai Brembang, Sungai Baharu, and Kuala Sanglang but only Kuala Perlis Port has commercial functions as well.

From a technical point of view, any portion of the Perlis coast can serve as a port develop-

ment site, however ports must be arranged based on the population and industry distributions. Since the goal is effective development with the least amount of investment, it is desirable to select a site where there are existing port facilities which can be upgraded and expanded.

Kuala Perlis and Kuala Sanglang are selected as study sites for possible development, capable of serving as general ports as well as fishing ports. For these two sites the following considerations must be examined in reference to the assignment of functions to be developed in Perlis State. These are the natural conditions of the construction site, the ease of port construction work, communication with land transportation facilities in the hinterland, future municiple development in the hinterland, and the accumulation of population and production activities.

The sphere of influence of each port functions should be set as a larger or smaller part of the combined hinterland that includes Perlis State, Satun Province in South Thailand and Langkawi Island.

④ To pursue port development in stages so that it keeps pace with the maturity of overall regional development.

The process of port development in Perlis State should be carried out in stages, while considering the potential of the region's economic activity, the financial restrictions, and how to fully utilize the development energy which the region presently possesses.

Therefore, it is of utmost importance that the port functions which are developed are suitable to the present economic activities of the region, to meet the present needs without deterring the development energy by the delay of port development. It is a priority target to eliminate the present problems of the existing ports at Kuala Perlis and Kuala Sanglang. In the next stage, port development to foster economic development will be undertaken.

⑤ To evaluate the effects of port development not only from the economic viewpoint but also from the social viewpoint.

In developing ports in underdeveloped areas, due to the character of the port functions being developed, most projects are not economically feasible. In Perlis State the expansion of ports for fishing and as passenger ferry terminals serving the offshore islands has its significance in that these facilities are basic to the living and production activities of the region. Therefore, these projects must be viewed as enhancing living standards and improving employment conditions, thus stabilizing the lives of the inhabitants, and not simply in economic terms.

Therefore, in the financial planning of the port development, special consideration must be given to the benefits that it has on social development.

2.1.2 The Expected Port Functions in Perlis State

At the present time Kuala Perlis Port has the multiple functions of a fishing port, a ferry terminal, and a terminal for exchanging goods and passengers with Thailand. All other ports, including Kuala Sanglang Port are solely fishing ports.

The only relations between Perlis State ports and those outside the state are the ferry connection with Satun Port in Thailand. Kuala Kedah Port, which is presently a base for transporting cargo to Langkawi Island, is a potential competitor for the ferry transportation going to the

island from Perlis Port.

Penang Port is the closest major port and is the second largest international port in Malaysia. It is located about 114 km south of Kuala Perlis and Perlis State is included within its sphere of influence.

The present functions of ports in Perlis State have been determined from the geographical relationships with the surrounding ports, the way functions are shared between these ports, the scale of these functions, and by the industrial activities within the state. These factors are the basis for considering the future expansion of Perlis' ports.

The development of an international port in Perlis State is not considered, and due to the limited size of its hinterland there is a low possibility of development for domestic trade. Therefore future port expansion will be related to the industrial activities in the state.

On the basis of the above, a list of port functions is given below.

A. The existing functions which must be continued or developed
   ① Fishery port functions
   ② Passenger transportation base
   ③ Base for trade with Thailand

B. Additional functions to be expected in the future
   ④ Base for cargo transport to Langkawi Island
   ⑤ Base for transporting raw materials to, and products from, factories
   ⑥ Ship repair

(1) Fishing Port Functions

The fisheries of Perlis and Kedah States combine to take 30% of the total west Malaysian catch, and 90% of this is exported to other states, making it a major fish supply area. The Perlis State fishing grounds are bounded by the Thai border in the north, Langkawi Island in the west, and the Kedah State fishing grounds to the south. This leaves a narrow area representing only limited fishery resources. Furthermore, overfishing results from the economic structure of the fishery's operation and the marketing system, which must be delt with through fishery policy.

In spite of these problems fishery is one of the important industries of Perlis State and must be promoted along with its related industries. In the future fishing grounds must be extended from the presently used coastal waters to offshore waters. Larger fishing boats must be built and mooring and other facilities to accomodate these boats will be required.

Kuala Perlis Port is expanding, year by year, its capacity to land fish caught by Thai fishermen for sale in the Malaysian market. It is desirable for the ports of Perlis State to develop as bases for importing marine products from Thailand, complimentary to the support of their own fleets.

(2) Passenger Transportation Base

Kuala Perlis Port presently functions as a base for transporting passengers to Langkawi Island and to Satun Port in South Thailand, and the number of passengers on both routes is increasing annually. These passengers travel mostly to visit relatives and hospitals, to go shopping, or on daily business, making these routes part of the traffic network within a single community. Thus, as long as there is no great change in the region's structure, this traffic will continue.

In fact, the traffic to South Thailand is expected to increase as the economic activities of both Perlis State and Satun Province grow and the people enjoy higher income levels, while the advance of the project to develop tourism on Langkawi should increase the demand on that route as well.

The greatest obstacle to the growth of tourism on Langkawi Island is the limited transportation. There is a plan to expand the airport for international use and to introduce airbus service. However, most of the passengers will still be transported by boats and the demand for ferry services will greatly increase in the future.

Kuala Perlis Port and Kuala Kedah Port are both being considered as possible bases for transporting passengers from the mainland to Langkawi Island. Kuala Perlis Port has a greater potential, as non-tourist passengers must use this port anyway, due to the nature of their travel, just as they do now. These non-tourist passengers can serve as the base of passenger volume to support the tourist traffic. In Kuala Kedah Port, however the only potential passengers are those coming up from Penang by high speed boat. In any case it is important to develop the port as the mainland window for tourism on Langkawi Island and also for Perlis State.

Based on the above, the following port facilities should be provided. As there are presently no special facilities to support passenger traffic to and from South Thailand, berthing facilities for the small boats used on this route will be required, as well terminals to allow safe embarkation and disembarkation of passengers, while maintaining control over entrance and exit procedures. The berthing facilities and waiting rooms supporting the passenger traffic to and from Langkawi Island should be expanded as they are presently insufficient. Finally, preparations should be made to handle the expected commencement of vehicular ferries on the Langkawai Island route, which will come with the development of industry and tourism on the island.

(3) Base for Trade with Thailand

Goods trade between Kuala Perlis and South Thailand is mostly carried out by small boats, which simultaneously carry passengers. Exports from Kuala Perlis include food goods and light industrial or daily necessity products of secondary industries, while imports from Thailand are mostly primary products, including rice, fruits, vegetables, and timber.

This trade has arisen from differences in the industrial structures, the levels of development (income level), and the commodity price levels in both areas. Thus trading of daily necessities, as opposed to foreign trade, is expected to increase along with the future increases in passenger traffic. This will give Perlis Port the character of a marine route 'border port', with functions similar to those of inland border towns on roads and railways. The formation of a market, related commercial facilities and simple workshops in port areas will help increase the income level and employment opportunities in Perlis State. Thus a 'border town' function is desired as actively promoting the development of Perlis State.

(4) Base for Cargo Transport to Langkawi Island

At present all types of cargo requiring transportation from the mainland to Langkawi Island are shipped from Kuala Kedah Port in Kedah State. This includes oil, construction materials, food, and daily goods, carried by ships with a maximum G/T of 200. The use of Kuala Kedah Port is presently favored over neighboring ports, including Kuala Perlis, by its greater water

depth, permitting entrance by larger ships, and by its proximity to the areas where the goods are produced as well as the market.

Due to the development of tourism in Langkawi Island, the future operation of cement factories, and to the ensuing location of related plants, the demand for transportation of cargo related to production and service, as well as of daily necessities, is expected to greatly increase.

Large vessels will be needed to meet such transportation demands. There is also the possibility of establishing lorry transportation that would use ferries to cross from the mainland. This idea together with that of starting vehicular ferries for passengers and cars at Kuala Perlis Port, must be studied further.

(5) Import/Export Base for Raw Materials and Products

Presently the Perlis ports provide no such function, primarily due to lack of factories that are large enough to support these functions. As it is roads and railroads provide land transportation to Penang Port, and Perlis is considered to be part of its hinterland. The transportation of coal into cement factories, of finished products out, and of raw sugar to the sugar refineries, are examples. In these cases there is the possibility of a switch to marine transportation if suitable ports existed within Perlis State. This switch is even more likely if the plans to expand factory production are realized.

Studies are needed on the possibility of creating demand for port cargo by building new cement product processing plant, a fertilizer plant, or something similar.

(6) Ship Repair

There is no place to repair ships along the Perlis State coast, or anywhere south until Penang Port. Private facilities are available in Che Mi Lang about 40 km to the north, in Thailand. These can repair max. 80 G/T ships, have an area of about 1 ha., and repair all the fishing boats in South Thailand and Perlis State.

As the number of fishing boats in Perlis State, which now number 664, is expected to increase, development of ship repair facilities will be required along with the expansion of the fishing port functions.

2.2 The Proposed Scale of Port Development

2.2.1 The Fishing Port Functions

(1) The Estimation of the Fish Handling Volume

The future fish handling volume are estimated as shown in following Table.

Table 2.2.1 Estimation of Fish Handling Volume

(Unit: tons)

Year	Landing by local fishing boats	Landing by Thai fishing boats	Total
1982	31,720	40,000	71,720
1990	46,820	46,800	93,620
2000	46,820	50,000	96,820

The increase over the 1982 volume must be handled at new port facilities, because present handling volume has been in excess of the handling capacity of existing facilities.

Basis for estimation

① Up to the short range target year of 1990, the growth rates of fish catches and imported fish are assumed to be 5% and 2% a year respectively. From these percentages using the 1982 base figures of 31,720 tons for local catch landings, and 40,000 tons (estimate), for fish imports, the anticipated yearly volume at Kuala Perlis can be estimated. Since any increase over the 1982 volume, being in excess of the handling capacity of existing fishing facilities, would necessitate the construction of a new port, it is used as the basis to determine the scale of the new facilities to be built.

② Between 1990 and 2000, the target year for the long range plan, no growth is assumed for fish catches in view of the restrictions on fishing grounds and the limit to fish resources (the MSY limit). A sustained growth of 2% per year is assumed for imported fish, on the ground that although fish catches by Thai fishing boats are also on a declining trend, the demand for fish in Malaysia will grow, and as the price of fish is higher than the prices in Burma and Thailand, will induce a gradual increase in the volume of fish caught in Burmese waters and imported through Thailand.

The above estimates are based on the following grounds:

① Based on the past history of the 5 years moving average of fish landings, future growth is anticipated to average 5% a year.

② This trend is anticipated to continue until the short range target year of 1990, but as there is a limit to fishing resources, and pelagic fish catches are traditionally unstable, it is considered unlikely that the recent growth of fish catches would necessarily continue, the MSY would probably be exceeded. Thus, fish catches after the target year of 1990 would probably remain the same despite some year-to-year fluctuations.

③ As for the volume of fish imported from Thailand, it is assumed reasonable to consider an annual average growth of around 2% judging from the past moving average (see Fig. 2.2.1, Table 2.2.2 and 3).

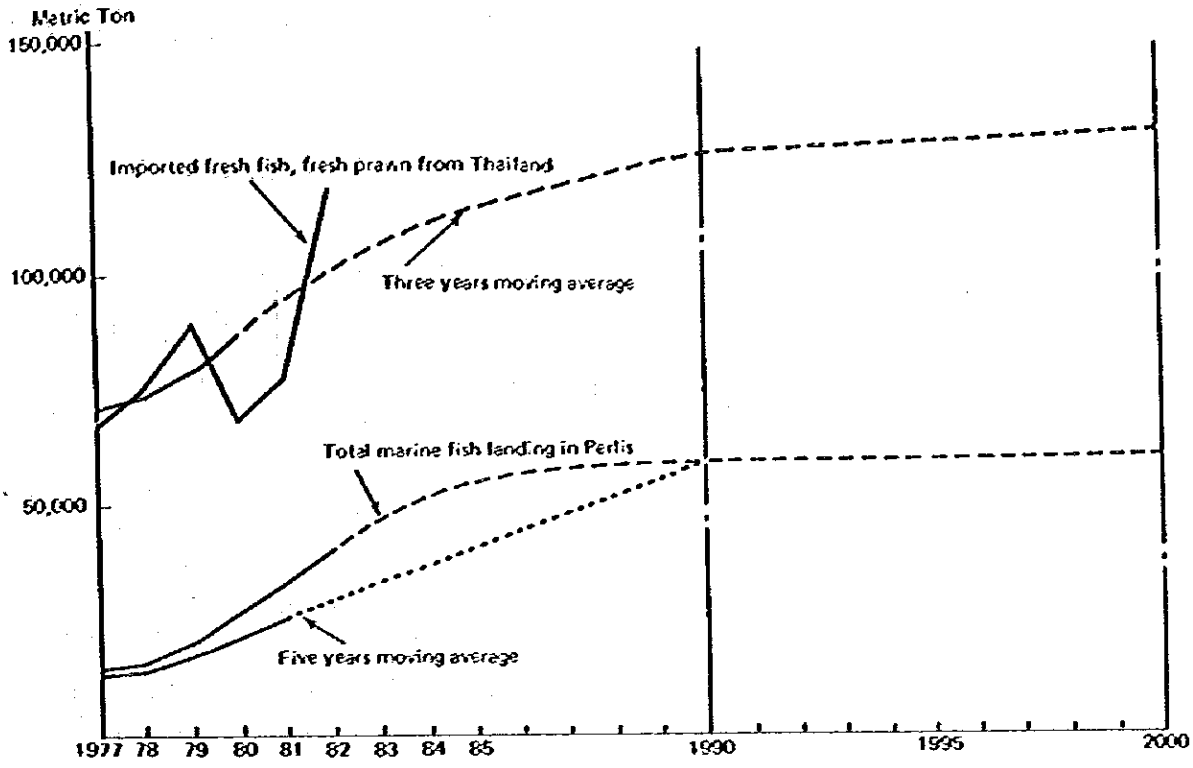

Fig. 2.2.1 Trend of Fish Landing in Perlis and Import Fish from Thailand

Table 2.2.2 Total Marine Fish Landing, Perlis

(Metric Ton)

Year	Landing volume	Year	Landing volume
1967	5,847	1975	13,780
1968	6,462	–	
1969	4,243	1977	14,333
1970	5,182	1978	14,544
1971	5,573	1979	18,194
1972	5,367	1980	26,732
1973	7,977	1981	32,829
1974	13,296	1982	40,292

Table 2.2.3 Trend of Imported Fresh Fish, Fresh Prawn from the Thailand

(Metric Ton)

Year	Fresh fish	Fresh shrimp	Total
1977	53,507	13,831	87,338
1978	55,391	18,730	74,121
1979	69,646	20,211	89,857
1980	46,998	21,467	68,465
1981	57,795	19,100	76,895
1982	89,727	28,692	118,419

(2) The Estimation of the Number of Fishing Boats by Type and Gross Tonnage

1) The number of fishing boats in Perlis State are estimated as shown in following table, based on the past trend.

Table 2.2.4 Estimation of the Number of Fishing Boats by Type

Year	Non-powered	Outboard powered	Inboard powered				Total
			Below 10 G/T	10–25 G/T	25–40 G/T	Above 40 G/T	
1982	18	163	176	183	80	44	624
1990	5	50	120	150	100	45	470
2000	5	30	120	150	110	60	475

Basis for estimation:

① The number of non-powered and outboard fishing boats are assumed to be reduced to the lowest limits.

② In the 10 GT category, the numbers of trawl boats and gill net boats are assumed to be reduced to the lowest limits.

③ After being reduced to the lowest limits, the numbers of these boats are assumed to remain unchanged.

④ In the 10 GT – 25 GT category, the number of trawl boats is assumed to decrease.

⑤ Medium and large sized fishing boats of 25 GT and above are assumed to increase, and particularly purse seiners are assumed to become larger in size.

⑥ These bases for estimation are determined based on the past trends in the number of fishing boats by type.

2) Estimation of the number of boats using the port on an average day in the planned target years is shown in following table.

Table 2.2.5 Estimation of the Number of Using the Port on an Average Day

Planned target year	25–40 GT	Above 40 GT
1990	8 botas	6 boats
2000	8 boats	8 boats

The number of boats using the port is estimated based on the increase in the number of fishing boats over and above those existing today.

(3) The Estimation of the Required Scale for Each of the Fishing Port Facilities

1) Required extension of quay in the planned target years is shown in following table.

Table 2.2.6 Required Extension of Quay in Fishing Port

Planned target year	Required extension of quay		
	Quay for fish landing	Quay for preparation and loading	Total
1990	59 m	21 m	80 m
2000	67 m	21 m	88 m

Calculation basis:

① Length of berth (L) = Average length of ship + allowance = 18 m + 3 m = 21 m

② Average daily number of fishing boats accomodated (N) = 16 boats (in year 2000)

③ Daily turnover per berth(r)$=\frac{\text{Hours available for landing}}{\text{Hours required landing per boat}}=\frac{15}{3}=5$

④ Required extension = $\Sigma\frac{N}{r}L \fallingdotseq 67$ m (in year 2000)

2) Required scale for Each of the Various Facilities

a) Fish Market (Fish Handling Place)

i) Average daily handling volume in the planned target years is shown in following table.

Table 2.2.7 Average Daily Handling Fish Volume

Planned target year	Handling volume/day)
1990	88 Metric tons
2000	100 Metric tons

Basis for estimation:

The number of operating days per year of the fish market is assumed to be 250 days/year and the handling volume per day is estimated accordingly.

ii) Required area for fish market in the planned target years is shown in following table.

Table 2.2.8 Required Area for Fish Market

Planned target year	Required area
1900	1018.5 m^2
2000	1157 m^2

Calculation basis:

$$S = \frac{N}{R \alpha p} = \frac{100{,}000}{2 \times 0.72 \times 60} = 1{,}157 \text{ m}^2$$

where S: Required area of sheltered sheds (m^2) ..... 1,157 m^2
P: Handling volume per unit area (kg/m^2) ..... 60 kg/m^2
R: Daily turnover of a sheltered shed (times/day) 2
α: Occupancy rate 0.72
N: Planned handling volume per day ..... 100,000 kg/day (in year 2000)

b) Ice Manufacturing Facilities

i) Requirement for ice manufacturing capacity in the planned target years is shown in following table.

Table 2.2.9 Requirement for Ice Manufacturing Capacity

Planned target years	Required ice manufacturing capacities/day
1990	Block ice 107 tons (≒ 110 tons) or Plate ice 71 tons (≒ 70 tons)
2000	Block ice 114 tons (≒ 115 tons) or Plate ice 76 tons (≒ 75 tons)

Note: Plate ice manufactured by automatic ice machine
: Plate ice manufacturing capacity is 2/3 of block ice

Calculation basis:

① Annual fish landings:

Landings by Malaysian fishing boats	15,100 tons
Imported fish landings	10,000 tons
Total	25,100 tons (in year 2000)

② Annual requirements for ice:

For landings by Malaysian fishing boats
Volume (tons) of landings x 0.8 = 12,080 tons
For imported fish
Volume (tons) of landings x 0.5 = 5,000 tons
Current volume short 12,000 tons
Total 29,080 tons

③ Daily ice manufacturing capacity = $\frac{29{,}080 \text{ tons}}{365 \text{ days} \times 0.7} \fallingdotseq 114$ tons/day

ii) Requirement for ice manufacturing area is shown in following table.

Table 2.2.10 Requirement for Ice Manufacturing Area

Block ice	110 tons/day	840 m²
	115 tons/day	890 m²
Plate ice	70 tons/day	160 m²
(Automatic ice machine)	75 tons/day	175 m²

iii) Requirement for ice storage capacity and space is shown in following table.

Table 2.2.11 Requirement for Ice Storage Capacity and Space

	Capacity (tons)	Space (m²)
Block ice 110 tons/day	300 (at -5°C)	100
115 tons/day	350 (at -5°C)	125
Plate ice 70 tons/day	150 (at -5°C)	130
75 tons/day	200 (at -5°C)	150

iv) Requirement for Ice Manufacturing Facilities using Automatic Ice Machines

① Ice manufacturing capacity ..... 70 ton/day
② Automatic ice machine ..... 35 ton/day x 2 set
③ Ice storage capacity ..... 150 ton (at -5°C)
④ Construction ..... Reinforced concrete, total three floor area: 480 m²

1st floor ..... control room, waiting room, pump room
2nd floor ..... ice storing room, measuring room
3rd floor ..... ice manufacturing room
Roof ..... Cooling towar, elevated tank

c) Cold Storage and Freezing Treatment Facilities

① Fish storage capacity ..... 100 tons (at -5°C)
1 room
② Freezing room capacity ..... 20 tons (at -25°C)
③ Contact freezer ..... (500 kg/6h) 1 set
④ Construction ..... Steel frame structure, one storied building
total floor area 422.3 m²

Machine room	65 m²
Cargo handling yard	100 m²
Cold storage at -5°C	87 m² (with 100 ton capacity)
Freezing room at -25°C	19 m² (with 20 ton capacity)

Preparation room	9.7 m²
Contact freezer (500 kg/6h)	1 set
Office space	25 m²
Processing bay	70 m²

d) Water Supply Facility

① Tank Capacity ..... 200 tons tank 1 set

Required daily volume of water in the planned target years is shown in following table.

Table 2.2.12 Required Daily Volume of Water

Planned target year	Required daily volume of water	
	Clear water	Miscellaneous water
1990	110 tons	150 tons
2000	150 tons	200 tons

Raw water for ice manufacturing	85 tons/day
Water for supply to fishing boats	25 tons/day

Clear water is supplied by the city waterworks and delivered to various facilities by pressure tank.

e) Fuel Oil Supply Facility

Required fueling volume per day in the planned target years is shown in following table.

Table 2.2.13 Required Fueling Volume Per Day

Planned target year	Required fueling volume/day
1990	17.6 kℓ
2000	23.8 kℓ

Calculation basis:

① Fueling volume per boat

for 25 GT – 40 GT type ..... 250 liter/day x 5 day = 1,250 liter

for 40 GT or above type ..... 600 liter/day x 7 day = 4,200 liter

② Number of fishing boats for oil supply per day

in 1990 ..... 25 G – 40 GT .... 4 boats

40 GT or above ... 3 boats

in 2000 ..... 25 GT – 40 GT ... 4 boats

40 GT or above ... 4 boats

③ Stock of fuel oil

in 1990 ..... 17.6 kℓ x 5 days = 88 kℓ

in 2000 ..... 21.8 kℓ x 5 days = 109 kℓ

f) Other Facilities

i) Administration Office (for fishing port administration office and middlemen's office)

Office area ..... 30 m² x 8 room, total floor area 315 m²

Construction ..... Steel frame structure (on the second floor of the fish handling place)

ii) Parking Area

For accomodating 15 large sized vehicles (13m x 3.25m)

Parking lot ..... total land area 850 m²

Construction ..... asphalt pavement (with drainage ditch)

iii) Warehouses (to store fishing gear, materials, equipment, and fish boxes, etc.)

① Number of rooms and area .... 150 m² x 3 rooms, total floor area 450 m²

② Construction ..... Steel frame structure

iv) Sewage Disposal Facilities

① Estimation of waste water volume in fishing port

Washing water for fish handling floor .... 25m³/day (0.02m³/floor m²)

Washing water for landing fish ..... 30m³/day (0.3m³/landing fish ton)

Washing water for fish hold of fishing boat ..... 45m³/boat (about 3m³/boat, 25 GT – 80GT type)

Washing water for fish box & Other 15m³/day (0.03m/box)

② Required capacity of disposition

115m³/day (= 25m³ + 30m³ + 45m³ + 15m³)

But there is no other way to dispose sewage of fishing boats inside of the port because it is very difficult to dispose it on land. Therefor it is recommended to set pipes or small gates on the breakwater so that water can be interchanged into and out of the port through the pipes or small gates.

The required capacity of disposition will be 70 tons per day.

g) Repair Facilities for Fishing Boat

i) Dockyard Facilities for Repair of Fishing Boat

Calculation basis:

① Estimation of the number of fishing boats by type and gross tonage in Perlis State in the planned target years is shown in following table.

Table 2.2.14 Estimation of the Number of Fishing Boats by Type and Gross Tonnage in Perlis State

Planned target year	Estimated number of inboard powered fishing boat				
	Below 10GT	10–25GT	25–40GT	Above 40GT	Total
1980	120	150	100	45	415
2000	120	150	110	60	440

② Estimation of the number of boats using the repair facilities on an average year in the planned target years of 2000 (see Table 2.2.15).

③ Required land area for repair facilities

$$S = A \times (1 + \frac{1}{0.6}) = 3{,}512m^2 \times 2.67 = 9{,}377m^2$$

S = Required land area

A = Total area of facilities for repair boats (see Table 2.2.15).

ii) Repair Facilities

① Slip way

Slip way that can accommodate one fishing boat of maximum 100 GT class (about 21m, L x 7m, B x 2.5m, D) ..... one line

② Transferring berth ..... one line

③ Repairing berth ..... ten berth

④ Lifting grade ..... ten sets

⑤ Transferring gradle ..... one set

⑥ Winch

Hauling winch (with reversing dram) ..... 1 unit

Capacity ..... 15 tons, 7.5 tons (4 tons, 2 tons)

Winding speed 35m/min, 7m/min

Type of drum ..... Grooved drum

Rated output of motor ..... 11KW x 4p, 8p

Wire rope ..... 37.5mm O.D.

Transferring winch (A) ..... 2 units

Capacity ..... 2.5 tons x 2 drums

Winding speed 5m/min

Type of drum ..... Double grooved dram

Rated output of motor ..... 5.5 KW x 4p

Wire rope ..... 16mm O.D.

Transferring winch (B) (with reversing drum) ..... 2 units

Capacity ..... 5 tons

Winding speed 5m/min

Type of drum ..... Grooved drum

Rated output of motor ..... 5.5 KW x 4p

Wire rope ..... 22.4mm O.D.

But required winch capacity is changed by kind of tackle.

⑦ Pumping room for washing water ..... 1 unit

⑧ Work shop & office

Table 2.2.15 Estimation of the Number of Boats Using the Repair Facilities on an Average Year in the Planned Target Years of 2000

Working	Classification of boats	1					2			3	
		Number of using boats V	Number of using time/ boat/ year N	Total number of using boat/ year V x N	Using days/ boat/ time d	Total using day/year D=VxNxd	Using month M	Working days P=24 days x M	D/P	Using area/ boat X	Total are required A=D/PxXx1/r*
Bottom washing painting	10 GT	96	1	96	2	192	10	240	0.8	50	80
	10-25GT	120	1	120	3	360	6	144	2.5	75	375
	25-40GT	88	1	88	5	440	3	72	6.1	110	1,342
	40 GT	48	1	48	7	336	3	72	4.7	139	1,222
Repairing hull engine Inspection	10 GT	40	1	40	2	80	12	288	0.3	50	30
	10-25GT	50	1	50	5	250	12	288	0.9	75	135
	25-40GT	37	1	37	7	259	12	288	0.9	110	198
	40 GT	20	1	20	7	140	12	288	0.5	130	130
											(TOTAL 3,512m²)

* 1/r . . . Effective percentage of Area = 0.6

Required land area for repair facilities

$$S = A \times (1 + \frac{1}{0.6}) = 3,512m^2 \times 2.67 = 9,377m^2$$

S = Required land area

A = Total area of facilities for repair boats.

(4) Manpower Requirements

The fishery facilities manpower requirement will be estimated by staff and worker, as shown in the following tables.

Table 2.2.16 Requirement of Staff for Fishing Port

Manager	Assistant Manager	Sales Supervisor	Operation Supervisor	Total
1	1	2	2	6

Table 2.2.17 Requirement of Workers for Fishing Port

Foremen	Workers		Mechanician	Electrician	Drivers	Total
	Men	Women				
6	30	6	7	5	4	58

Staff Functions:

① Manager : The responsibility for general management of the fisheries complex or refrigeration factory, and repairing facilities.

② Operation supervisor : The responsibility for operation of the facilities and equipment. The responsibility for control of the fishing boats and for providing services to them.

③ Sales supervisor : The responsibility for sales of the products such as ice, frozen fish or prawns, fuel oil, water and repairing services.

④ Chief engineer : The responsibility for machinery operation and maintenance, or repairing facilities or equipment.

2.2.2 The Commercial Port

(1) The Estimation of the Cargo and Passenger Volume

1) Perlis State

a) Cargo

i) Rice

Rice is transported mainly by lorries, partly by trains and not by the ships. But, there is a possibility of using ships for the long distance transportation of rice between Perlis State and Johor. Supposing that 10% of the rice outbound from Perlis State is transported by ship, the outbound volume at Kuala Perlis Port becomes as follows.

The outbound volume of rice by ship = 90,000 tons x 0.9 x 0.1 = 8,000 tons

Further, in Malaysia, 20% of the rice consumption is imported from foreign countries, of which 80% is from Thailand, and 20% is from the Philippines, Pakistan and China. Most of this rice is imported by ship, while some of the rice from Thailand is imported by lorries through Padang Besar to Penang.

On the other hand, a large-scale rice mill with a capacity of 55,000 tons per annum will be completed at Kuala Perlis by the end of 1983. It is supposed that mainly rice imported from Thailand, Burma and other countries will be cleaned at this rice mill. Supposing that 60% of the imported rice is cleaned in this rice mill, the following volume of imported rice will be landed through Kuala Perlis Port.

Imported rice 55,000 tons x 0.6 = 33,000 tons

From the above, the volume of rice handled at Kuala Perlis Port is estimated as follows.

1990	Outbound	8,000 tons
	Import	33,000
2000	Outbound	8,000
	Import	33,000

ii) Wood

Supposing that all of the raw wood used in the sawmills on the reclaimed land is imported from Thailand, the volume of wood handled at Kuala Perlis Port is estimated as follows (see Table 2.2.39).

1990	Import	5,000 tons
2000	Import	10,000

iii) Coal

At the CIMA cement factory, 180 tons of coal per day are transported from Butterworth by train, but managers of the factory hope to convert to ship transportation. Supposing that all of the coal to be used after Expansion Plans I and II are completed is transported by ship, the volume of coal handled at Kuala Perlis Port is estimated as follows.

1990	Inbound	108,000 tons
2000	Inbound	162,000

iv) Phosphate

Supposing that all of the phosphate is transported to Kuala Lumpur by ship, the volume of phosphate handled at Kuala Perlis Port is estimated as follows, provided that production in 2000 is same as in 1990 (see Table 2.2.39).

1990	Outbound	6,000 tons
2000	Outbound	6,000

v) Cement

At the CIMA cement factory, 25% of the products are now shipped to central and southern Malaysia, Kuala Lumpur and Johor, for which the factory managers hope to construct cement silos at Kuala Perlis, so as to transport it by ship. Production of cement is planned at 600,000 tons by 1985 under expansion plan I and at 1,000,000 tons by 1995 under expansion plan II. From the above, cargo handled at Kuala Perlis Port is estimated as follows.

1990	Outbound	150,000 tons
2000	Outbound	250,000

vi) Cement Products

Supposing that 60% of the cement products produced in the cement product factory on the reclaimed land will be outbound through the port, the volume of cement products handled at Kuala Perlis Port is estimated as follows (see Table 2.2.39).

1990	Inbound	8,000 tons
2000	Inbound	17,000

vii) Petroleum

Petroleum consumption in Perlis State was composed of 24,000 tons of diesel oil and 14,000 tons of gasoline totaling 38,000 tons in 1981 (see Table 2.2.18). Supposing that petroleum consumption is proportionate to the population, it will become 50,100 tons in 1990 and 60,000 tons in 2000 as shown in Table 2.2.19. Petroleum is presently largely transported by tank-lorries. When Kuala Perlis Port is developed, 50% of the petroleum will be transported by oil tankers. Therefore, the volume of petroleum handled at Kuala Perlis Port is estimated as shown in Table 2.2.19.

1990	Inbound	25,000 tons
2000	Inbound	30,000

Table 2.2.18 Consumption of Petroleum in Perlis State

Unit: liter

Year		Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
1981	Diesel oil	KIOSK	418,290	335,290	423,750	447,250	434,270	412,620	366,380	421,590	455,670	431,700	347,090	392,160	4,886,060
		General	1,757,460	1,595,560	2,030,790	1,918,530	1,872,300	1,868,300	1,502,840	1,151,410	1,423,610	1,596,930	1,421,600	1,371,370	19,510,790
		Total	2,175,750	1,930,850	2,454,540	2,365,780	2,306,660	2,280,920	1,869,220	1,573,000	1,879,280	2,028,630	1,768,690	1,763,530	24,396,850
	Gasoline	KIOSK	1,271,570	1,170,390	1,261,410	1,216,320	1,230,000	1,176,400	1,237,890	1,264,320	1,318,640	1,122,392	972,108	1,070,717	14,312,157
	Total		3,447,320	3,101,240	3,715,950	3,582,100	3,586,660	3,457,320	3,107,110	2,837,320	3,197,920	3,151,022	2,740,798	2,834,247	38,709,007
1982	1) Diesel oil	KIOSK	–	–	–	–	–	–	–	–	–	–	–	–	–
		General	–	–	–	–	–	–	–	–	–	–	–	–	–
		Total	–	–	–	–	–	–	–	–	–	–	–	–	–
	Gasoline	KIOSK	1,121,606	1,125,828	1,088,665	1,404,160	1,421,520	1,324,890	1,319,210	1,261,650	1,360,810	1,321,590	1,273,132	1,286,720	15,309,781
	Total		1,121,606	1,125,828	1,088,665	1,404,160	1,421,520	1,324,890	1,319,210	1,261,650	1,360,810	1,321,590	1,273,132	1,286,720	15,309,781

Source: SEDC, Perlis

Note: 1) Data concerning Diesel oil in 1982 was not available.

Table 2.2.19 Estimation of Petroleum

	1981	1990	2000	Remarks
Population (person)	147,726[1)]	191,200	229,200	Consumption per capita is same. 50% for port.
Petroleum consumption (ton)	38,709	50,100	60,000	
Petroleum handled at port (ton)	0	25,000	30,000	

Note: 1) The number in 1980 is used for 1981.

viii) Raw Sugar

At the FELDA sugar factory, it is hoped to import 21,000 tons of raw sugar per annum from Australia, Formosa and the Philippines, in order to avoid the stoppage of operation during the sugarcane growing season. From this, the volume of raw sugar handled at Kuala Perlis Port is estimated as follows.

1990	Import	21,000 tons
2000	Import	21,000

ix) Miscellaneous

Currently, approximately 1,400,000 tons of crushed stone and building stone are produced per annum. Because they are heavy and have a little freightbearing capacity, some part of the outbound stones will be transported by ship through Kuala Perlis Port.

The breed food factory expected to locate on the reclaimed land will use the port in case of outbound cargo.

Some part of the fertilizer for agriculture in Perlis State will be transported through the port. Fertilizer consumption in Perlis State in 1982 is shown in Table 2.2.20.

Table 2.2.20 Quantity of Fertilizer Consumed in 1982 in Perlis State

	Agency handled	Quantity consumed
Rubber	RISDA	327,470 Kg
Paddy	MADA	2,536,390
Other crops	LPN	5,630,820
Total		8,494,580

Source: SEPU, Perlis.

2) Langkawi Islands

a) The Estimation of Visitors

i) Existing Estimation

PPM & Co.'s, "Langkawi Visitor Destination Plan, Summary Report", (October

4, 1977) is a tourist development plan for Langkawi Islands submitted to the Tourist Development Corporation. In this report, visitors to Langkawi Islands are estimated to increase to 155,800 in 1986 from 7,400 in 1976, supposing that the tourist development arround Tangjung Rhu goes forward. Visitors are projected to be 65–70% international visitors, 15–20% domestic visitors and 10–15% regional visitors (Thailand, Singapore).

ii) The Estimation of Visitors

The characteristics of various resorts comparable with Langkawi Resort Plan are as shown in Table 2.2.22. Among these resorts, Kaanapali Beach Resort on Maui in Hawaii is analogous in many ways to the proposed development at Langkawi Resort. Planning for Kaanapali began in 1956 when Maui had minimal accommodations and limited air access, much as Langkawi at present. Since 1960, 3,700 hotel rooms, 1,300 condominiums, 18-hole golf courses and other amenities have been built.

In Langkawi Islands, "Langkawi Tourist Resort Concept Plan" (LTRCP) has been made around Tanjung Rhu and it is assumed from the above comparison that a resort on the same scale as Kaanapali will be developed by 2000. The scale of Langkawi tourist development in 2000 is assumed as follows.

Vistors per annum	500,000 persons
Foreign people (40%)	200,000 persons
Malaysian (60%)	300,000 persons
Hotel	3,000 rooms
Average stay length	4 days
Average annual occupancy	80%
Weekly air seats	20,000 seats

It is supposed that foreign 200,000 visitors will use aircraft, for whom 100–200 seat jet planes will be prepared with 5 double-trip flights a day. Supposing that the expansion of the air port and hotels at Tanjung Rhu will be completed in 1990, tourist development of Langkawi Island in 1990 is supposed to be on a scale one third that of 2000. Visitors per annum are supposed to be 170,000 persons, 70,000 foreign (40%) and 100,000 Malaysian (60%). 10,000 weekly air seats are to be prepared for the foreign visitors and some of the Malaysian visitors.

b) The Estimation of Ferry Passengers

i) Actual Results

Ferry passengers between Kuala Perlis and Langkawi Island increased from 187,257 persons in 1976 to 276,565 persons in 1980, as shown in Table 1.2.6.

ii) Estimation

The number of ferry passengers is estimated at approximately 450,000 in 1990 and 650,000 in 2000 according to the regression analysis through the actual results, as shown in Figure 2.2.2. It is not appropriate to adopt these values as the estimated number of passengers in future, but they give us some grounds for the estimation.

For the estimation of the number of passengers, we classify passengers as the following two types.

① Local People

② Visitors for LTRCP (Malaysians)

With the execution of LTRCP on Langkawi Island, approximately 20,000 workers will engage in the construction works and they will use ferry boats. Here, these passengers are included in "Local People". Output of the numbers of visitors for LTRCP estimated in the above mentioned clause, foreign visitors will not use the ferry boats, only Malaysian visitors. The number of Malaysian visitors is estimated at 100,000 persons in 1990 and 300,000 persons in 2000. Supposing that approximately 70% of the Malaysian visitors use the ferry boats both ways, the number of passengers will be 150,000 persons in 1990 and 400,000 persons in 2000.

From the above, the number of ferry passengers are estimated at 500,000 in 1990 and 800,000 in 2000, as shown in Table 2.2.21.

Table 2.2.21 Estimation of Ferry Passengers

Passengers	1990	2000
① Local People Present state (1980) Increment (Workers of LTRCP are included.)	300,000 persons 50,000	300,000 persons 100,000
② Visitors for LTRCP (Malaysians)	150,000	400,000
Total	500,000	800,000

Table 2.2.22 Characteristics at Comparable Resorts

COOMMODATION CHARACTERISTICS AT COMPARABLE RESORTS

	BALI	PENANG	PATTAYA	PHUKET	MALAYSIA E. COAST	FIJI	KAANAPALI	CANCUN
Visitors Annually	184,000	160,000	695,000	77,200	n.a.	188,700	500,000	395,000
Major Hotels (over 100 rooms)	4	10	12	6	5	11	6	16
Major Hotel Rooms	1,417	1,419	2,332	1,159	1,359	3,408	3,700	2,215
Average Annual 82.5% Occupancy	75.0%	78.6%	70.8%	59.0%	78.0%	n.a.	86.5%	n.a.
Planned Hotels	3	3	n.a.	3	n.a.	n.a.	1	9
Planned Hotel Rooms	740	360	n.a.	572	n.a.	n.a.	460	1,875
Number Weekly Air Seats	20,560	21,160	n.a.	3,460	315	5,630	32,630	10,570

VISITOR CHARACTERISTICS AT COMPARABLE RESORTS (1979)

	BALI	PENANG	PATTAYA	PHUKET	MALAYSIA E. COAST	FIJI	KAANAPALI	CANCUN
Foreign Visitor (%)								
ASEAN	2.0	30.6	18.5	2.8	n.a.	4.9	n.a.	n.a.
Japan	17.9	15.6	9.6	2.1	–	–	–	n.a.
USA/Canada	12.3	11.1	8.9	6.5	–	21.2	–	94.0
Australia/NZ	32.0	13.8	5.7	3.0	–	62.9	–	n.a.
Europe	28.0	25.9	47.5	80.4	–	5.6	–	2.0
Other	9.8	3.0	9.8	5.1	–	5.4	–	4.0
Party Size	n.a.	1.7	1.7	n.a.	–	n.a.	–	n.a.
Length of Stay	3.7	3.3	5.6	3.5	–	9.1	–	4.5

Source: Yaco & Associates Consultants, "Langkawi Tourist Concept Plan".

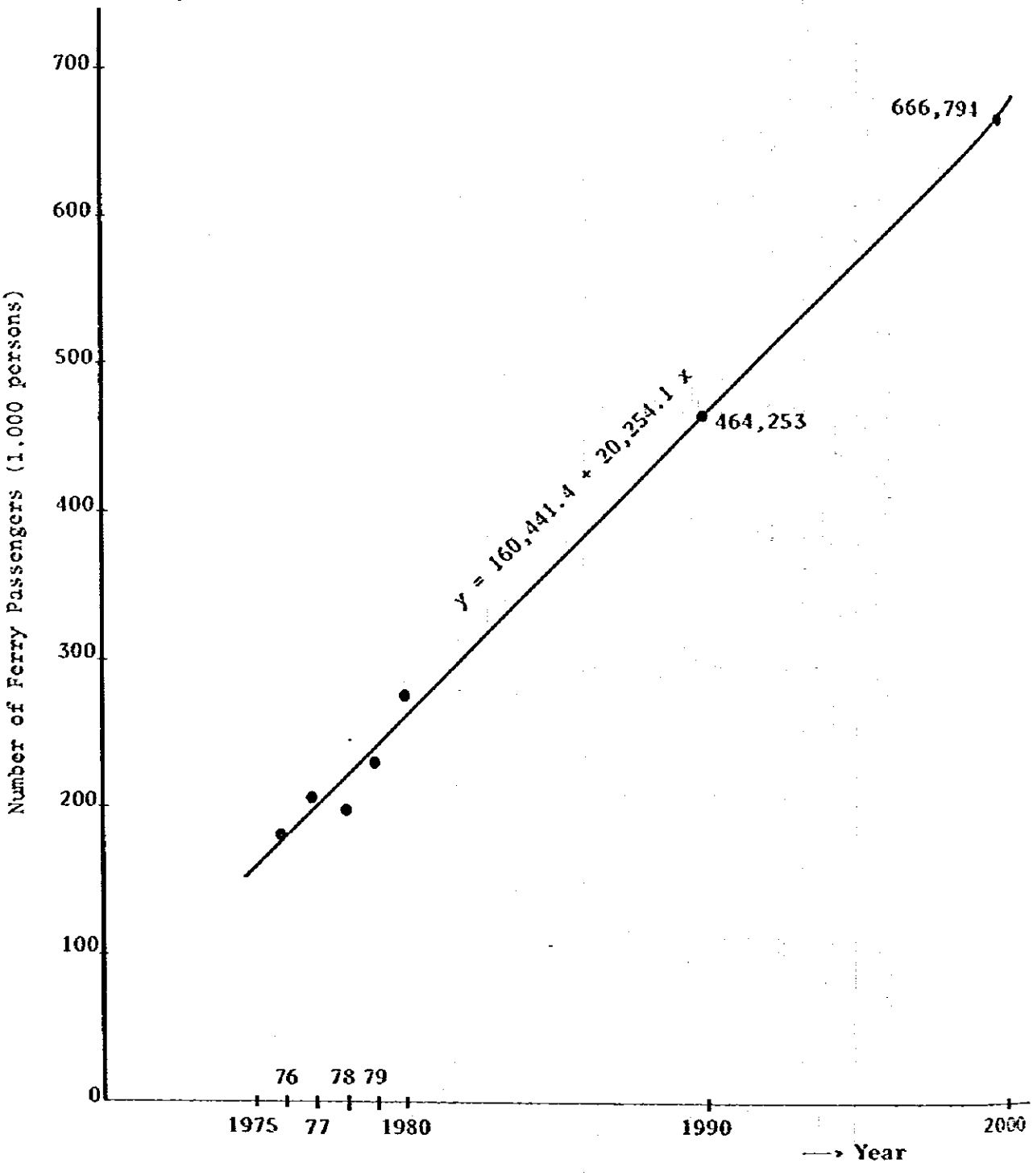

Fig. 2.2.2 Estimation of Number of Ferry Passengers

c) Cargo between Kuala Kedah and Langkawi

Presently, three 30 D/W class cargo boats, under three companies, ply between Kuah Port on Langkawi Island and Kuala Kedah Port. It takes 6 hours to get to Langkawi Island and back to Kuala Kedah Port, so these boats go and come back once a day. From Kuala Kedah Port to Langkawi Island, living necessities for the islanders and visitors, such as foods (rice, beer, tobacco, sugar, tea, coffee, coca-cola and biscuit), construction materials, petroleum, furniture and fertilizer are transported, foods accounting for approximately 50%. From Langkawi Island to Kuala Kedah Port, salty fish, empty bottles and drum cans are transported. All of the living necessities for Langkawi Island are transported from Kuala Kedah Port, not from Kuala Perlis Port, not from Kuala Perlis Port. Cargoes handled at Kuala Kedah Port in 1982 are shown by month in Table 2.2.23. Cargo to Langkawi Island shows an approximately fixed value of 5,000 tons every month, which implies that living necessities are carried solely by ship. Thus, in 1982, inbound cargo to Kuala Kedah Port amounted to approximately 17,000 tons and outbound cargo to approximately 52,000 tons, totaling approximately 69,000 tons annually.

d) The estimation of cargo between Kuala Perlis Port and Langkawi Island

Supposing that the amount of living necessities being shipped to Langkawi Islands will increase in proportion to the ferry passengers between Kuala Perlis Port and Langkawi Island and this increase of cargo will be handled at the new Kuala Perlis Port, the future volume of cargo between Kuala Perlis Port and Langkawi Island is estimated as shown in Table 2.2.24. In this estimation, the future ratio of outbound and inbound is assumed to be the same as in 1982.

Table 2.2.23 Cargo Handled by the Kuala Kedah-Langkawi Line in 1982

Year & Month	Arrival	Departure
1982. Jan.	1,296.14 ton	1,580.47 ton
Feb.	2,106.22	3,527.65
Mar.	1,522.59	4,475.27
Apr.	1,665.77	4,469.08
May	833.49	5,384.04
Jun.	822.19	4,998.00
Jul.	749.87	4,915.24
Aug.	1,427.47	4,842.27
Sept.	953.14	4,357.80
Oct.	1,241.33	4,073.85
Nov.	1,647.54	4,925.38
Dec.	2,777.76	4,752.30
Total	17,043.51	52,299.35

Source: Kuala Kedah Customs

Table 2.2.24 Estimation of Cargo handled by Kuala Perlis Port -- Langkawi Line

	Actual		Estimated	
	1980	1982	1990	2000
Cargo volume for Langkawi Island (B)		69,000 ton	110,000 ton	178,000 ton
Number of ferry passengers between Kuala Perlis and Langkawi Island (A)	persons 280,000	persons[1] 310,000	persons 500,000	persons 800,000
B/A		0.22	0.22	0.22
Increased Volume (B -69,000 t)			41,000 ton { outbound 31,000 ton; inbound 10,000 ton }	109,000 ton { outbound 82,000 ton; inbound 27,000 ton }

Note: 1) This is estimated as mid value between 1980 and 1990.

3) Thailand

a) The present Situation and the Estimation of Passengers between Thailand and Malaysia.

According to our observations and field inquiries, approximately 50 passenger boats with a capacity of 40 passengers currently ply between Satun Port (Tamelang Port) and Kuala Perlis Port. A single fare is M$3 per capita.

The number of passengers per annum amounts to 150,000 or 200,000, as shown in Table 2.2.25. But, these data are estimated to represent approximately 50% of the total, the real number of passengers is estimated as follows.

$$\text{Number of passengers (A)} = (150{,}000 \sim 200{,}000) \times \frac{1}{0.5}$$

$$= (300{,}000 \sim 400{,}000) \text{ persons per annum}$$

On the other hand, supposing that there are 50 passenger boats and that the occupancy rate is 50%, the number of passengers is estimated as follows.

$$\text{Number of passengers (B)} = 40 \text{ persons} \times 50 \text{ boats} \times 0.5 \times 365 \text{ days}$$

$$= 365{,}000 \text{ persons per annum}$$

From the above-mentioned, the number of passengers at present is estimated at approximately 300,000 persons.

In the estimation of the number of passengers, it is supposed that the future number of passengers will increase in proportion to the growth of GDP of Perlis State and the average annual growth rate of the number of passengers will be the same as that of the Perlis State GDP, namely 7.1% between 1980 and 2000. Supposing that the number of passengers in 1982 is 300,000 and that the average annual growth rate between 1982 and 1990, 2000 is 7.1%, the number of passengers is estimated at 500,000 persons in 1990 and 1,000,000 persons in 2000.

It is said that in Thailand the construction of a Coastal Road between Satun and Malaysia is planned. When this Coastal Road is completed, some passengers between Satun and Kuala Perlis will be transported by motor vehicles along this Coastal Road.

b) Actual Results and Estimation of Cargo

Cargo between Thailand and Kuala Perlis is totaled up from the foreign trade statistics at Kuala Perlis Customs, as shown in Table 2.2.26 and 2.2.27. Though these data do not always show all of the real value of cargo handled at Kuala Perlis, they show that approximately 1,000 tons of export cargo and approximately 10,000 tons of import cargo are handled every year. The major commodities of export cargo are agricultural and fishery products (skin, trepang, abalone and so on), chemicals (second-hand sack, film, soap and so on) and light industry products (wheat, canned bamboo shoot, canned mushrooms, coffee and so on). Major commodities of import cargo are agricultural and fishery products (fish, prawn, crab and so on), forest products (wood, bamboo and rattan), machinery (engine, armature, coil and so on) and miscellaneous (fish meal). These data are estimated to represent approximately 20% of the real cargo handled at Kuala Perlis Port, so that cargo in 1982 is estimated as follows.

Cargo	Export	1,000/0.2 =	5,000 ton
	Import	10,000/0.2 =	50,000 ton
	Total		55,000 ton

For the estimation of cargo handled at Kuala Perlis Port, it is supposed that cargo will increase in proportion to the growth of the Perlis State GDP and that the average annual cargo growth rate is the same as that of the Perlis State GDP, namely 7.1% between 1980 and 2000. Supposing that export cargo is 5,000 tons and import cargo is 50,000 tons in 1982, cargo handled at Kuala Perlis Port is estimated as shown in Table 2.2.28.

Table 2.2.25 Number of Passengers between Thailand and Malaysia

(Unit: person/year)

	Inbound	Outbound	Total	
1976	51,077	59,847	110,924	
1977	57,245	57,233	114,478	
1978	77,935	60,272	138,207	
1979	75,941	78,535	154,476	
1980 (-June)	42,485	41,803	84,288	(Estimated number for the year is 168,576)

Source: SEPU, Perlis

Table 2.2.26 Major Commodities of Foreign Trade Statistics at Kual Perlis Customs

Commodities		Export	Import
Agricultural & Marine products	Agricultural products	Rye, Pepper, Dry mushroom, Dry fruits, Raisins	Maize, Fruits, Coconut
	Livestock products	Skin	Honey, Bird nest
	Marine products	Cockle, Fish, Sardine, Trepang, Abalone	Fish, Prawn, Crab
Forest products		Rubber mat, Rubber	Wood, Bamboo, Rattan
Minerals			Salt, Charcoal
Machinery		Machinery	Carbon cap, Armature, Cover, Coil
Chemicals		Second-hand sack, Palm oil, Film, Soap	Raw Material of Medicine sack, Saccharin
Light industry products		Wheat, Canned bamboo shoot, Canned mushroom, Coffee	Fish net, Ice
Miscellaneous		Fish meal	Fish meal

Table 2.2.27 Foreign Trade Statistics at Kuala Perlis Customs

Unit: ton

Commodities \ Year		1978		1979		1980		1981		1982	
		Export	Import	Export	Import	Export	Import	Export	Import	Export	Import
Agricultural & Marine products	Agricultural products		0		1.7	7.76	29.49	71.477	117.503	85.654	69.8515
	Livestock products		0.692 33 pieces		2.12481 341 pieces	0	1.453	91.465	25.5	248.55	17.502
	Marine products		14.412 34 pieces		602.65228 756 pieces	12.195	1176.3583	174.3765	1222.269	106.812	1861.2977
	Total		15.104 374 pieces		606.47709 790 pieces	19.955	1207.3013	337.3185	1365.272	441.016	1948.6512
Forest products			1537.739 38520 pieces		3261.157 107180 pieces	0	4049.993	0.465	2696.2327 13 pieces	2.94	3495.1271
Minerals			0		0	0	87.751	0	326.589	0	32.328
Machinery			0.805 2064 pieces		24.853 4838 pieces	0	0.2 8912 pieces	0	9307 pieces	0.5	178.09763 30297 pieces
Chemicals			0		0	49.005	3.77	829.562	2.50455 10 pieces	363.364	91.38
Light industry products			0		0.6	3.31	27.851	189.608	77.2058	279.462	141.6322 300 pieces
Miscellaneous			8230.29 163560 pieces		9973.175 189395 pieces	0	3642.72	1.05	1478.76 4 pieces	3.544	4286.5839 3671 pieces
Total			9783.938 204518 pieces		13866.262 302203 pieces	72.27	9019.5863 8912 pieces	1358.0035	5946.564 9334 pieces	1090.826	10174.674 34288 pieces
Remarks						Only December				from January to August	

Table 2.2.28 Estimation of Foreign Trade Cargo Handled at Kuala Perlis Port

Year	1982	1990	2000
Export	5,000 ton	9,000 ton	17,000 ton
Import	50,000	87,000	172,000
Total	55,000	96,000	189,000

4) Summary

Estimation of cargo handled at Kuala Perlis Port is shown in Table 2.2.29.

Table 2.2.29 Estimation of Cargo and Passengers Handled at Kuala Perlis Port

			Year 1990							Year 2000						
			Total	Foreign			Domestic			Total	Foreign			Domestic		
				Total	Export	Import	Total	Outbound	Inbound		Total	Export	Import	Total	Outbound	Inbound
Cargo (ton)	Perlis State	Rice	41,000			33,000		8,000		41,000	33,000		33,000	8,000	8,000	
		Wood	5,000			5,000				10,000	10,000		10,000			
		Coal	108,000						108,000	162,000				162,000		162,000
		Phosphate	6,000					6,000		6,000				6,000	6,000	
		Cement	150,000					150,000		250,000				250,000	250,000	
		Cement product	8,000					8,000		17,000				17,000	17,000	
		Petroleum	25,000						25,000	30,000				30,000		30,000
		Raw sugar	21,000			21,000				21,000	21,000		21,000			
		Total	364,000	59,000		59,000	305,000	172,000	133,000	537,000	64,000		64,000	473,000	281,000	192,000
	Perlis-Langkawi line		41,000				41,000	31,000	10,000	109,000				109,000	82,000	27,000
	Perlis-Thailand line		96,000	96,000	9,000	87,000				189,000	189,000	17,000	172,000			
	Total		501,000	155,000	9,000	146,000	346,000	203,000	143,000	835,000	253,000	17,000	236,000	582,000	363,000	219,000
Passenger (person)	Perlis-Langkawi line		500,000				500,000			800,000				800,000		
	Perlis-Thailand line		500,000	500,000						1,000,000	1,000,000					
	Total		1,000,000	500,000			500,000			1,800,000	1,000,000			800,000		

(2) Proposed Scale of the Commercial Port Facilities

1) Passengers Ship Wharf

a) Proposed Ship Type

For the Langkawi Island sea route, same type of high speed boat presently in service between Kuala Perlis Port and Kuah Port will be employed in the future.

The specifications of the high-speed boats presently in service are as given below.

Table 2.2.30 Physical Dimensions of High-Speed Boat

Gross Tonnage G/T	Overall Length m	Width m	Draft (Full Load) m	Speed (Navigating) Knot	Number of Passengers
130.08	26.00	5.80	1.80	22.00	132

Passenger transportation between Langkawi Island and Kuala Perlis Port is expected to increase due to the increase of tourists with the development of tourism on Langkawi Island. Demand for vehicular ferries will also grow due to the tourists. If there is no such special restrictive policy as placed on non-resident cars operating on Langkawi Island, vehicular ferry service will become an effective means to develop Langkawi Island and foster tourism.

The port plan is prepared assuming that vehicular ferry service will start by 1990.

Once vehicular ferry service has started, passenger transportation will be carried out by two means, ie: high-speed boats and vehicular ferries. Their ratio is estimated as follows.

Of passengers travelling between Langkawi and Perlis, the number travelling by passenger cars is assumed to be in proportional to the number of passenger cars owned in the region.

The passenger car owner rate has been changing as shown in Table 2.2.31, and assuming the same trend will continue. The number of passenger cars owned per 1000 persons which is 64.2 in 1980 will be 95 in 1990 and 131 in 2000.

Assuming 3 persons ride in 1 car, the percentages of passengers travelling by car (those using vehicular ferries), and by high-speed boat are estimated as shown in Table 2.2.32.

Table 2.2.31 Passenger Motor Cars Owned in Peninsular Malaysia

Year	Population[2]	Motor Cars	
		Number[1]	Number of cars owned per 1,000 persons
1970	8,780,728	231,539	26.4
1973	9,502,131	316,894	33.3
1974	9,742,211	357,910	36.7
1975	9,997,252	398,014	39.8
1976	10,242,352	436,939	42.7
1977	10,510,105	491,933	46.8
1978	10,761,615	555,358	51.6
1979	11,029,400	595,600	54.0
1980	11,138,227[3]	714,742	64.2

Source: 1) Dicetak oleh Jabatan Percetakan Negara, "Year Book of Transport Statistics Malaysia, 1981", 1981.10.
2) Department of Statistics, "Monthly Statistical Bulletin, Peninsular Malaysia, Mei, 1983".
3) Department of Statistics, "Annual Statistical Bulletin Malaysia, 1981", 1982. 11.

Table 2.2.32 Estimate of the Number of Passenger Cars and Passengers Using Vehicular Ferry

Year	Number of passengers (1,000 persons)	Number of cars owned per 1,000 persons	Number of passenger cars transported (cars/year)	Number of passengers using passenger car (1,000 persons)	Number of passengers using high-speed boat (1,000 persons)
1990	500	95	47,500	142.5	357.5
2000	800	131	104,800	314.4	485.6

With regard to the Thailand sea route, small outboard motor boats with an overall length of about 10 m carrying 30 – 40 passengers are presently in service but the safety and comfortableness of the passengers are problems.

To meet the increasing transportation demand in the future, it is assumed that ships like the high-speed boats presently in service on the Langkawi route will be used.

b) Berthing Facilities

Pontoon type berthing facilities will be used by the high-speed boats in order to secure the safety and convenience of passengers in consideration of the great tidal variation in water level. The pontoons are 30 m long and 10 m wide, and will be installed for use both on sea routes to facilitate the control of entering and exiting passengers.

The capacity of each pontoon for handling passengers, depending on frequency of service, ie: for arrival and departure every 10 minutes, assuming 12 hours-a-day opera-

tions (from 7 am to 7 pm), and that the rate of use is 0.7, is annually about 5,000 thousand per berth.

Judging from the above, it will suffice to install 1 pontoon (2 berths) for the Langkawi route (passenger transport demand 357.5 thousand in 1990 and 485.6 thousand in 2000) and another for the Thailand route (500 thousand in 1990, 1,000 thousand in 2000).

c) Passenger Terminal

The size of the passenger terminal is calculated by the following formula.

$A = a \cdot h \cdot N \cdot \alpha \cdot \beta$

A : required area for the passenger terminal

a : area occupied by each passenger

h : capacity of passenger ship

N : number of ships served per hour

α : concentration rate

β : variation rate

Assuming a = 1.2 m^2/person, h = 132 persons, α = 1.6 and β = 1.2, A = 304 m^2 for each route (N = 1).

2) Vehicular Ferry Wharf

a) Proposed Ship Type

The vehicular ferries not only transport passenger cars carrying people but also tracks carrying goods.

The type of ship to be used for ferry service between Kuala Perlis Port and Langkawi Island must be decided according to the transportation demands on the route.

Considering the possibility of reducing or abolishing the ferry service at Penang after the construction of the Penang Bridge and using them for the Kuala Perlis – Langkawi route, this size of ship has been assumed in this plan.

The specifications of the ferries at Penang Port, and therefore for this plan, are as follows.

Table 2.2.33 Physical Dimensions of Vehicular Ferry

	Gross Tonnage	Overall Length	Width	Draft	Loading Capacity
Ferries at Penang Port					
Passenger/Vehicular Ferries	322 G/T	48.3 m		2.1 m	460 passengers 31 motorcars
Passenger Ferries	466 G/T	51.0 m		2.4 m	32 motorcars 14 lorries
Proposed Ferry	400 G/T	40 m	11 m	3.2 m	24 motorcars or 6 lorries

b) Berthing Facilities

Movable access bridges will be installed at the end of the ferry berth since the proposed vehicular ferry has hatches to load/unload cars in the front and rear (only one of these is used during any one port call).

The berth will be either a wharf type or a dolphin type berth. To allow for multiple use of the berth, the wharf type is considered better, as shown in 2.2.3.

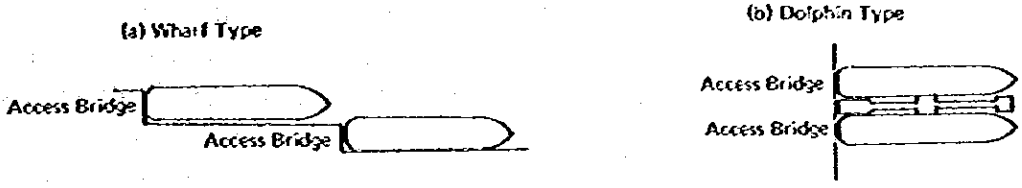

Fig. 2.2.3 Shape of Ferry Wharf

The specifications of the berth are 50 m in length and an alongside water depth of 3.5 m.

The cargo volume between Kuala Perlis Port and Langkawi Island is estimated to reach 82,000 tons a year by 2000. This will be loaded onto trucks which can carry 8 tons at one time, thus requiring 28 trucks per day. The total passenger car traffic is estimated at 287 per day (both ways), making a combined one way traffic of 171 vehicles per day which can be carried by 10 – 11 ferries runs.

This traffic can be handled at a single berth.

c) Parking Area

The size of the parking area for cars using the ferry is calculated by the following formula.

$A = a \cdot h \cdot n \cdot \alpha \cdot \beta$

A : required area of parking place

a : area occupied by each car

h : number of cars to be loaded each ferry (capacity)

N : number of departures/arrivals in an hour

α : utilization rate

β : concentration rate

Where, a = 100 m²/truck, h = 6 (calculated in terms of trucks), N = 1, α = 0.8 and β = 1.6, then A = 768 m².

3) Cargo Handling Wharf

a) Proposed Ship Type

Since there is no actual record of the type of ships transporting cargo handled at Kuala Perlis Port, the proposed ship size is estimated based on the following information about factory shipment plans, the types of ships engaged in Malaysian coastal transportation, and the condition of the receiving facilities at the counterpart ports.

① According to the plans of the CIMA Cement Factory, cement will be shipped in bulk and, judging from the condition of Malaysian port development, it is expected to be handled by 500 – 1000 D/W class cement tankers.

Imports of coal will be transshipped through Butterworth, and these ships are not expected to be very large.

② For transporting oil, etc., the 3,000 D/W class tankers now operating on the west coast of Peninsular Malaysia are assumed.

③ Average size of ships over 75 N/T which arrived at West Malaysian ports is getting bigger annually (see Table 2.2.34).
Projecting the present trend, average ship size will be 722 N/T (about 2,000 D/W) in 1990 and 912 N/T (about 2,500 D/W) in year 2000.*

④ The size of the 90 vessels used by the 29 companies now engaged in Coastal Liner Trade between West Malaysia and East Malaysia ranges from 1,000 to 3,800 D/W, averaging about 2,200 D/W.

Considering the characteristics of Kuala Perlis Port and the above estimated ship sizes, it is safe to plan on a maximum calling ship size of 2,000 D/W.

The speicfications of the standard vessel types in the 2,000 D/W class are as given in Table 2.2.35.

Table 2.2.34 Ships Arrival at West Malaysian Ports Coastal Trade, 1964–1981

Year	Ships of Over 75 N.R.T.		
	Ships Arrival (Number)	Net Reg. Tons (1000)	Average Tonnage of Shipes (Tons)
1964	2,472	722	292
1965	2,536	774	305
1966	2,756	784	284
1967	3,045	858	282
1968	3,239	884	273
1969	3,059	868	284
1970	3,066	974	318
1971	3,169	1,005	217
1972	3,263	1,050	322
1973	3,023	1,164	385
1974	3,512	1,229	350
1975	3,843	1,625	423
1976	4,211	2,070	492
1977	5,071	2,450	483
1978	6,210	3,457	557
1979	7,736	4,026	520
1980	5,889	3,241	550
1981	6,040	3,412	565

Source: Year Book of Transport Statistics Malaysia

* Reference

Equation $Y = -37151.6 + 19{,}032X$ ($\gamma = 0.9308$)

Y : average tonnage (N/T)

X : Year

Table 2.2.35 Specification of the Vessels in the 2,000 D/W Class

Type	Overall Length	Width	Depth	Draft (full load)
General cargo ship	77 (m)	11.5 (m)	5.8 (m)	5.1 (m)
Ore carrier	77	11.1	6.0	5.1
Oil tanker	76	11.2	5.7	5.1

b) *Berthing Facilities*

There are many ways to determine the scale of cargo handling berthing facilities. In the case of Kuala Perlis Port, since there are no cargo wharves nor have they any experience of working with freighters, no data are available for ship arrivals and departures or for loading and unloading work. Therefore, the simplest method is used in order to obtain the length of quay required.

The following formula is used.

$$\text{Development standard (t/m)} = \frac{\text{Volume of cargo in terms of general cargo (ton)}}{\text{Length of quay in terms of large size quay (m)}}$$

The cargo volume in terms of general cargo is obtained by classifying cargo by packing style into general cargo and bulk cargo, and by multiplying these cargo volumes by a coefficient of 1 for general cargo and of 1/2 for bulk cargo.

The length of quay in terms of large size quay is obtained respectively by multiplying coefficient related to the water depth, ie: 1 for a water depth of over 7.5 m, 2/3 for a water depth between 4.0 m and 7.5 m and 1/3 for a water depth between 2.0 m and 4.0 m.

According to experience to date, it is sufficient to set the development standard at 1,000 tons/m.

With regard to the alongside water depth, the length of quay developed at Kuala Perlis Port will be not very long so the water depth will be 5.5 m for ships in the 2,000 D/W class to permit multiple purpose wharf use for the convenience of the users.

In consideration of the foregoing, the required quay lengths are as follows.

371 m water depth 5.5 m in year 1990

647 m water depth 5.5 m in year 2000

Table 2.2.36 Calculation of the Required Quay Length

1. Volume of Cargo in Terms of General Cargo

Commodity	Coefficient	Cargo Volume (1,000 tons)		Cargo Volume in Terms of General Cargo (1,000 tons)	
		Year 1990	Year 2000	Year 1990	Year 2000
Cement	1/2	150	250	75	125
Coal	1/2	108	162	54	81
Raw sugar	1/2	21	21	10.5	10.5
Rice	1	41	41	41	41
Phosphate rocks	1/2	6	6	3	3
Oil	1/2	25	30	12.5	15
Timber	1/2	5	10	2.5	5
Concrete products	1	8	17	8	17
Miscellaneous goods (trade with Thailand)	1	41	134	41	134
Total		405	537	247.5	431.5

Note: With regard to cargo transported to/from Thailand, the present handling volume of 55,000 tons is expected as it is transported by passage ship and boats as before.

2. Required Quay Length

Assuming the coefficient for water depth alongside berth of 5.5 m is 2/3 and the level of quay improvement is 1,000 tons/m.

371.3 m in year 1990
647.3 m in year 2000

c) Storage Facilities

The area required for warehouses and open storage is obtained by the following formula.

$$A = \frac{N}{R \cdot \alpha \cdot w}$$

Where,

A : required area of storage facilities

R : turnover of storage facilities (times/year)

α : utilization rate

w : volume of cargoes stored in unit area (tons/m^2)

N : volume of cargoes (tons/year)

The required area obtained from the above formula are shown by commodity in Table 2.2.37.

Table 2.2.37 Estimate of Required Area for Storage Facilities

Facilities	Commodities	Packing type	w ton/m^2	R (Times/ Year)	α	N (tons/year)		A (m^2)	
						Year 1990	Year 2000	Year 1990	Year 2000
Warehouse	Rice	sack	2.0–3.5	8–12	0.7	41,000	41,000	2,130	2,130
	Raw sugar	bulk	1.0–3.0	8–12	0.7	21,000	21,000	1,500	1,500
Open Storage	Timber	logs	0.6	6	0.8	5,000	10,000	1,736	3,472
	Coal	bulk	1.5–2.0	8–12	0.7	108,000	162,000	8,816	13,225
	Phosphate rocks	bulk	2.0–3.5	8–12	0.7	6,000	6,000	312	312
	Concrete products	bulk	2.0–3.5	8–12	0.7	8,000	17,000	416	883
Silo	Cement	bulk		24	0.8	15,000	250,000	2,500	4,000
Tank	Oil	liquid		24	0.8	25,000	30,000	2,000	2,100

Note: For values of w and R with a broad range, median value is used to calculate A.

2.2.3 The Factories on the Reclaimed Land

(1) Concept of Establishment of Industry

We consider that the strategy for manufacturing industrialization in Perlis State should be as follows.

First, manufacturing based on agro-resources should be chosen, because it is desirable to add value to local products and ship these outside the State.

Secondly, light manufacturing should be located, because the skill level in Perlis State is not so high.

Considering the above, we consider that the strategy for attracting factories to locate on the reclaimed land should be as follows.

First, marine manufacturing should be located in order to make use of the advantages of the seaside location. Secondly, manufacturing that handles heavy materials should be located in order to make use of the advantages of ready ship transportation.

(2) Selection of Industry Types

Selection of industry types on the reclaimed land is shown in Table 2.2.38. From this result, we expect the location of factories such as marine products, breed food, sawing, paper board, cement products, fertilizer and auto repair shop, that agree with the above-mentioned strategy for manufacturing industrialization in Perlis State and strategy of the location on the reclaimed land. Here, factories of breed food and paperboard are expected to use paddy-straw as raw materials, and the fertilizer factory means a processing factory for phosphate rocks.

Table 2.2.38 Selection of Industry Types on the Reclaimed Land

Industry Types	Location of Industry		Location of Industry on the Reclaimed Land	
	Agro-based Industry	Light Industry	Marine Industry	Heavy Cargo
Marine	O	O	O	
Breed Food	O	O		O
Sawing		O		O
Paperboard	O	O		O
Cement Products	O	O		O
Fertilizer	O	O		O
Auto Repair Shop			O	

(3) Factory Sizes

The sizes of factories on the reclaimed land are estimated as shown in Table 2.2.39, which is based on the size of existing factories in Perlis State in the cases of marine products, sawing, fertilizer and auto repair shop, and based on some papers by FIDA and MIDA in the cases of

breed food, paper board and cement products.

Table 2.2.39 Size of Factories on the Reclaimed Land

Industry Types	[1] Value of output (M$ thousands)		Employee (person)		Area (ha)		Port cargo	Number of factories
	1990	2000	1990	2000	1990	2000		
Marine products			50	80	0.5	1		1
Breed food[2]		4,500		16		0.5		1
Sawing	3,000	6,000	40	80	4	8	○	2
Paperboard[2]		6,600		40		1		1
Cement products[2]	400	800	30	60	4	8	○[3]	1
Fertilizer	1,000	1,000	20	20	1	1	○[4]	2
Auto repair shop	300	1,000	15	50	0.2	1		1
Total	4,700	19,900	140	296	9.7	20.5		9

Notes: 1) in 1980 prices.
2) The sizes of these factories are based on the following papers.
a. MIDA, "An Investigation Report on Nutritionally Improved Straw", 1983.8.13.
b. FIDA, "Investigating Report on the Manufacture of Paperboard from Paddy Straw".
c. FIDA, "Investigation Report on Clay Building Bricks", 1975.
d. FIDA, "Investigation Report on Concrete Hollow Blocks," 1977.
3) Total cargoes are estimated at 14,000 ton per annum in 1990, based on the above papers c. and d.
4) Total cargoes are estimated at 6,000 ton per annum in 1990 and 2000, based on the actual results of existing factories.

2.3 The Evaluation and Selection of a Port Development Site

2.3.1 The Socio-economic Evaluations of the Proposed Development Sites

Comparative socio-economic evaluation of the appropriateness for port development of both Kuala Perlis Port and Kuala Sunglang Port was made by carring out separate comparisons for each of the port functions considered for ports in Perlis State.

Different evaluation items are set for each port function and are used to qualitatively evaluate the appropriateness of each port.

(1) Fishing Port Functions

The fishing port functions considered for ports in Perlis State are:

① Those of small scale coastal fisheries to supply marine products to the population of the surrounding areas.
(Fishing port functions serving the population of the surrounding areas)

② Those of bases to supply marine products, not only within but also outside of the state.
(Regional marine products supply base functions)

③ Those bases to land and import Thai marine products.
(Marine products import base functions)

Since part of the population at Kuala Perlis Port and Kuala Sanglang Port make their livelihood by fishing and this life style will continue though the scale may differ, suitable development of the fishing port functions will be required at both ports, regardless of whatever other evaluations are made.

Therefore, the following 4 evaluation items are compared and evaluated only for the functions of regional marine products supply, and marine products import.

1) Existing Fishery Activities

The size of fishing activities can be expressed in terms of the number of fishermen, the number of fishing boats and the amount of the catch. In the case of existing fishing activity, the larger the size of the fishery, the greater the potential for introducing new fishing port functions.

Kuala Perlis Port, as compared with Kuala Sanglang Port, has about 11 times as many fishermen, 6 times the number of fishing boats and 11 times as large a catch. Due to the present trend of larger fishing vessels and increase of imports from Thailand to Kuala Perlis Port, there is a greater demand there for the expansion of fishing boat piers.

2) Accumulation of Existing Fishing Port Related Facilities and Business Functions

The present accumulation of facilities to support fishing activities, such as ice making plants and cold storage facilities, and of marine products trading functions is an important element when considering the introduction of new fishing port functions.

At Kuala Perlis Port there are two small scale ice making plants and 11 cold storages, fishery material and equipment can be easily procured from Kuala Perlis or Kangar and finally, Kuala Perlis Port has a far greater accumulation of trading activities.

3) Distance from Fishing Areas

Since future expansion of offshore fishery is to be promoted northward into the Andaman Sea, Kuala Perlis Port has a geographical advantage because of proximity to this

fishing area and to Thailand.

4) Distance to Consumer Area

Of the marine products landed in Perlis State 10% are consumed in the State, mostly around Kangar, and while 90% are exported south to the main consuming areas of Penang, Kuala Lumpur, etc. Therefore, Kuala Perlis is close to the instate market but further than Kuala Sanglang from the out-of-state markets.

(2) Passenger Transportation Base

The passenger transportation considered for ports in Perlis State is on 2 routes, one going to south Thailand and the other to Langkawi Island.

Evaluation of the proper arrangement of these routes was made considering the following 3 items.

1) Purpose of Travel

Both routes are used by passengers on shopping trips or visiting their relatives, mostly headed for Kuala Perlis and Kangar.

Since this traffic is based on the long established habits and social structure of the local population, it cannot be easily changed.

2) Distance by Sea

The distance from Kuala Perlis Port to Satun Port in South Thailand and to Kuah Port on Langkawi Island are 19 km and 36 km respectively. The distances from Kuala Sanglang are 36 km and 43 km respectively, thus both the distance and the travel time will be shorter from Kuala Perlis.

3) Distance from Port of Passenger Origins and Destinations

Passengers traveling to South Thailand usually come from Kuala Perlis and Kangar, while those coming from South Thailand an usually going to these areas. Thus for the South Thailand route Kuala Perlis is most convenient. Passengers for Langkawi Island are not only inhabitants of Perlis State and Kedah State but also travellers from all over the mainland touring to Langkawi Island for sightseeing. Although in this case Kuala Sanglang Port is more convenient, most travellers coming from Langkawi Island to the mainland are destined for the areas around Kuala Perlis and Kangar.

From the foregoing, a clearcut evaluation of the superiority of Kuala Perlis Port or Kuala Sanglang Port cannot be made.

(3) Base for Trade with Thailand

This trade consists mostly of shopping and small scale merchandizing accompanying the human traffic to and from Thailand and similar to that observed at border towns on land. The following 2 items are considered for evaluation.

1) Distance by Sea

Since this cargo transportation is performed by the same small ships used for passenger traffic, the shorter the distance, the better.

Distance from Kuala Perlis Port is 17 km shorter than from Kuala Sanglang Port.

2) Distance from Port of Cargo Origins and Destinations

Most of the Thai imports are consumed in Perlis State and adjacent areas, while exports

to Thailand include imports landed at Penang Port, as well as the products of Perlis State region. Since most of the trade transactions are carried out by stores located in Kuala Perlis and Kangar and most of the traffic by people, Kuala Perlis Port has the advantage.

(4) Base for Cargo Transportation to Langkawi Island

This transportation is presently carried out from Kuala Kedah Port in Kedah State. Therefore, a comparative study is made to consider the possibility of conversion to Kuala Sanglang Port or Kuala Perlis Port in Perlis State. Evaluation is based on the following items.

1) Distances

The distance between Lankgawi Island and the mainland is shortest for Kuala Perlis Port but the distance to port from the places of cargo origin and supply is shortest for Kuala Kedah Port, since it is located in Kedah State.

As the total distance does not vary greatly between these ports, these is no good reason, based on distance, to switch cargo transportation from Kuala Kedah to either of the Perlis State Ports.

2) Other Causes for Site Selection

If the future vehicular ferries are put into service to handle passenger traffic to Langkawi Island, they will be able to carry loaded cargo trucks as well as passenger cars.

In this case, there is a high probability of switching some of the Langkawi Island cargo transportation from Kuala Kedah Port to Kuala Perlis Port.

(5) Base for Transporting Raw Materials and Products to and from the Factories

The following 2 items are evaluated.

1) Distance from Factory to Port

Factories presently located in Perlis State and which can possibly use ports, eg. the cement factory (CIMA) and the sugar refinery, are both located north of Kuala Perlis Port and closer to Kuala Perlis Port than to Kuala Sanglang Port.

2) Possibility of Development of an Industrial Estate

The most promising factory sites are expected to be areas around Kangar and Kuala Perlis because of the ease of procuring manpower and because of existing production activity.

Therefore, assignment of this function at Kuala Perlis Port is desirable.

(6) Ship Repair

In considering a site for ship repair work, the procurement of materials and labor, and the proximity of related factories are major consideration. Based on these conditions, there is little difference between the two ports, so evaluation was made based only on convenience for users.

The registered number of fishing boats in Perlis Province is presently (as of 1982) 664 of which 67% or 448 boats are based at Kuala Perlis Port. Only 11% or 76 boats stay at Kuala Sanglang Port.

Therefore, demand for ship repair is far greater at Kuala Perlis Port, so the function of ship repair is most reasonably given to Kuala Perlis Port.

2.3.2 The Technical Evaluation of the Relevant Natural Conditions

The natural conditions of the site affect the work conditions, and the cost of construction during development of the port, and the calmness of water surface, convenience, maintenance and control of the facilities once the port is in operation.

Here, evaluations are made on items of natural conditions which are considered to differ at both places with regard to suitability of port development for each place.

(1) Geographical Features

Both proposed sites are located in alluvial flat plains along Malacca Strait. Kuala Perlis is at the northern region of the Perlis coast and Kuala Sanglang is at the southern region shearing the borderline between Perlis State and Kedah State. From the view of land use conditions of each site, siting condition of a port are reviewed as follows.

As to a case of Kuala Perlis, water front of the Perlis River has already been over-utilized as commercial, fishery, transportation and residential area. It would be essential to select another district adjacent to existing urban area for obtaining sufficient space for the expected port construction. However, a reclamation of shore area on the left side of the river mouth enables to construct a new land for a port site.

On the other hand, in the vicinity of Kuala Sanglang voluminous quantity of sediment have accumulated around New Sanglang Drain, causing the shoreline to advance offshore in more than 500 meters. The natural consequence of accumulation of littoral drift made a land in very short period, so that it is questionable whether or not this area will remain stably in future. Whatever, it is suitable for siting a new port at Kuala Sanglang. Additionally, there would be sufficient extra area in neighboring agricultural field which may be converted to other uses for port activities later.

(2) Wave Conditions

Wave conditions of the Perlis coast are greatly influenced by Langkawi Island, Terutao Island and other small islands off Perlis State. Storm waves including greater swells which may propagate north-westerly from Andaman Sea are sheltered by these islands. Shoreline in the vicinity of Kuala Perlis is well sheltered, while wave diffraction effect of barrier becomes diminished for Kuala Sanglang as it is located further south of the islands. The diffraction coefficients which is a ratio of diffracted wave height and incident wave height are computed as 0.014 at Kuala Perlis and 0.019 at Kuala Sanglang,*) assuming a direction of invading swells as WNW, a wave period as 8 seconds and water depth as 10 meters uniformly for whole sea area. Therefore, wave height of swells at Kuala Sanglang is expected 1.36 times higher than that at Kuala Perlis under the assumed wave condition.

Regarding waves originated inside of Malacca Strait, south-west monsoon is expected to generate westerly wind wave due to prevalent wind direction of west. Since the shoreline of Kuala Sanglang opens more than that of Kuala Perlis as shown in Fig. 2.3.1, Kuala Sanglang is extensively influenced by the waves from west to south, allowing greater wave invasions than

*) Mitsui H., Y. Ochi, Y. Kawamura: Study on the Profile of Waves Reflected from Angular Surface of Reclaimed Land, The 23rd Conference on Coastal Engineering, JSCE, pp. 395 - 400, 1976.

Kuala Perlis. Thus, the degree of wave agitation in the surrounding waters is supposed to be better for Kuala Perlis.

In addition to these wave conditions, wave attenuation due to bottom friction is discussed as follows. The bottom slope at Kuala Perlis is 1/1,600 which is more gradual than 1/400 for Kuala Sanglang. For this reason, waves reaching Kuala Perlis must propagate over a longer distance in very shallow water region, so that wave attenuation caused by wave breaking and bottom friction would take place greatly during wave propagation. As mentioned in Section 1.2.1 the wave attenuation rate due to sea-bottom friction for Kuala Perlis is 2 times more than that for Kuala Sanglang. Therefore, the design wave height for coastal structures and also wave agitation of surrounding harbor area is smaller considerably for Kuala Perlis, suggesting it is more advantageous in designing waterfront structures.

(3) Soil Conditions

Using the soil investigation results from the coastal areas, a comparison between Kuala Perlis and Kuala Sanglang is made based on the folowing items.

1) Depth of the Bearing Layer

The depth of the bearing layer is -12 to -15 meters below ground level in Kuala Perlis, and -15 to -25 meters below ground level in Kuala Sanglang. The depth of bearing layer of Kuala Perlis is less than that of Kuala Sanglang.

2) Condition of the Very Soft Marine Clay

With respect to the expected settlement of layer the natural moisture content (Wn) varies 80 to 120% in Kuala Perlis and 80 to 150% in Kuala Sanglang. As shown in Fig. 2.3.2, the value of Wn is lower in Kuala Perlis than in Kuala Sanglang, and the range of variation is smaller in Kuala Perlis than in Kuala Sanglang. Furthermore, the value of unit weight is greater in Kuala Perlis than in Kuala Sanglang. According to these results, the compressibility of the very soft marine clay is higher in Kuala Sanglang than in Kuala Perlis.

It is supposed that the value of cohesion in Kuala Sanglang is lower than that in Kuala Perlis, although the number of testings in Kuala Sanglang is few. Considering, as well, the value of the preconsolidation pressure (Py), as a index of cohesion of clayey soil, is lower in Kuala Sanglang than in Kuala Perlis. It is supposed consequently that soil stability (strength of the soil) at Kuala Perlis is better than that at Kuala Sanglang.

The thickness of the marine clay layer in Kuala Perlis is 10 to 12 meters, and 12 to 14 meters in Kuala Sanglang. The difference of stratum thickness is not large enough to distinguish between the two sites.

3) Condition of the Middle Clay Layer

The thickness of this layer is 0.5 to 2 meters in Kuala Perlis, and 5 to 10 meters in Kuala Sanglang. N-value is 7 to 30 ($N \geq 10$) is Kuala Perlis, and 5 to 20 ($N \fallingdotseq 10$) in Kuala Sanglang. Big problems would not be caused by this layer as the settlement is expected small. However, the test results imply that the settlement is greater in Kuala Sanglang than in Kuala Perlis.

4) Expected Settlement

The model section assumed for settlement calculation is as shown in Fig. 2.3.3. This

figure shows the case where 4 meters of fill are placed on the existing ground without taking any counter measures. Based on this figure, the amount of settlement and the period of consolidation are calculated. The results shown in Table 2.3.1 and Fig. 2.3.4 indicate that the amount of settlement is about 1.6 times as great in Kuala Sanglang as in Kuala Perlis, while the time required for 90% of consolidation to reach is about 2.5 times as long in Kuala Sanglang as in Kuala Perlis.

According to the results of studying item 1) to 4), it can be concluded that Kuala Perlis is superior to Kuala Sanglang from the view of soil conditions.

Table 2.3.1 Ground Level Settlement Calcualation

	Amount of Settlement		Time for 90% Consolidation
	Layer	Total	
Kuala Perlis	Marine Clay 195.5 cm Middle Clay 2.7 cm	198.2 cm	11.4 years
Kuala Sanglang	Marine Clay 303.6 cm Middle Clay 11.0 cm	314.6 cm	28.1 years

(4) Maintenance of Navigation Channel

Siltation of navigation channels due to sediment discharge from the Perlis River and New Sanglang Drain located in Kuala Perlis and Kuala Sanglang respectively is not supposed to be so severe, considering the field survey on suspended solid conducted by JICA Study Team and the river conditions of upper stream. The littoral drift agitated by waves and transported along the coast by currents would be more dominant for siltation of channels rather than river sedimentation. As the wave condition is more severe for Kuala Sanglang, suspended load of sea-bed material by wave agitation and bed load transported on sea-bed surface is expected to be more remarkable than Kuala Perlis, which causes more siltation in navigation channel.

From the coastline transformation of Perlis State in recent years, the sediment provided by beach erosion originating southerly from Kuala Perlis has accumulated in great volume around the shore of Kuala Sanglang. This region is supposed to correspond to a termination point of littoral drift system of the Perlis coast. Considering huge amount of sediment accumulation, siltation rate of navigation channel at Kuala Sanglang is expected to be remarkably high. On the other hand, the considerable beach erosion adjacent to Kuala Perlis suggests that sediment supply from northern region of the Perlis River is insufficient, comparing with sediment discharge for downward region. Deficit balance of sediment supply at the beach adjacent to Kuala Perlis implies to alleviate siltation of navigation channel as well. This sedimentation state is expected to continue in future, and it is predicted that a port sited at Kuala Sanglang would always have a siltation problem more severly in comparison with that of Kuala Perlis.

Regarding to the volume of maintenance dredging for a navigation channel, the bottom slopes

are 1/1,600 and 1/400 for Kuala Perlis and Kuala Sanglang respectively as shown in Fig. 2.3.5, which indicates that the extension of the expected navigation channel to reach an arbitrary water depth becomes approximately 4 times more for Kuala Perlis than that of Kuala Sanglang. More gentle slope of sea bottom increase a volume of dredged material for Kuala Perlis, if the shoaling rate of channel is about the same for the two sites. Considering littoral drift system of the Perlis coast, the shoaling rate of navigation channel, however, is supposed to be serious in spite of shorter extension of the navigation channel. Therefore, the volume of maintenance dredging of each year would not show a big difference between each proposed site.

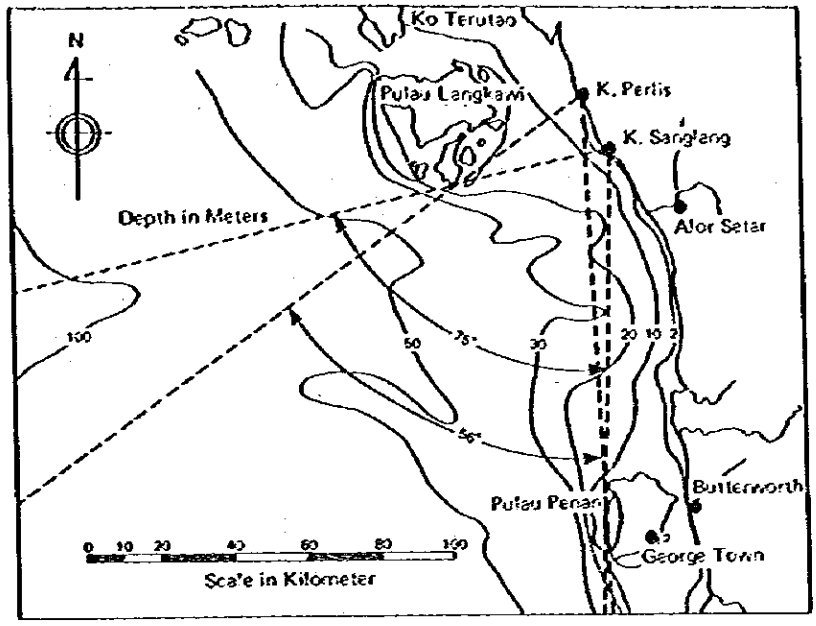

Fig. 2.3.1 Wave Induced Angle at Kuala Perlis and Kuala Sanglang

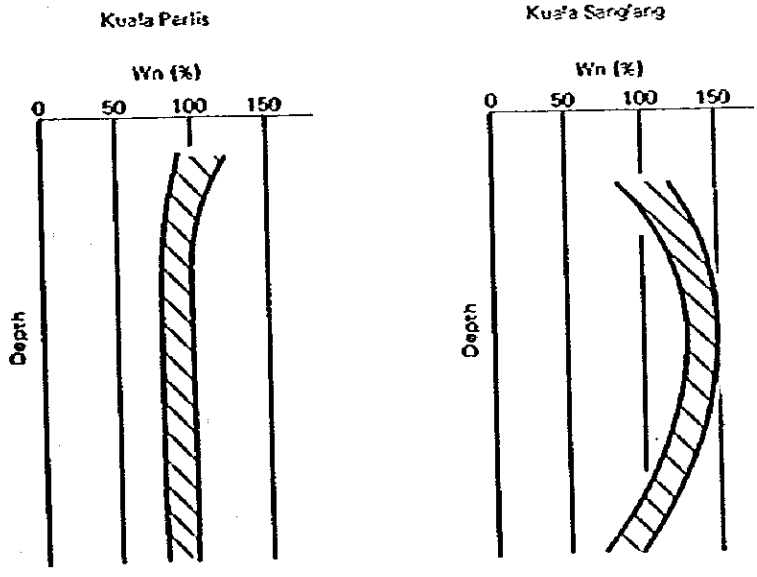

Fig. 2.3.2 Relationship between Moisture Content (Wn) and Depth

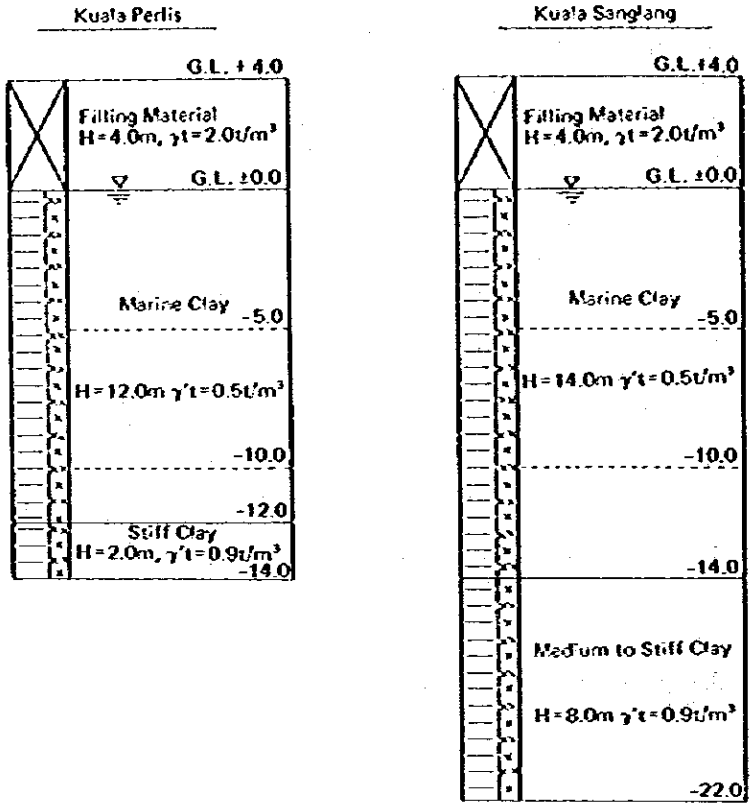

Fig. 2.3.3 Model Section for Settlement Calculation

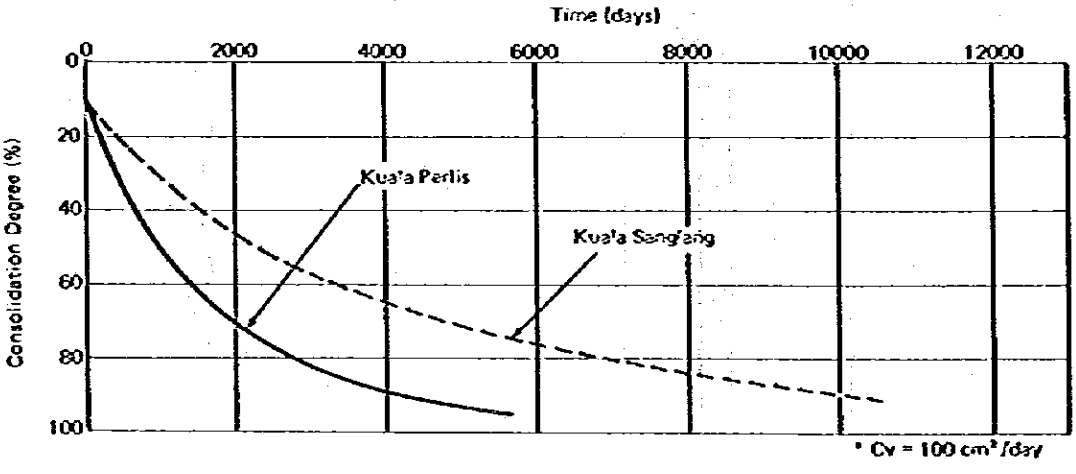

Fig. 2.3.4. Relationship between Time and Consolidation Degree

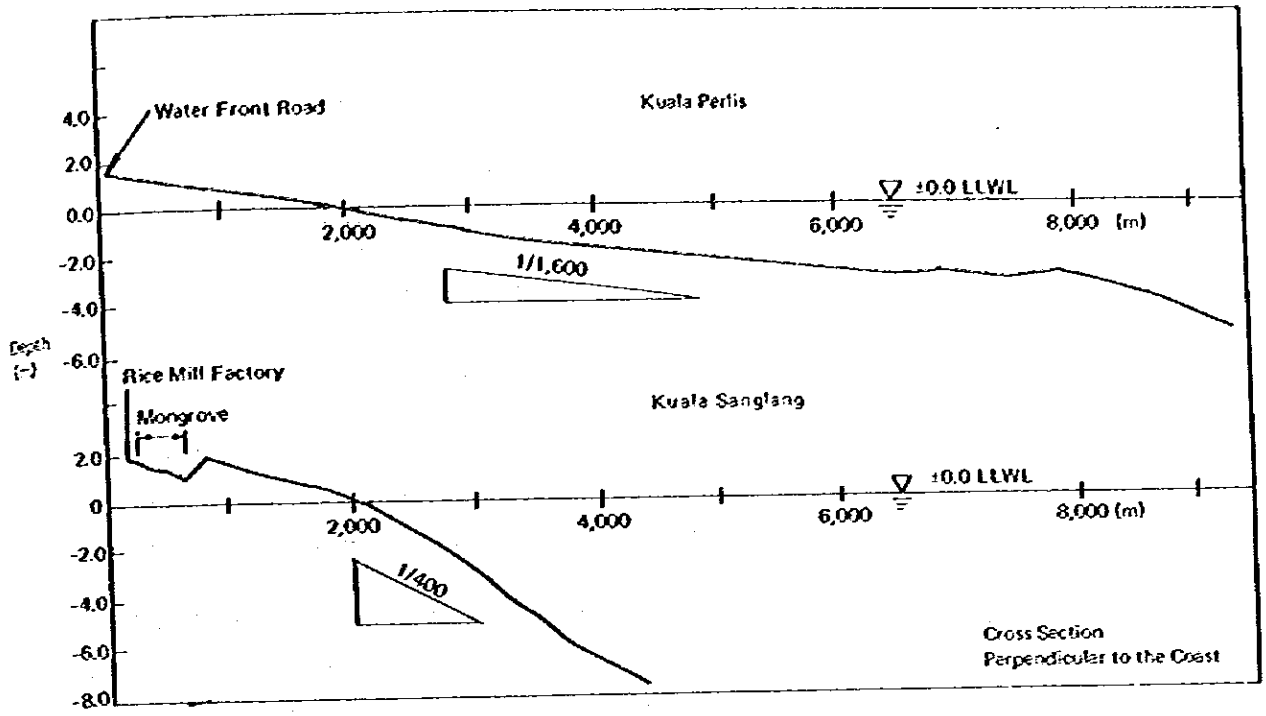

Fig. 2.3.5 Typical Bottom Profiles at Kuala Perlis and Kuala Sanglang

2.3.3 Setting Up the Alternative Port Development Plans

(1) The Basic Idea for Setting Up the Alternatives

It is possible to propose several alternative Perlis State port development plans depending on how the port functions to be developed in the state are shared among the two proposed sites, Kuala Perlis Port and Kuala Sanglang Port.

However, from the comparative study (see section 2.3.1 and Table 2.3.2) examining the ports, function by function, it is clear that Kuala Perlis Port is a superior development site in regard to all 6 functions considered for ports in Perlis State.

Therefore, from the viewpoint of the sites' economic and social conditions, it is judged most suitable to assign all the functions to Kuala Perlis Port.

From the technical evaluations of the natural conditions (see section 2.3.2 and Table 2.3.3), it was found that Kuala Perlis Port has somewhat superior wave and soil conditions but that Kuala Sanglang Port has better topographical conditions. No significant difference was noted for the maintenance of waterways.

In order to take advantage of the better topographical conditions at Kuala Sanglang Port as much as possible, a plan to disperse some functions from Kuala Perlis Port to Kuala Sanglang Port will be proposed. In this case the cargo wharf, that is import and export base for raw materials and products, and the industrial area which is inseparable from cargo wharf can be alloted to Kuala Sanglang Port. It is considered impractical that other functions be alloted to Kuala Sanglang Port, because they are unable to function except at Kuala Perlis Port due to geographical and socio-economical conditions.

From the above considerations, two alternative plans relative to the sharing of the port functions among the two proposed sites are set up. They are a plan to concentrate all functions at Kuala Perlis Port and a plan to share them between Kuala Perlis Port and Kuala Sanglang Port.

By the way the most important problem in planning the layout of port facilities both at Kuala Perlis Port and at Kuala Sanglang Port is how to secure the approach of ships to the wharves in view of the very shallow water along the coast. In regard to this problem, the following 3 basic plans are considered.

① To dredge the waterway up to quays on the coast and secure the depth of the waterway by carrying out maintenance dredging. (Maintenance dredging plan)

② To dredge the waterway up to quays on the coast and prevent shoaling of the waterway by building training walls. (Training wall plan)

③ To construct quays where the required water depth already exists and build a trestle to connect the offshore quays and the coast. (Trestle plan)

To make comparative evaluations of these plans, a simple model was drawn, as shown in Fig. 2.3.6.

Table 2.3.2 Socio-economic Evaluation of the Proposed Development Sites

Type of port functions	Evaluation items	Comparative evaluation	
		K. Perlis Port	K. Sanglang Port
Fishery port functions	Exsisting fishery activities	O	
	Accumulation of facilities and business functions	O	
	Distance from fishing areas	O	
	Distance to consumer area		O
Passenger transporation base	Purpose of travel	O	
	Distance by sea	O	
	Distance from port of passenger origins and destinations	O	
Base for trade with Thailand	Distance by sea	O	
	Distance from port of cargo origins and destinations	O	
Base for cargo transporation to Langkawi Island	Distances	O	O
	Other causes for site selection	O	
Base for transporting raw materials and products to and from the factories	Distance from factory to port	O	
	Posisbility of development of an industrial estate	O	
Ship repair	Convenience for users	O	

Note: 'O' denotes superiority in the case of difference between the two sites and in case of no difference the 'O' mark is given to both sites.

Table 2.3.3 Technical Evaluation of the Proposed Development Sites

Items of natural conditions	Evaluation items	Comparative evaluation	
		K. Perlis Port	K. Sanglang Port
Geographical features	Procurement of land on the coast	O	O
	Slope of seabed (water depth)		O
Wave conditions	Design wave height	O	
	Calmness	O	
Soil conditions	Stability of structures	O	
Maintenance of navigation channel	Rate of deposition	O	
	Amount of maintenance dredging		O

Note: 'O' denotes superiority in the case of difference between the two sites and in case of no difference the 'O' mark is given to both sites.

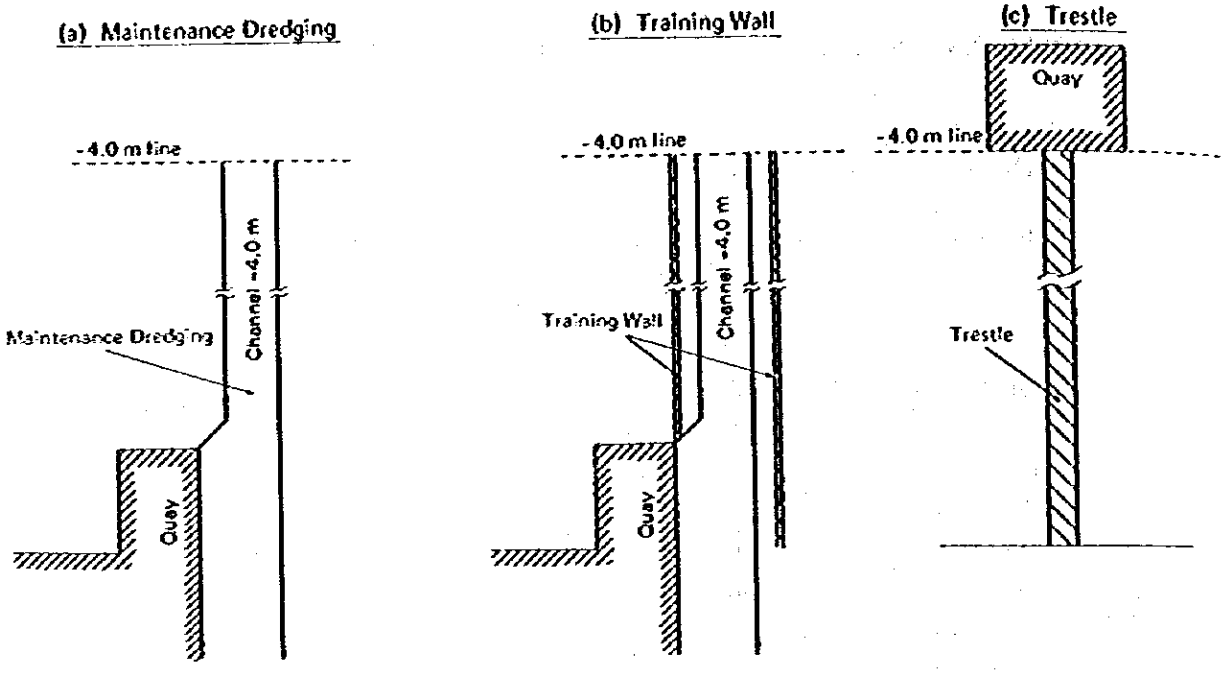

Fig. 2.3.6 Alternative Plans to Secure the Approach of Ships to the Quays

In the first step of a comparative evaluation of the 3 alternative plans for maintenance and security of the waterways, the construction costs are roughly compared.

The comparison of the construction costs is made by using the annual maintenance dredging cost for the maintenance dredging plan, and the depreciation cost for the training wall and the trestle plans. The ratios of these construction costs, calculated under the above premises, are as shown in Table 2.3.4.

Table 2.3.4 Comparison of Construction Cost of Alternatives

Alternative		Ratio of Construction Cost	
		Rate of deposition 60 cy/year	Rate of deposition 100 cm/year
Maintenance Dredging		100	100
Training Wall	Timber Mat	290	174
	Raft-Net & Rock Bank	165	99
	Double Sheet Pile	388	233
Trestle		240	144

Note: 1) The cost of maintenance dredging is set at 100
2) The input values for the comparison are as follows.
① Items of construction cost
Maintenance dredging plan ..... cost of maintenance dredging
Training wall plan ..... construction cost of training walls
Trestle plan ..... construction cost of trestle
② Rate of deposition in the waterway ..... 60-100 cm/yr
③ Unit cost of dredging ..... M$3.5/$m^3$
Method of dredging; 2600 hp cutter suction dredger discarding debris 2 – 5 km offshore by sand discharge pipeline
④ The life of each structure is as follows
Timber mat : 15 years
Raft-net & rock bank : 20 years
Double steel pile : 25 years
Trestle : 25 years
⑤ Profile of structure ..... as shown in Fig. 2.3.7

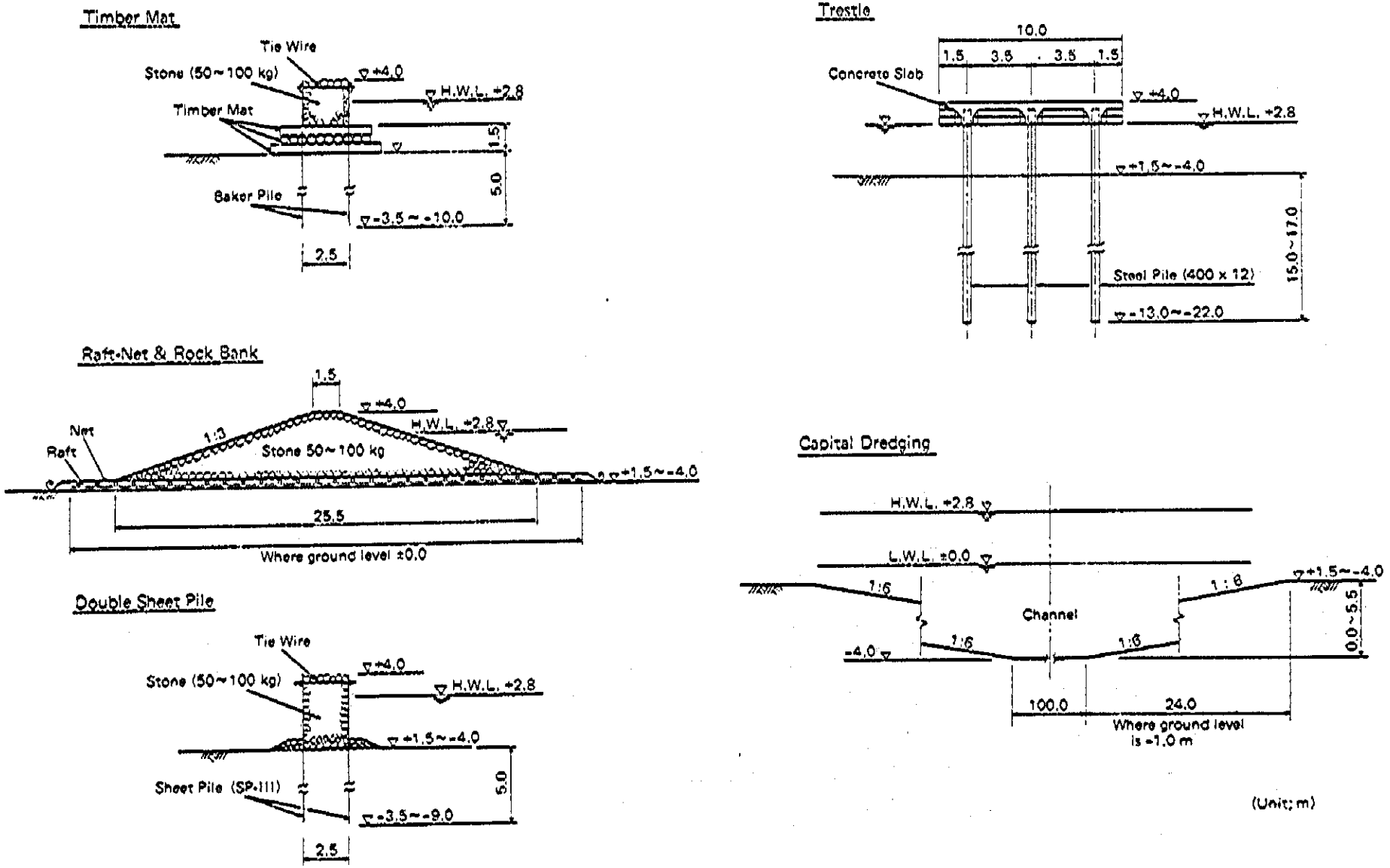

Fig. 2.3.7 Profile of Structure

As observed in the above comparison, the construction cost of the maintenance dredging plan is the lowest, excluding the training wall plan with raft-net and rock bank, and from the economic point of view, the maintenance dredging plan is most suitable.

In this comparison, it is assumed that the training walls and the trestle are extended to the required water depth, but because it is indeterminable whether their length may be shortened and the estimated useful life of each structure prolonged, a clear-cut decision cannot be given.

Apart from the foregoing comparative evaluations the following may be considered.

① The training wall will stick out across more than 1/3 of the strait between the main land and Langkawi Island, more than 22 km. It is expected to produce various adverse effects such as the erosion of the main land coast line, large changes in the sedimentation patterns due to changing the currents in the strait, adverse influences on the fishing ground, and forcing small boats to detour when navigating in coastal waters. Further, the extending of the training wall will cause the water level to rise in the Perlis River, due to back water, and will have bad effects upon flood control.

② With regard to the trestle plan, the distance to the quay will become very large, causing inconvenience to the port users and making it difficult to integrate the use of the existing facilities and the new quay.

③ For both the training wall plan and the trestle plan, since long, large structures must be constructed at one time, a large amount of initial investment will be required.

From the results of the above comparative evaluation, the maintenance dredging plan is judged most suitable for Kuala Perlis Port because the slope of the sea bottom is so gentle that the required water depth cannot be secured until 8 or 9 km offshore, while at Kuala Sanglang Port, two alternatives, the maintenance dredging plan and the trestle plan, are proposed, since the required water depth is achievable at a comparatively short distance, 3 or 4 km offshore.

Therefore, 3 alternative plans for port development in Perlis State are set up as shown Plan A, Plan B-1 and Plan B-2 in Table 2.3.5, based on the difference in allotment of port functions to the two proposed sites and the variation of the means to secure the approach of ships to the wharves.

Table 2.3.5 Alternative Plans for Port Development in Perlis State

Plans	Allotment of port functions	Means to secure the ship's approach to the wharves
A	Concentration of all port functions at K. Perlis Port	K. Perlis ..... Maintenance dredging plan
B-1	Dispersion of port functions among K. Perlis Port and K. Sanglang Port (allotting cargo wharf and industrial area to K. Sanglang port)	K. Perlis ..... Maintenance dredging plan K. Sanglang ..... Maintenance dredging plan
B-2		K. Perlis ..... Maintenance dredging plan K. Sanglang ..... Trestle plan

(2) The Presuppositions in Preparing the Alternative Port Facilities Layout Plans

1) Dimensions of the Navigation Channel

a) Width

In the case where cargo vessels enter the port, the width of the channel is required to be 1 or 1.5 times the overall length of a 2000 D/W ship with an overall length of 77 m, in consideration of the great length of waterway.

Here, the width is set at 100 m equivalent to the middle value of the range.

In the case of smaller vessels less than 500 G/T such as vehicular ferries, passenger boats and fishing boats, the width is set at 60 m, equivalent to the overall length of the proposed vehicular ferry which is the largest of these ships.

b) Water Depth

i) In the Case of Cargo Vessels

For the maximum proposed ship with a full loaded draft 5.1m, the water depth should be 5.5 m below L.L.W.L. However, the depth of the waterway is planed to be 4 m in consideration of the low frequency of calls by large ships close to the maximum size which, when they have a draft greater than 4 m, can enter using the 2.84 m tidal range found in this water area.

In this case, the percentage of time when the hight of the tide exceeds a specific water level above L.L.W.L. is shown in Table 2.3.6, by seasons and by kinds of tide.

Table 2.3.6 Time Ratio for Tidal Level Exceeding an Arbitrary Level

Season	Water Level (m)	Spring Tide (%)	Neap Tide (%)
Spring	2.0	33.8	0
	1.5	47.1	47.1
	1.0	59.6	92.1
	0.5	75.8	100
	0	100	100
Summer	2.0	27.5	0
	1.5	44.6	47.9
	1.0	61.7	87.1
	0.5	88.3	100
	0	100	100
Autum	2.0	33.8	10.4
	1.5	47.1	43.3
	1.0	59.6	92.9
	0.5	75.3	100
	0	100	100
Winter	2.0	27.5	8.3
	1.5	46.3	48.3
	1.0	61.7	83.3
	0.5	89.6	100
	0	100	100

According to this result, it is seen that when the depth of waterway is 4 m below L.L.W.L., the depth of water in the channel will exceed 5.5 m between 43% and 48% of the time, during which larger ships can go in and out of the port.

ii) In the Case of Vehicular Ferries, Passenger Boats and Fishing Boats

As for vehicular ferries and passenger boats, as the demand for their services increases, all day service will be required and the existing transportation system, that ships enter and leave the port only at high tides using the tidal range, will be unable to cope with the increasing demand.

As for fishing boats it is a serious problem at Kuala Perlis Port that fishing operations are restricted and the freshness of fish is adversely affected because the fishing boats must wait for high tide to go in and out.

In order to eliminate these problems, it is necessary that the water depth in the channel is maintained at a depth sufficient for vehicular ferries, passenger boats and fishing boats to enter at any time. In this case the required water depth is 3.5 m below L.L.W.L.

2) The Water Depth and Area of the Basin

a) Water Depth

The water depth of the basin must be secured at a depth sufficient for all the proposed ships maneuvering and mooring within the port. Therefore the water depth should be maintained at 5.5 m in order to allow the 2000 D/W class ships to enter.

b) Area

The area of the basin should be that of a circle with a radius more than 3 times the overall length of the ship.

c) Others

For preventing siltation of the basin by tidal currents and waves, it is necessary to surround the basin with breakwaters.

3) Size of Required Facilities

The port facilities layout plans are prepared so as to secure the sizes of facilities given in Table 2.3.7 based on the results of the study in Section 2.2.

As for the industrial area, around half of the area needed for the silting of port related industries, indicated in Table 2.3.7, will be secured in the area to be reclaimed from the sea. This will be for the factories which it is most desirable to arrange close to the wharves. The rest of the area will be at inland location near the port, keeping pace with the urban development.

Table 2.3.7 The Minimum Required Sizes for the Port Facilities in the Master Plan

Functions	Facilities	Minimum Required Size of Facilities (until the year 2000)	Remarks
Commercial Facilities			
Passenger Wharf	Berthing Facilities	Pontoon 2 units	Length 30 m, width 10 m
	Passenger Terminal	304 m^2 x 2 places	One for Langkawi route, the other for Thai route
Vehicular Ferry Wharf	Berthing Facilities	Length 40 m, water depth 3.5 m	With a access bridge
	Parking Place	768 m^2	
Cargo Wharf	Berthing Facilities	Length 647 m, water depth 5.5 m	
	Warehouse	3,630 m^2	
	Open Storage	17,892 m^2	
	Cement Silo	4,000 m^2	Storage capacity 13,000 ton
	Oil Tank	2,000 m^2	Storage capacity 1,500 kℓ
Fishing Port Facilities	Berthing Facilities	Length 88 m, water depth 3 m	
	Fish Market	1,157 m^2	Daily handling volume 100 tons
	Ice Making Facilities	175 m^2	Automatic ice machine 75 tons/day
	Ice Storage	150 m^2	Capacity 200 tons
	Cold Storage	87 m^2	
	Freezer	19 m^2	Capacity 20 tons
	Water Supply Facilities	200 tons tank	
	Oil Tank	50 kℓ tank	
	Other Sites		
Industrial Area		205,000 m^2	

(3) The Port Facilities Layout Plans for Each Alternative

The port facilities layout plans for the alternative plans for port development in Perlis State are shown as Plan A, Plan B-1 and B-2 in Fig. 2.3.8, Fig. 2.3.9 and Fig. 2.3.10 respectively.

The considerations related to preparing each of the port facilities layout plans are as follows:

1) Planning the Layout of Port Facilities at Kuala Perlis Port

a) Selection of the Site for Development at Kuala Perlis Port

Possible development areas at Kuala Perlis Port include the areas on either side of the Perlis River and the coastal areas south and north of the estuary.

As the fishing jetties, used for landing fish, boat layoff and preparation, the ferry terminal, and the restaurants occupy both banks of the Perlis River for about a kilometer upstream from its mouth, there is no space for developing new facilities along the river.

Obtaining development space by redevelopment will take much time and incur a high cost for adjustment of the vested user rights and for settling problems of compensation. If redevelopment work is undertaken, there are other difficult problems such as where to locate alternative facilities for use during the construction period. In any case, sufficient space cannot be secured for cargo handling facilities or plant sites.

The shallow water tidelands that stretch along the coast on both sides of the estuary are essentially free from extreme marine conditions and through reclaimation can provide sufficient development area. They do however, present the problems of dredging the water ways and anchorage and of having to reinforce the soft soil.

Of these tidelands the south shore is best suited for development, as the north shore has no approach roads and a new road would have to be built, while all the stores and fishery related facilities are located on the left bank of the Perlis River.

In addition to the foregoing, since SEDC (State Economic Development Corporation) has a plan to develop a commercial and housing estate a part of which is to be reclaimed from the sea, it is possible to make integrated the plan for port development with the SEDC project.

In the case of laying out the port facilities on the south shore, it is necessary that the marine cable that will transmit electricity to Langkawi Island and the prohibited anchorage area to protect the cable are taken into consideration.

When construction of the port facilities, reclamation and dredging are carried out in the prohibited anchorage area, a considerable additional cost might be required in order to protect or replace the cable. Furthermore, when the marine cables are replaced, roughly half month should be paid to stop transmitting electricity to Langkawi Island for the cable replacing constructions. However, since the necessary area for the port development can be obtained in the area between the mouth of the Perlis River and the prohibited anchorage area, the port layout will be carried out there avoiding the prohibited anchorage area.

b) Basic Considerations for Arranging Port Functions

i) Plan A

The locations of each of the functions to be developed in Kuala Perlis Port should satisfy the following requirements:

① Fishing port facilities ..... Placed where contact can be maintained with the

existing fishery port functions on the banks of the Perlis River.

② Passenger ship terminal ..... Close to the center of the town of Kuala Perlis

③ Ferry terminal ..... Easy approach of passenger cars, trucks and other vehicles using the ferries and close to the passenger terminal for the convenience of passengers

④ Cargo wharf ..... Adjacent to the industrial area

⑤ Industrial area ..... Placed where future development can be easily accommodated.

The areas proposed for the locating of port functions are the banks along the Perlis River and the south coastal area, in which case, how to make use of the riverbanks is an important decision. The banks of the Perlis River are almost completely occupied with facilities for fishing boats, as mentioned before, and the left bank should be used for landing fish from fishing boats and the right bank, including the area around Ketam Island, should be used for laid-off ships and for preparations.

Since the present ferry terminal does not have sufficient space, redevelopment is required and the following 2 alternatives are presented:

(Plan I) This is a plan to upgrade the existing ferry terminal as a small boat passenger terminal for the traffic with Thailand. It is convenient because the location is closest to the center of Kuala Perlis and Customs and Immigration are already located at the terminal.

(Plan II) This is a plan to expand the terminal, turning it into landing facilities for the fishing boats. This would help to concretrate all the fishing port facilities along the banks of the Perlis River and to improve their effective use. The future catches from Thai fishing boats and catches from large ships operating in the offshore fishery will be concentrated here.

Comparing these two alternatives, Plan I is considered superior to Plan II in the following points.

① The location of the present ferry terminal is closest to the center of Kuala Perlis, and close to stores and the restaurant. It is better suited for a passenger ship terminal than for fishery facilities.

② Plan II does not provide enough space for locating fishery facilities and there is the possibility of congestion due to car traffic.

③ Plan II does not allow for future expansion.

④ Plan I makes it easier to redevelop the existing central area by installing fishery port functions in new areas.

ii) Plan B-1 and Plan B-2

Both Plan B-1 and Plan B-2 are plans to develop only fishery facilities, and the passenger and vehicular ferry wharves at Kuala Perlis Port while developing the cargo wharf and industrial area at Kuala Sanglang Port. In this case it is also difficult to secure the space for development of new port facilities in the existing developed port area at Kuala Perlis. Therefore new port facilities are planned at the south shore, in coordination with SEDC's project.

2) Planning the Layout of Port Facilities at Kuala Sanglang Port

a) Selection of the Site for Development at Kuala Sanglang Port

Possible functions to be developed at Kuala Sanglang Port are the cargo wharf and the industrial Area. It is necessary to secure the space for development of these functions in coastal areas because the area required is more than 25 ha.

In this case possible development areas include the areas along the coast both south and north of the Kuala Sanglang irrigation canal. Of these areas the north shore is best suited for development as the north shore is nearer than the south shore to the cement and sugar factories which will use the cargo wharf and to the town center of Kuala Sanglang which is located on the north side of the canal.

b) Basic Considerations for Arranging Port Functions

i) Plan B-1

The cargo wharf is planned along the shore area, and the industrial area is arranged close to the cargo wharf.

As for fishery facilities, there are various problems since the existing facilities are insufficient even for small scale coastal fisheries. In order to solve the present problems space for development of new fishery facilities is to be secured close to the existing fishing port area.

ii) Plan B-2

A quay, which has the minimum area necessary for the berthing facilities for cargo ships and cargo handling facilities, is to be constructed about 2.5 km offshore where the required water depth already exists, and connected to the coast by a trestle. In the shore area, facilities for cargo storage are planned and the industrial area is arranged closed to the cargo storage area.

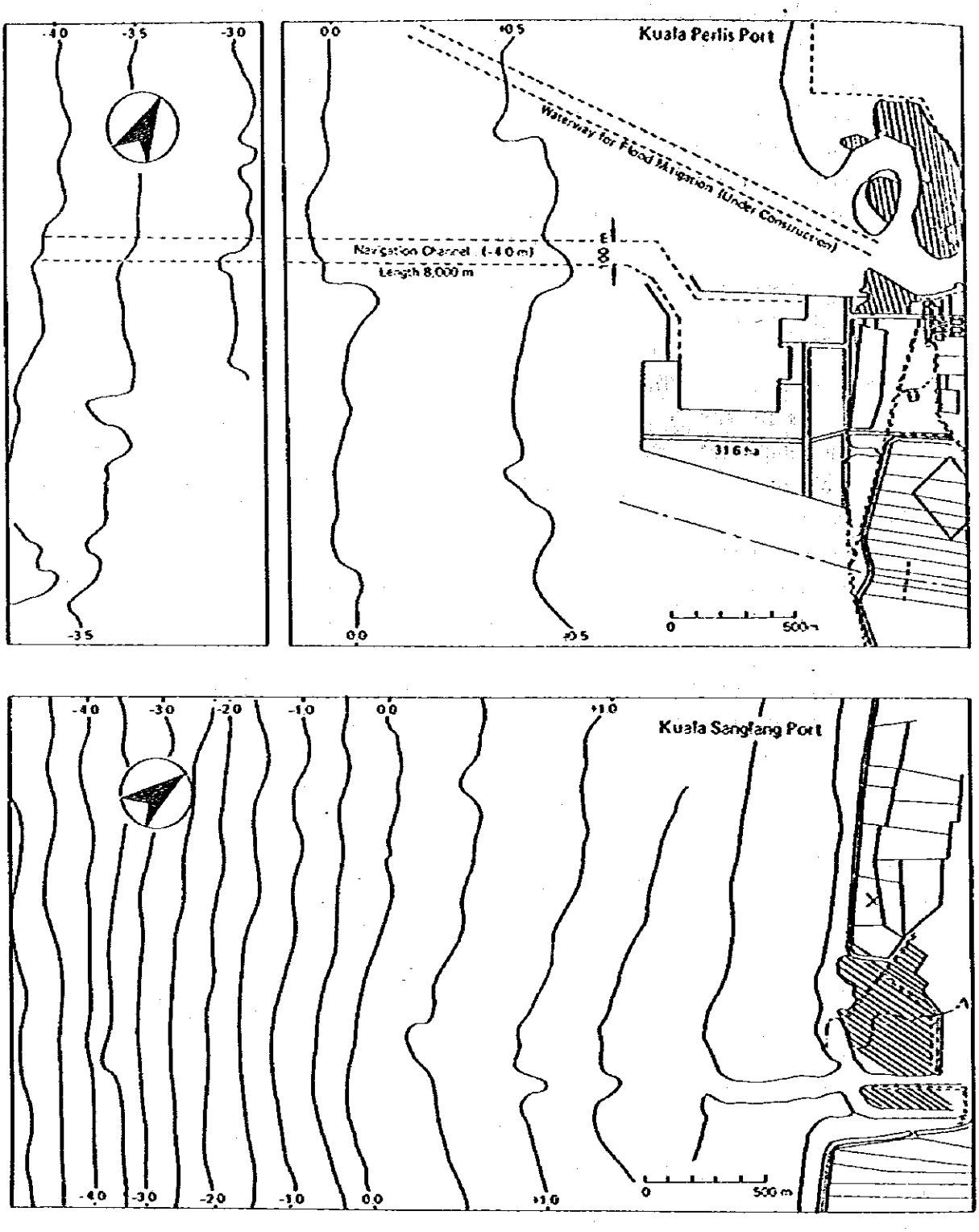

Fig. 2.3.8 Alternative Plan (Plan A)

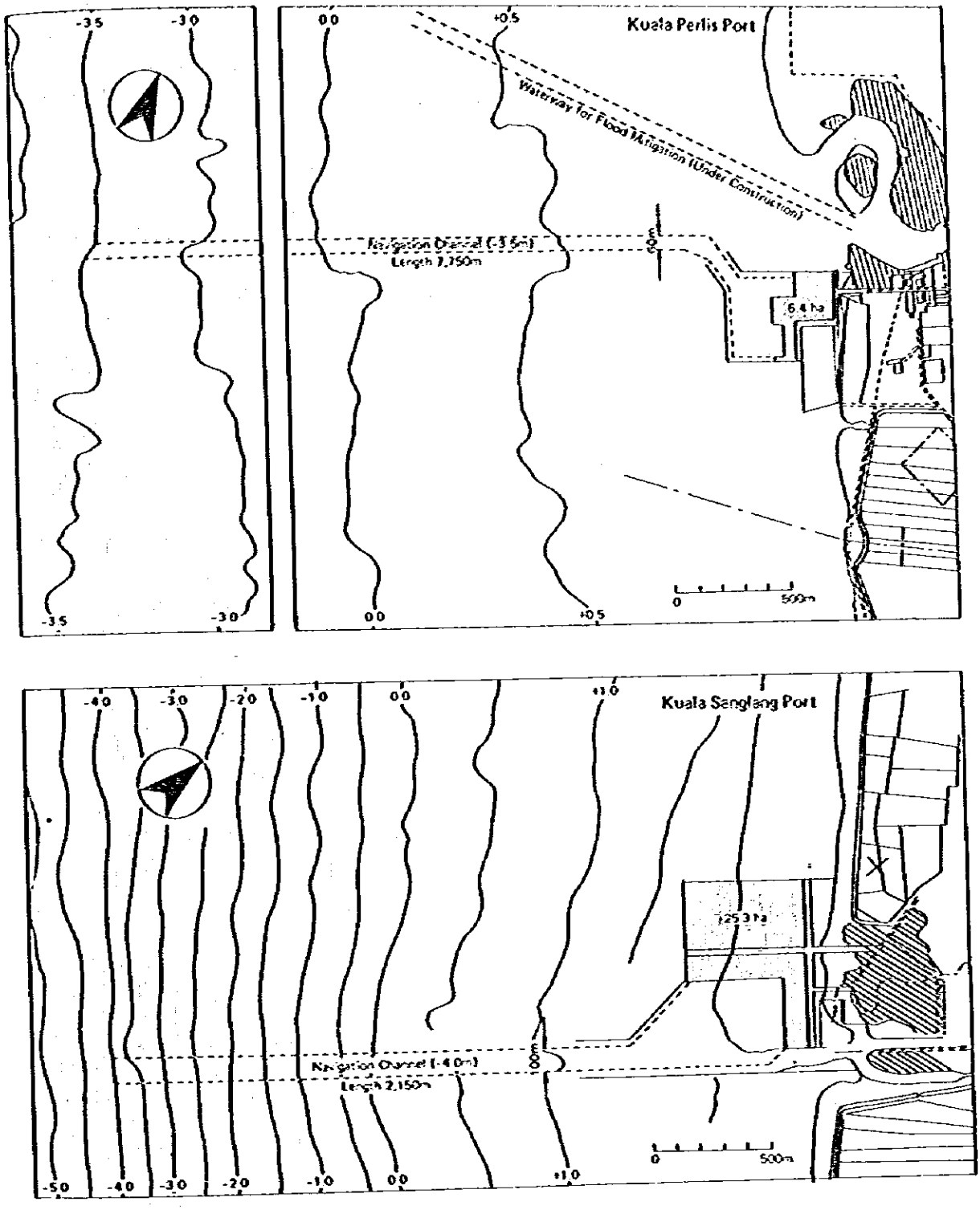

Fig. 2.3.9 Alternative Plan (Plan B-1)

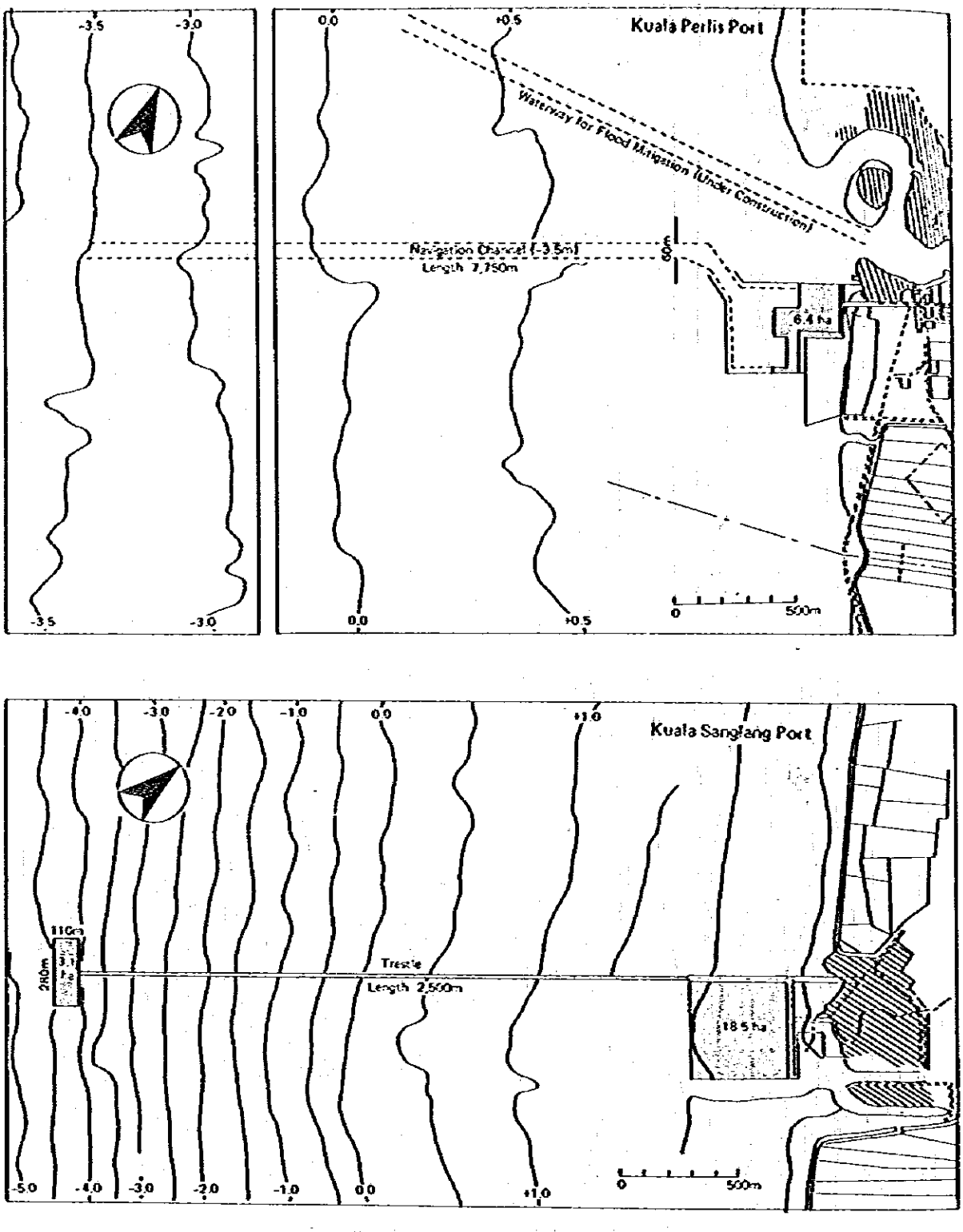

Fig. 2.3.10 Alternative Plan (Plan B-2)

2.3.4 The Selection of the Optimum Plan

In order to select the optimum plan from among the alternatives set up in Section 2.3.3, a comparative study is made from the viewpoints of minimizing the construction costs, effective port development and urban development strategy.

(1) Minimizing the Construction Costs

The construction cost for each alternative plan differs due to the different natural conditions (especially topographical conditions and soil conditions) at Kuala Perlis Port and Kuala Sanglang Port and the different means used to secure the approach of ships to the wharves.

The purpose of the comparative cost estimation in this study is not to estimate the total construction cost itself, but to determine which port development site and which means to secure the approach of ships to the wharves should be selected from the viewpoint of economy.

Therefore, the comparison is made on the construction and maintenance costs of the facilities which are required only when the same functions are developed in both plans.

The facilities covered by the cost estimation are as follows:

① With regard to initial investment

..... Dredging of the waterways and the basins
Construction of the trestle
Construction of the breakwaters and the training walls
Construction of the berthing facilties
Construction of the sea walls and the reclamation

Note that the SEDC's reclamation project and the fishery facilities at Kuala Sanglang Port are not included.

② With regard to maintenance investment

..... Maintenance dredging of the waterways
Maintenance of the trestle's pavement

Rough estimations of construction cost based on the above considerations are shown in Table 2.3.8.

Table 2.3.8 Estimation of Construction Cost for Alternatives

Unit: M$1,000

	Initial Investment	Maintenance Investment (/year)					
		Kuala Perlis		Kuala Sanglang		Total	
		S = 60 cm	S = 100 cm	S = 60 cm	S = 100 cm	S = 60 cm	S = 100 cm
A	46,010	1,823	3,015	–	–	1,823	3,015
B-1	53,996	1,029	1,706	596	969	1,625	2,675
B-2	88,453	1,029	1,706	332	332	1,361	2,038

Note: 1) The type of quaywall is a steel sheet pile type. Typical section is shown in Fig. 2.3.7.
2) The type of trestle is concrete slab and pile supporting type. Typical section is shown in Fig. 2.3.7.
3) In these construction costs, the costs for facilities such as fishery, ship repairing, vehicular ferry, office are not included.
4) These construction costs are based on the unit price in August 1983.
5) "S" means siltation rate by year.

In order to compare the total construction cost among the alternative plans, the total cost in 25 years which is the life of the trestle has calculated and the ratios of the total costs are shown in Table 2.3.9.

Table 2.3.9 Comparison of Alternative Plan Construction Costs

Plan	Rate of Deposition	
	60 cm/year	100 cm/year
A	100	100
B-1	110	107
B-2	161	146

Note: 1) The cost of Plan A is set at 100.
2) The total costs are converted into net present value using a discount rate of 10%.

From the results of this comparison, it is leavned that the differences in the construction costs become less as the volume of dredging gets larger and the dredging cost increases but that in any case Plan A is the cheapest.

In addition to the foregoing, Plan A is superior from the viewpoint of reducing the initial investment as much as possible.

(2) Effective Port Development

When carrying out development of small scale ports such as the port development in Perlis State, the common use of basic facilities to serve multiple functions will make better overall use of the development resources. If functions are alloted to two places for port development, such basic port facilities as the waterways must be maintained for each place and the required investment will be double that for a single port.

In this sense, it is desirable to concentrate functions on Kuala Perlis Port where the fishery and the passenger transport functions are already developed to some extent.

(3) Urban Development Strategy

In Perlis State such towns as Kangar, Arau, Simpang Empat, Kuala Perlis, Kaki Bukit and Padan Besar are grwoing but none of them has grown large enough to serve as a nuclear city and provide various urban services to local inhabitants.

Therefore, they presently depend on Alor Setar in Kedah State. In developing Perlis State, it is desirable to concentrate efforts to build Kangar into a nuclear city and expand its services over wider areas.

Considering this, port development, as well, should not be diversified into several places but be concentrated on Kuala Perlis Port in order to realize its role as a motivating force for regional development.

Overall consideration of the above evaluations led to selecting Plan A as the optimum plan, and Plan A was determined as the basic port facilities layout plan of the master plan for port development in Perlis State.