The Government of Malaysia
The State of Pahang

PAHANG TENGGARA

Regional Masterplanning Study

The Masterplan

Association of Canada Engineering Corp. Ltd.
van Ginkel Associates Ltd.
S.G. Gardiner Engineering Services Ltd.
Chenault International Consultants Ltd.

PAHANG TENGGARA REGIONAL MASTERPLANNING STUDY

The Masterplan for the Development of Pahang Tenggara

Planning
Engineering
Project Management

FENCO

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June 30, 1972

Chief Secretary to the Government,
Economic Planning Unit,
Prime Minister's Department,
KUALA LUMPUR.

The Hon. State Secretary,
Pahang,
KUANTAN.

Dear Sirs:

PAHANG TENGGARA REGIONAL MASTERPLANNING STUDY

In accordance with the Agreement effective July 1, 1970 between the Government of Malaysia, the State Government of Pahang and Foundation of Canada Engineering Corporation Limited we are pleased to submit herewith the Pahang Tenggara Regional Masterplan Final Report.

This report represents the findings of a two year Study by our Consortium members and consultants which produced a Master Plan for the Pahang Tenggara Region, consisting of a detailed development programme over the first five year period and a general development plan for twenty years.

The Master Plan is contained in one volume and is accompanied by additional volumes of supporting reports and a resource atlas.

Working papers of various forms are prepared and distributed to your staff throughout the period of the Study and are available for reference in your project files.

In accordance with the terms of the Agreement eight Progress Reports were submitted at two month intervals, and a Draft Project Report was produced in December 1971. Using these reports the Government's Steering Committee, through the use of Review Groups, produced detailed comment and decisions on which basis the Final Report was produced.

The Consortium expresses its sincere appreciation for the opportunity to participate with you in this Study for the orderly Development in Pahang Tenggara. The Master Plan is truly a team effort contributed to significantly through the active and willing cooperation of the many public, semi-official agencies as well as that of the private sector in Malaysia. The report acknowledges grateful thanks to only a part of their large number. The Consortium further expresses the sincere desire to assist in every way practicable to achieve the realization of the implementation of the project and would make every effort through their international contacts towards that end; subject to the Government's encouragement and approval.

Respectfully submitted,

G. B. MORRIS,
Project Director

W. WEINSTEIN,
Senior Vice President, FENCO

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0.0 SUMMARY AND RECOMMENDATIONS

0.1 THE OBJECTIVES

It goes without saying that any masterplan for the development of Pahang Tenggara should not run counter to the stated objectives of the Malaysian Government. With respect to the study region, these objectives might be paraphrased as follows:

(*a*) The creation of efficient, well managed, technologically advanced and large scale enterprises in agriculture and forestry and the assurance of employment opportunities for participation of Malays in these enterprises at all levels. Small scale enterprises in these fields should be seriously considered only if there is reason to believe that they can be as modern technologically and as well managed as larger scale enterprises in the same fields.

(*b*) The promotion of substantial amounts of industrialisation and urbanisation of a kind which provides opportunities for Malays as well as for other Malaysians to find employment at all levels in the modern sector.

(*c*) Assuring a pattern of development which will contribute to the reduction of regional gaps. This objective requires a pattern of development which will prevent levels of income and social welfare in the region from dropping too far below the national average, and permit substantial migration from relatively low productivity sectors of the poor regions.

(*d*) Providing means of acquiring higher level of skills, particularly for Malays but also for other Malaysians.

(*e*) Providing employment opportunities. (It should be noted that the Second Malaysia Plan does not suggest anything like "make-work" projects for creation of employment opportunities, even for the period of the Second Malaysia Plan. It foresees no reduction in the overall rate of unemployment. The references in the plan to employment creation are hedged in by references to raising productivity at the same time. Thus the references are to "more productive employment", and to "enhanced rural incomes and expanding job creation" in that order).

(*f*) Building a base for attracting manufacturing and service enterprises not directly related to resource exploitation. (The development of Pahang Tenggara should not aggravate the unemployment problem. Consequently, when the point is reached where the natural rate of population growth in the region exceeds the rate of employment creation through resource development, plus industry and tertiary activities directly related to resources development, the plan should permit either of two options: net emigration from the region, if suitable employment opportunities exist elsewhere; or the creation of other employment opportunities within the region. Essentially, the latter option means attracting "footloose" industries and sophisticated "quaternary" services. Consequently, the relative capacity of attraction of such activities of various patterns of development should be given some weight in the formulation of the Masterplan).

0.2 THE MASTERPLAN

The Masterplan is designed to settle approximately 500,000 people in the Pahang Tenggara region by 1990, at incomes close to the national average. The recommended pattern of development will not only provide satisfactory levels of income, but also a social environment that will compare favourably with that of other parts of the country; and opportunities for Malays to enter managerial, scientific, technical, commercial and financial posts as well as agricultural pursuits. Doing so, however, will require governmental concern with development of the urban structure of the region, and the creation of high productivity jobs in the manufacturing and services sectors located mainly in the region's cities, as well as with the oil palm, rubber, diversified agriculture and forestry complex projects that form the hard core of the plan. All this will require a proportion of the labour force engaged outside of agriculture of at least fifty per cent; and this pattern of employment is unlikely to emerge automatically from the "multiplier" effects of developing natural resources alone. Some government services must be located within the region that could function effectively elsewhere as well; and some "footloose" enterprises and sophisticated services must be attracted to the region. These may require a special incentive policy.

Of particular importance is the development of the region's major urban centre, in the north-eastern portion of the region, tentatively called "Bukit Ridan", after the hill at the site. Given a dynamic, attractive regional centre, satisfactory development of the rest of the urban structure of the region should be relatively easy. In order to make a maximum contribution to the reduction of regional and racial disparities, in accordance with the government's own priorities, it is felt that the development of the region should be closely tied to the growth of Kuantan as the major growth centre and most promising potential development pole of the east zone. Interactions between the growth of Kuantan and development of Pahang Tenggara can become mutually reinforcing.

Where Pahang Tenggara (and thus Pahang) will stand in the hierarchy of regions and states in 1990, if the recommended plan is implemented, will depend as much on what happens in the rest of the country as on what happens in the region. If Malaysia succeeds in industrialising at the rate needed to maintain a 3.5% annual growth of per capita income, the Pahang Tenggara envisaged is unlikely to have incomes quite as high as the national average, unless there is a further effort at industrialisation and urbanisation within the region: but it should compare favourably with other regions with similar occupational structures. If structural change and overall growth in the national economy take place more slowly, Pahang Tenggara could have levels equal to or even above the national average.

Figure 5.1 "The Land Use Plan For Pahang Tenggara" (attached in wallet) indicates the extent of land designated for conservation, (for areas, see related section) potential sustained yield forestry operations (including watershed protection) and agriculture. The phasing of agricultural development and settlement is shown for the Second, Third and combined Fourth and Fifth Malaysia Plan periods.

0.3 THE RECOMMENDATIONS

(1) That logging operations in the region be directed to the cutting of commercial tree species in sequence with the proposed clearing for agricultural land use at the approximate rate of 60,000 acres per year until 1980. The logs resulting from this programme should be either absorbed by existing industry outside Pahang Tenggara or form the supply source for special conversion facilities within the region. It is possible that up to 3 such plants should be established on the coast each utilising 36,000 tons of logs per year for 17 years.

(2) That 250,000 net planted acres in the Second Malaysia Plan and 271,000 net planted acres in the Third Malaysia Plan be developed for the crops of oil palm, rubber and various diversified crops shown in the agricultural development plan. Further diversification possibilities are to be the subject of trials by a MARDI research sub-station in the region. Soils which have already been identified as suitable for diversified agricultural development should be protected until expansion possibilities are proven. Further soil surveys should be performed to obtain the necessary data for further land use development.

(3) That two integral forest complexes be established as soon as possible on the basis of a potential sustained yield resource of 236,000 acres of forest. These plants would have an annual capacity of 5,000,000 and 6,250,000 cubic feet of processed timber to produce high value products such as plywood, particleboard, component parts and possibly pre-fabricated housing units. The Lesong industry would operate on a trial

harvesting system after reaching full production in 1977. The Bukit Ibam industry would cut logs on land destined for agricultural use until such time as the intensive resource management system being tested at Lesong is capable of being adopted in the area reserved as a sustained yield resource. Additional research in forestry harvesting methods in the Bebar swamps and silvicultural plantings should be commenced to provide information for future development.

(4) That managed conservation areas be established over 165,200 acres of land identified as having special biological significance and judged necessary for the preservation of wildlife. Each of the 5 zones which comprise this area have potential for tourism in due course and as such can be considered as a productive as well as protective element of the masterplan. A further area of 258,000 acres of steepland and miscellaneous lowland should be retained as protective forest to safeguard the soil and water resources of the region. Environmental control measures are suggested for adoption as a means of protecting the ecology both during and after the development of the region.

(5) That the areas identified as having mineral potential be explored as soon as possible. The area of possible alluvial deposits should be prospected by traditional means and publicly encouraged. The zones of subsurface base metal potential which comprise a total of 260 square miles should be explored by organised and experienced mining companies using sophisticated techniques. Special contract arrangements suitable to such a large venture have been suggested.

(6) That 14 rainfall and stream gauging stations be installed in the recommended locations within the region as soon as possible. In the absence of adequate data the study has been unable to recommend flood control measures and is obliged to site urban and infrastructural development on high ground. Water resource information is needed for several planning purposes and records are necessary for a number of years before becoming useful in detailed design.

(7) That the 36 new towns be established on the basis of concentrated settlements in order that they can create a complete urban hierarchy within the region. By 1990, the regional centre should rank by size in the top twenty towns of West Malaysia. This settlement policy is judged to provide the best means of achieving the desired composition of employment in the region while focusing the development to the east coast.

(8) That services within the region be provided at a level above standards prevailing at present in other parts of the country. To achieve the necessary level of migration an attractive environment should be created. This is proposed by means of well serviced urban areas readily accessible to settlers who can thus fully benefit from the development opportunities throughout the region.

(9) That the Development Authority already established, expand its staff as soon as possible and refrain from becoming involved in operational levels of the regional development. The functions of Land Use Control, Regional Performance and Manpower represent the catalyst role on which the Authority should concentrate. Since many of the participants in the development are from the private sector, the Authority should acquire personnel, particularly in the "Performance Division", who have business acumen and experience in the co-ordination of implementation programmes. In all matters the Authority should take the initiative in order to establish confidence in the masterplan.

(10) That the progress of the implementation be monitored and that records be kept which will enable the flexibility of the masterplan to be used. The various sensitive elements of the programme have been defined and tolerable limits of deviation from the projected development path enumerated. The mid-term review of the masterplan, proposed for 1980, is of vital importance to the successful completion of the implementation. At that time it will be necessary to reassess the progress to date; the impact of research and new information; the priorities which were originally assigned to government objectives and the validity of the basic assumptions of 1972.

PART I—GENERAL ANALYSIS

1.0 INTRODUCTION

On July 1st, 1970 the Government of Malaysia, the State Government of Pahang and Foundation of Canada Engineering Corporation Limited (FENCO) entered into an agreement for the preparation of a masterplan for development of the Pahang Tenggara region with FENCO to act as sponsor of a consortium of Canadian consulting firms as follows:

Foundation of Canada Engineering Corporation Limited.

van Ginkel Associates Limited (previously ECOS Limited).

S.G. Gardiner Engineering Services Limited.

Charnell International Consultants Limited.

The two year study was financed by the Canadian International Development Agency under a loan agreement with the Government of Malaysia.

The results of the study are contained in this report in the following volumes:

The Masterplan for the Development of Pahang Tenggara.

The Pahang Tenggara Map Atlas.

Soil Survey Studies and Interpretations in Pahang Tenggara.

Geology and Mineral Resources of Pahang Tenggara.

Climate and Water Resources of Pahang Tenggara.

Wildlife, Conservation and Tourism in Pahang Tenggara.

Agricultural Development in Pahang Tenggara.

- Appendix 1. The FLDA Keratong Oil Palm—Feasibility Study.
- Appendix 2. The Beef Project—Feasibility Study.
- Appendix 3. The Rubber/Tapioca Estate —Feasibility Study.
- Appendix 4. The Sago Experimental Project—Feasibility Study.
- Appendix 5. The Private Oil Palm—Feasibility Study.

Forestry Development in Pahang Tenggara.

- Appendix 1. Forest Inventory Data—Pahang Tenggara.
- Appendix 2. The Lesong Forest Products Project.

Sociology and Migration in Pahang Tenggara.

Economics of Development in Pahang Tenggara.

Settlements and Infrastructure in Pahang Tenggara.

Organisation and Implementation of Development in Pahang Tenggara.

The study of development for Pahang Tenggara is one of a series of regional studies identified and co-ordinated by the Economic Planning Unit of the Prime Minister's Department of the Government of Malaysia. However the Pahang Tenggara region presents the largest single development opportunity of the series which has included the Jengka Triangle and Johore Tenggara in the past and will include other areas of both west and east Malaysia in the future.

The Pahang region (*see* Fig. 1.0) consists of 2,485,000 acres bounded on the north by the Pahang river, the east by the coast and the south and west[1] by the State of Pahang border. These boundaries define an area whose natural resources are predominantly unexploited and which is largely unpopulated. The terms of reference of the study reflect a philosophy that Pahang Tenggara is an "area of opportunity" for natural resource development.

The "product" of the study is a detailed masterplan for the period to 1975 (inclusive) and a flexible masterplan for the period 1976-1990. Since there are no published plans at a State or Federal level for this planning horizon the consultants are required to make long range projections in conjunction with the Economic Planning Unit (EPU). The objectives of the masterplan are defined[2] as follows:

(*a*) Determination of land capability through data collection and analysis procedures.

(*b*) Investigation of possible land use including agriculture, grazing, townsites, recreation, wildlife management and forest, both natural and man made.

(*c*) Evaluation of socio-economic factors relevant to the present and future use of the area.

(*d*) Identification of discrete projects and scheduling of priorities for such undertakings.

(*e*) Preparation of a long range Masterplan of development of the Pahang Tenggara area.

1.1 SCOPE OF WORK

The scope of work of the study included the inventory of the natural resources of the region from both available data and fieldwork, and a thorough socio-economic appraisal of regional development prospects within the context of Government objectives.

1.1.1 Natural Resources

Reconnaissance soils information was available for the region, however semi-detailed surveys were to be performed over an area of approximately 500,000 acres. From this area a detailed agricultural programme was to be derived for a total "not to exceed 250,000 acres"[1] suitable for development during the Second Malaysia Plan. A general agricultural plan for the region was to be based upon "a wide range of economically attractive crops"[1] and special investigations of peat and muck soils. The required format of information was defined for:

(*a*) terrain classification

(*b*) semi-detailed soil survey

(*c*) soil suitability classification

(*d*) evaluation of irrigation and drainage requirements

(*e*) agronomic and economic assessment of crops that could be grown in the area, with particular attention given to the suitability of the area for crops other than rubber and oil palm.

The inventory of forest resources was to be carried out over the entire region and documented in the prescribed manner[1]. These resources were to be analysed taking into account existing agreements, the needs of existing industry, the UNDP "Forest Industry Development Project" and "Pilot Plantations for Quick Growing Industrial Tree Species Project", and the potential of the region for the establishment of new industries. From this analysis a forestry programme to optimise the exploitation of these resources would specifically recommend[1]:

(*a*) The location of forests suitable for development as permanent productive and/or protective forest estates.

(*b*) The location of primary forest communities suitable and desirable to be preserved for study, research and other scientific purposes with particular attention to the preservation of a genetic pool for tree breeding and extension purposes.

(*c*) The management of the forests, including presently unproductive forests, with a view to increasing their productivity as applicable, with due emphasis to the permanent forest estate.

(*d*) Detailed proposals for new forest industries to be established to harvest and process the yield of timber from the existing forest resources, including their impact upon the existing industries locally and on a national scale.

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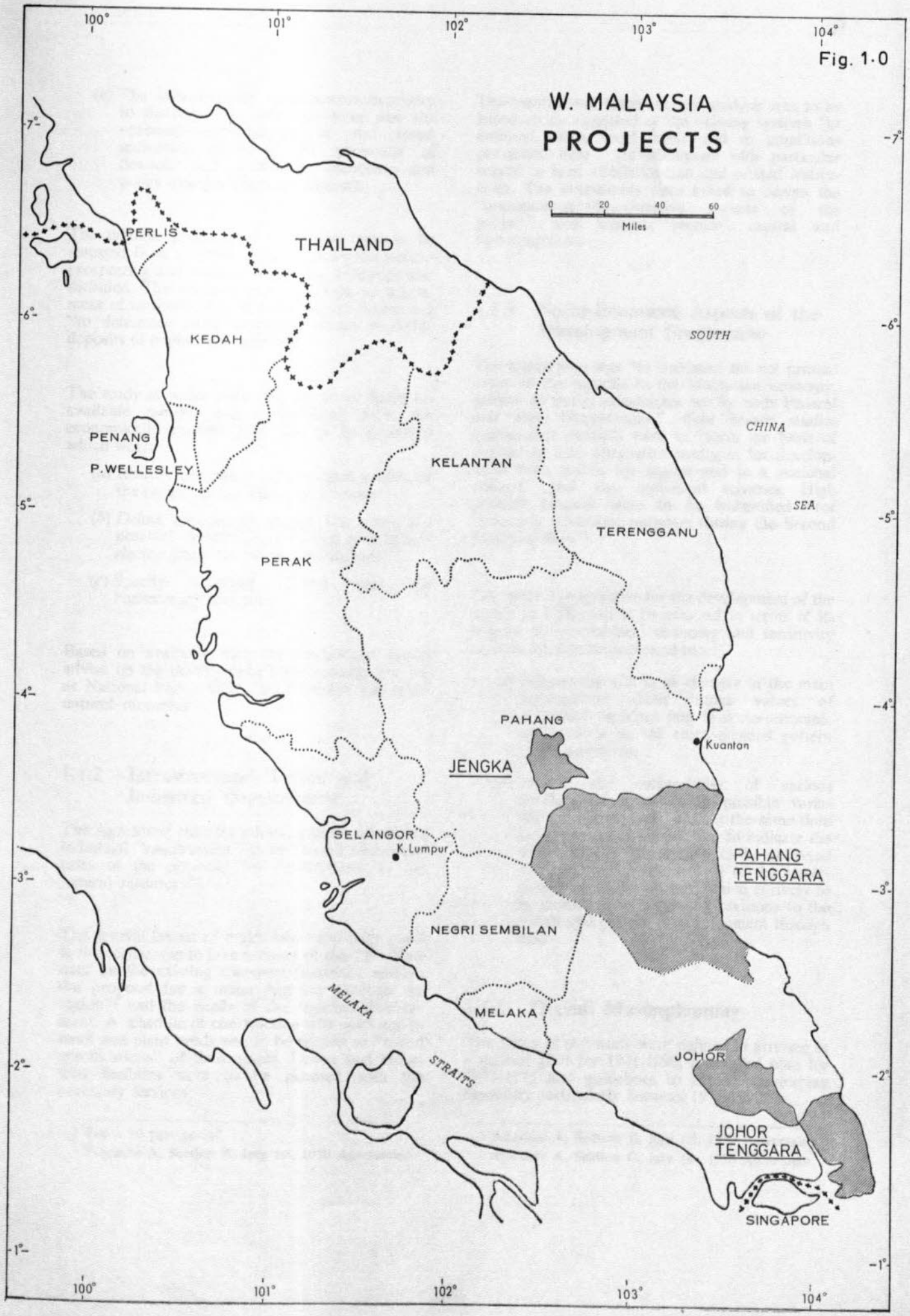
[1] For more precise boundary *see* supporting report "Settlement and Infrastructure in Pahang Tenggara".

[2] Article III of the Agreement (July 1st, 1970).

[1] Schedule A, July 1st, 1970 Agreement.

Fig. 1.0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2 Article III of the Agreement (July 1st, 1970).

1 Schedule A, July 1st, 1970 Agreement.

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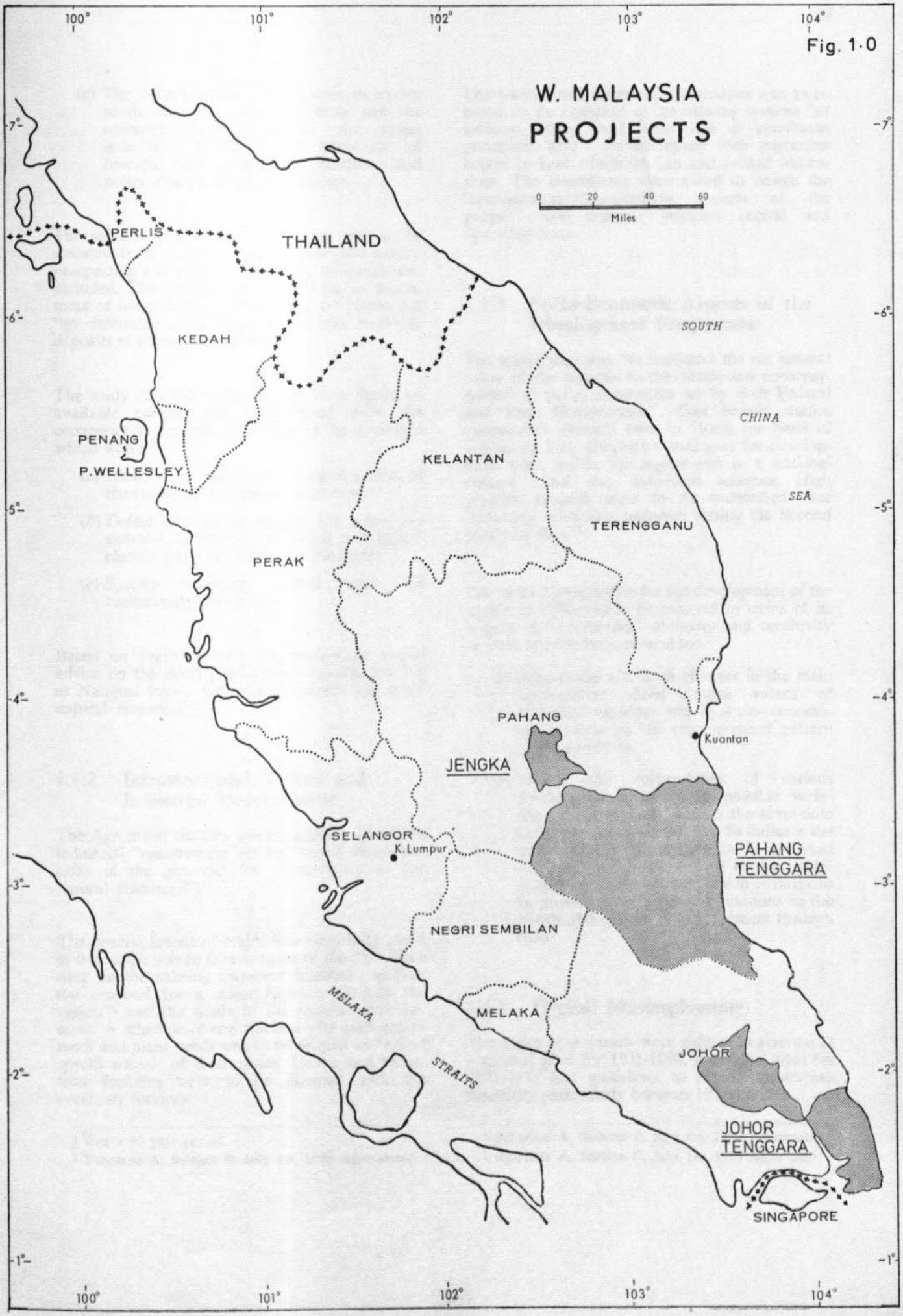
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(*e*) The infrastructure requirements necessary to develop the forest resources and the optimum development of the forest industries, including the provision of financial and institutional incentives and policy changes where appropriate.

The mineral potential of the region was to be assessed from available data of geological nature, prospecting and mining records. No fieldwork was included. The analysis was to include an assessment of methods of prospecting in the future and "to determine areas likely to contain workable deposits of exploitable minerals".

The study of water resources was to be based on available rainfall and hydrological data. An economically realistic plan was to be produced which would:

(*a*) Identify the effects of the development of the region on the discharge of rivers.

(*b*) Define sources of supply for water for potable[1], industrial[1], irrigation and hydro-electric purposes (where applicable).

(*c*) Specify necessary related works or conservancy measures.

Based on available data the consultants would advise on the development areas suitable for use as National Parks, Wild Life Reserves and other natural resources"[2].

1.1.2 Infrastructural, Urban and Industrial Development

The Agreement calls for infrastructural, urban and industrial "requirement" to be "based on evaluations of the potential for development of the natural resources"[2].

The general layout of major and subsidiary roads in the region was to take account of the "available data on the existing transport (national) system, the proposal for a major highway through the region"[2] and the needs of the regional development. A schedule of construction with staff equipment and plant needs was to be related to "broad specifications" of these roads. Urban and industrial facilities were to be planned with the necessary services.

1 For a 30 year period.

2 Schedule A, Section B, July 1st, 1970 Agreement.

The institutional infrastructure analysis was to be based on an appraisal of the existing systems "at national, state, local levels and to conditions prevailing here"[1] (in Malaysia) with particular regard to land administration and related institutions. The consultants were asked to design the "management/administrative aspects of the project" and estimate required capital and operating costs.

1.1.3 Socio-Economic Aspects of the Development Programme

The masterplan was "to maximise the net present value of the benefits to the Malaysian economy, subject to policy constraints set by both Federal and State Governments". Cost benefit studies (parameters defined) were to "form the basis of evaluating both alternative strategies for development both within the region and in a national context" and also individual schemes. High priority projects were to be indentified "for budgetary allocation purposes during the Second Malaysia Plan"[2].

The phased programme for the development of the region to 1990 was to be assessed in terms of its impact on the national economy and sensitivity analysis were to be presented to:

(*a*) indicate the effects of changes in the main assumptions about future values of economic variables and in socio-economic assumptions on the recommended pattern of development.

(*b*) suggest the vulnerability of various development strategies to possible variations in prices, costs, etc. At the same time the presentation should aim to indicate the nature of the information to be collected and analysed after the start of the implementation of the project, which is likely to be important in suggesting revisions to the design and pattern of development through time.

1.1.4 Overall Masterplanning

The stages of the study were defined in arriving at a general plan for 1971-1990, a detailed plan for 1971-1975 and guidelines to exploit masterplan flexibility particularly between 1976-1990.

1 Schedule A, Section B, July 1st, 1970 Agreement.

2 Schedule A, Section C, July 1st, 1970 Agreement.

The first stage consisted of defining alternative strategies for development and the sensitivity of the main assumptions on which they were based; to be presented January 1972 (after 18 months).

The second stage concerned the selection of high priority projects to be developed in detail sufficient for presentation to "international lending institutions" (defined elsewhere in Article IV of the Agreement).

The third stage concerned the definition of the final masterplan which summarised the previous instructions and emphasised the need for the presentation of development during the 1976-1990 in a manner which could be adjusted to actual rather than predicted conditions prevailing at that time.

1.2 ORGANIZATION OF THE STUDY

Section E of the Scope of Work (Schedule A of the Agreement) concerned the establishment, for policy guidance, of a "Co-ordinating Committee" comprising representatives of the Ministries/ Departments of the Governments concerned.

This committee became known as the Steering Committee and was formed during the negotiating phase prior to the commencement of the study. The chairman was alternately the Director General of the Economic Planning Unit and the State Secretary of Pahang. The Steering Committee met at approximately 2 month intervals from the signing of the agreement until month 20 of the study, to review the progress of the work and to discuss substantive issues as well as provide general policy guidance. The consultants provided 8 progress reports and one draft masterplan report in accordance with Article IV of the Agreement during this period, the final report being prepared for printing by the Government July 1st, 1972.

It was clarified by the Steering Committee at the first meeting that in a number of instances policy decisions should influence the course of the study and in this regard the final masterplan is not based exclusively on the consultants recommendations.

Continuous technical and administrative liaison was established between FENCO and the Governments by the appointment of a full time co-ordinating officer for the State of Pahang who was located in the main office of the consultants in Kuantan, and the designation of a responsible officer within the Economic Planning Unit.

The study comprised approximately 560 man months of professional Canadian personnel, approximately 25 man months of professional Malaysian Government counterpart officers participation (soil inventory forestry, geology conservation and sociology) and over 2,500 man months of local Malaysian supporting personnel, all under the FENCO project director. The Canadian professionals were divided into two groups as shown in Fig. 1.2a working almost exclusively in Malaysia (98%).

The size of the area to be covered by Forestry field work (almost 4 times that of S.E. Johore Study) and the considerable impact of the programme on both State and National economies called for special measures in scheduling the work. Only 18 months were allowed for data collection (*see* Fig. 1.2b), analysis and synthesis of alternative strategies. The fieldwork of soils needed 10 months and would only cover 20% of the region but the forestry inventory had to overrun, taking 20 months. Thus planning studies had inevitably to be based on partial or estimated data and analysis was concurrent with data collection.

The sequence of planning studies adopted to meet this requirement consisted of:

(*a*) An assessment of the National economy for both 1971 and 1991.

(*b*) An analysis of regional objectives.

(*c*) A detailed analysis of regional development potential through emphasis on different government objectives using data assumptions.

(*d*) A development plan with alternative strategies based on restraints and preliminary data.

(*e*) A masterplan using Final data.

PAHANG TENGGARA

REGIONAL
MASTERPLANNING STUDY
1970 - 1972

ORGANIZATION CHART

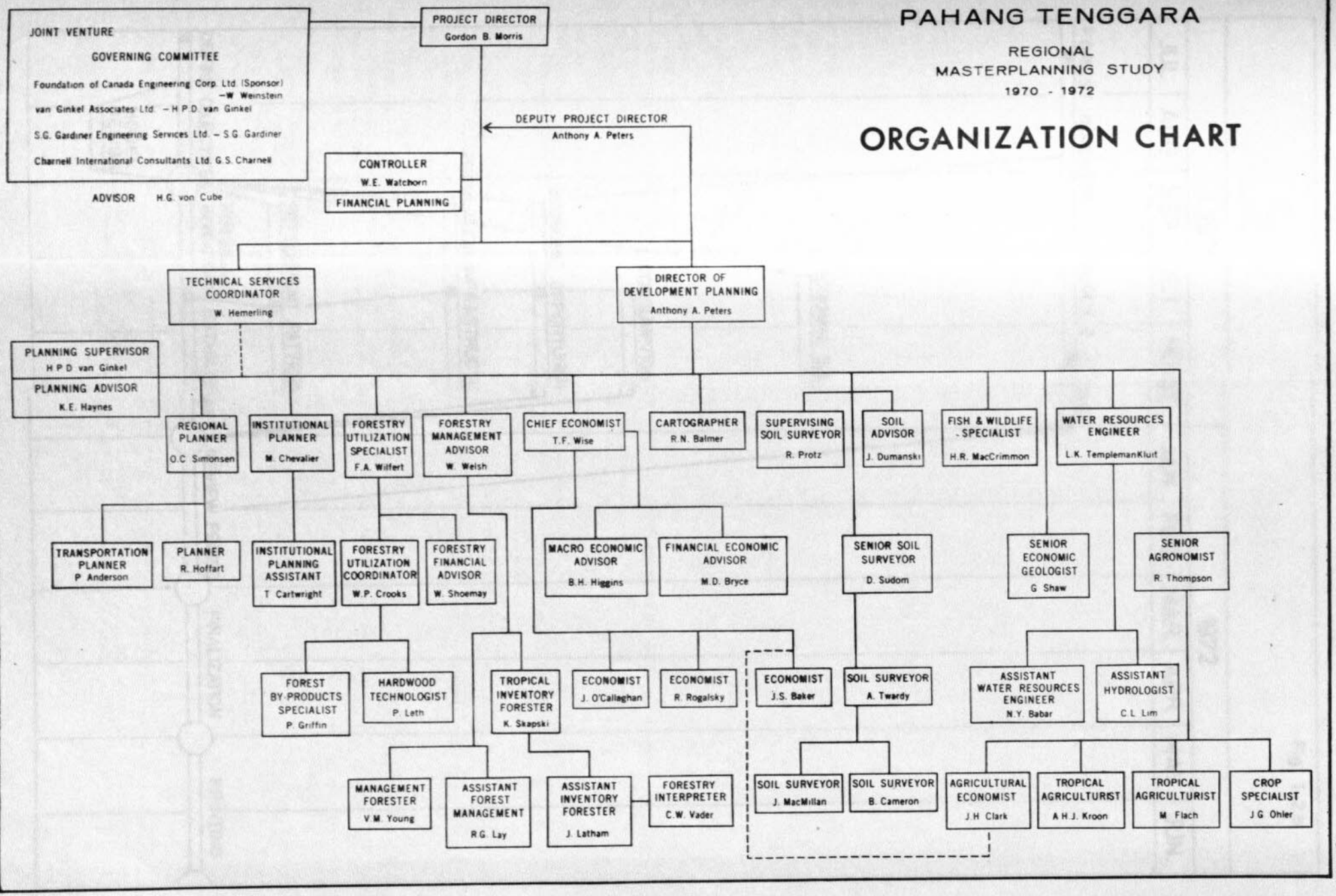

Fig. 1.2a

2.0 NATIONAL DEVELOPMENT

2.1 THE MALAYSIAN ECONOMY TODAY

The Malaysian economy is unique. It is the second most prosperous major country in Asia, after Japan[1] with a per capita income in excess of US$400 (study estimate, the official figure is US$360). This estimate puts Malaysia today about where Japan was in the mid 1950s. Yet this relative prosperity has been achieved with very little "industrialisation" in the ordinary sense of the word; manufacturing accounts for less than 9% of total employment[2]. There is a large—perhaps excessively large—services sector containing over one-third of the labour force. Services of various kinds account for more than half the gross national product. Yet it is not the services sector that is primarily responsible for Malaysia's relatively high degree of development among Asian countries. A large proportion of the services are traditional, and productivity in traditional services is close to the national average for all occupations.

The key to Malaysia's relative prosperity lies in the extraordinary structure of her agriculture. Whereas in most other Asian countries 50% to 80% of the labour force is in peasant agriculture, in Malaysia less than 1/5 of the labour force is so engaged. Almost half the labour force is in agriculture, it is true; but over 3/5's of these are engaged in production for export, either as smallholders or as estate workers.

Yet the strength of Malaysia's economy is also its weakness. An export-oriented, commercialised agricultural sector does not have the resilience of peasant food-producing societies. It cannot so easily absorb a growing population, and disguised unemployment tends to be converted into open unemployment.

It was not until after World War II that West Malaysia experienced truly high rates of population growth. But this high growth took place from a low base and the rate of growth of national income has also been fairly high and increasing through the postwar period: 3 percent per year between 1950 and 1955, 4.1 percent between 1955 and 1960, and 6.0 percent between 1960 and 1970, or about 5.3% at constant prices. With a population growth in the neighbourhood of 3 percent, these figures do not represent a high rate of growth of per capita income for the period as a whole but certainly a respectable one.

There has been only limited structural change in Malaysia since World War II; yet structural change will surely be necessary if Malaysia is to continue raising per capita income by 3 to 3.5% per year. Continued growth in Malaysia requires investment in the modern sector, where both capital: output ratios and capital: job ratios tend to be high. Malaysia's economic problems lie mainly in the uncertain prospects for its major exports, especially rubber, tin and palm oil. The social and political problem lies in the concentration of entreprenuership or ownership in the hands of non-Malays and in the inadequate opportunities for young people emerging from the school system.

No attempt will be made here[1] to provide a complete survey of Malaysian economic structure, potential, and problems, but the main

[1] Excluding the small countries of Hong Kong, Singapore and Brunei.

[2] The 1970 figure for West Malaysia alone was 9.2%.

[1] *See* Supporting Report "Economics of Development of Pahang Tenggara".

features of the economy, as they bear on the design of a development strategy for Pahang Tenggara are:

(*a*) An export-oriented economy.

(*b*) A relatively "advanced" occupational structure. (*see* Table 2.1).

(*c*) High and growing unemployment.

(*d*) Small manufacturing sector relative to level of per capita income.

(*e*) Large, but substantially modern services sector.

(*f*) A special pattern of urbanisation.

(*g*) A special relationship between exports and investment.

(*h*) Price stability and strong balance of payment position.

Table 2.1—Employment Structure, West Malaysia 1967 (Employment in Thousands)

INDUSTRY		Total Employment
0.	Agriculture, forestry, hunting and fishing	622.6
1.	Agricultural products requiring substantial processing ...	766.2
2.	Mining and quarrying ...	68.7
3-4.	Manufacturing	261.1
5.	Construction	95.4
6.	Electricity, water, sanitary services	170.0
7.	Commerce	323.4
8.	Transport, storage, communication	108.1
9.	Services	500.2
	TOTAL ...	2,762.7

2.2 MALAYSIA 1990

Taking the 1970 per capita income of West Malaysia as between US$360 and US$400 and projecting the target 3.5% annual growth of the Second Malaysia Plan to 1990, gives a target per capita income in that year of US$720 to US$800.

Malaysia has demonstrated a capacity to produce given levels of per capita income with a disproportionately high percentage of the labour force in agriculture. On the basis of experience in other countries appears probable that the "degree" of disproportion must drop for the above target to be reached. If incomes are to continue to rise at 3.5% per year however it is unlikely that employment in agriculture can exceed 25% of the labour force by 1990.

A similar exercise relating industrialisation to population and income, using a target per capita income of US$720 for West Malaysia in 1990 and a projected population in that year of 15.4 million, gives a figure for value added in manufacturing of US$4,068 million. The corresponding figure for Gross Domestic Product (GDP) would be US$11,100 million; thus manufacturing would be about 37% of GDP. It might be noted that if the target rate of growth of manufacturing in the Second Malaysia Plan were projected to 1990, the value added in manufacturing would be $3,850 million, which is very close to the figure obtained above.

Population growth *requires* industrialisation to relieve population pressure on the land, and *permits* industrialisation, especially in the form of import replacement, by broadening the market. The Second Malaysia Plan implies a rise in the ratio of manufacturing: total "industry" (with mining, construction, and utilities added in) from about 60% to about 65% by 1976. If it is assumed that in 1990 manufacturing would be 70% of "industry", the figure of 37% for manufacturing would correspond to an industrial sector that would account for nearly 53% of GDP. This figure might be regarded as too high on two grounds: first, the general tendency for the share of manufacturing in GDP to taper off as figures above 45% are reached; and second, the relatively efficient character of Malaysia's agriculture. However, substituting the study estimate of US$800 for US$720 (1990 per capita income) would raise the figure for manufacturing giving a target of between 45% and 50%.

A manufacturing sector of that magnitude would support a large services sector as well, without excessive transfers from agriculture. Countries that achieve manufacturing sectors producing 45% to 50% of gross domestic product usually have services that are responsible for 35% to 45% of GDP. Thus if Malaysia attained the suggested target for manufacturing, agriculture would be left with 15% to 20% of GDP. Since there is reason to hope that structural change at such a speed and to such an extent would keep agricultural

productivity close to the national average, these figures for GDP would imply 20% to 25% of the labour force in agriculture.

The First Malaysia Plan includes a Perspective Plan for 1985, which has not as yet been formally replaced by a revised Perspective Plan. It shows the share of agriculture in GDP falling from 32% in 1970 to 26% in 1985. However, the 1970 figure was a projection, and turned out to be high. The actual figure for 1970 was 30.6%. Thus with the same rate of structural change the figure for 1985 might be around 24% and for 1990 around 22%. The Second Malaysia Plan shows the ratio of share of agriculture in employment to share of agriculture in GDP falling from about 1.6 in 1970 to about 1.53 in 1975. With the expected structural change within agriculture (disappearance of traditional subsistence agriculture) this ratio might fall to 1.20 in 1990. There would then be 24% of the labour force in agriculture in 1990.

The Second Malaysia Plan provides for modest structural change. The statement about trends of output and employment in the longer run, however, suggest an acceleration of structural change in future plans (Table 2.2a). If the same growth rates are maintained for each of the three major sectors (agriculture, industry, and services) in 1990 there will be 36% of the labour force in agriculture, 23% in industry and 40.8% in services (Table 2.2b). Such a structure would mean that in 1990 Malaysia would still be an under-developed country even in 1970 terms. Moreover, such a structure would almost certainly imply disguised unemployment in the services sector. No country has ever had a healthy economy with nearly twice as many workers in services as in industry.

Table 2.2a—Structure of Output and Employment, Malaysia, 1970 and 1975

	1970		1975	
	GPD (%)	Employment (%)	GDP (%)	Employment (%)
Farming, Fishing Forestry	30.6	49.5	30.2	46.0
Manufacturing	13.1	9.2	16.9	11.0
Construction	3.8	3.5	4.3	3.9
Utilities	2.7	0.6	3.0	0.7
Commerce	14.4	11.6	13.0	12.2
Services	24.4	23.4	24.3	24.7

Source: Second Malaysia Plan

Table 2.2b—Projections of Demand for Labour by Sector: SMP

Annual Growth Rates	1970		1975		1980		1985		1990	
	No.	% Tot.	No.	% Tot.	No.	% Tot.	No.	% Tot.	No.	% Tot.
Agriculture 1.79% ..	1,454	49.5	1,579	46.0	1,718	42.6	1,869	39.3	2,033	36.0
Industry 5.4% ..	456	15.5	594	17.3	773	19.2	1,005	21.1	1,307	23.2
Services 4.1% ..	1,030	35.0	1,262	36.7	1,543	38.2	1,886	39.6	2,306	40.8
	2,940	100.0	3,435	100.0	4,034	100.0	4,760	100.0	5,646	100.0

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	2,940	100.0	3,435	100.0	4,034	100.0	4,760	100.0	5,646	100.0

Therefore the study has retained the 1.7% growth of agricultural employment up to 1975, but has assumed that total agricultural employment ceases to grow thereafter. This provides a hypothetical framework that would permit both a transfer of agricultural workers from traditional to commercial agriculture, with the abandonment of submarginal land and opening up new land of superior quality, and an increase in the average size of holdings. In this fashion output and incomes per man-year in agriculture can be prevented from falling too far below those in other sectors. Similarly, the study has retained the 5.4% growth of industrial employment for the Second Plan period, but raised it to 6.1% thereafter; and for services retained the 4.1% growth rate to 1975 and raised it to 4.9% thereafter[1]. The 6.1% target for industry is not over optimistic; the Second Malaysia Plan requires a 7% growth rate for manufacturing, and as time goes by it will be this growth rate that will dominate the industrial sector. Also, mining will not continue to shrink indefinitely, if mining law is changed. (*See* Section 10.3).

Even these assumptions do not give entirely satisfactory results. The share of agriculture in total employment drops to 28.2% in 1990 (*See* Table 2.2c), close enough, given margins of error, to the targets obtained by other methods. However, the industrial sector expands only to 25.7% of the labour force, while services grow to 46.1%. Thus the imbalance between industry and services remains. The conclusion must be that sometime between 1975 and 1985 the rate of growth of industry must be raised to a level about 6.1%, which is by no means impossible. If the entire industrial sector grew at the 7% rate projected for manufacturing, the sector would reach 36% of total employment, or about 45% of GDP, by 1990.

Table 2.2c—Employment Projections by Sector: Constant Agricultural Employment after 1975

Annual Growth Rates	1970		1975		1980		1985		1990	
	No.	% Tot.	No.	% Tot.	No.	% Tot.	No.	% Tot.	No.	% Tot.
Agriculture—										
1.7% '75 - '90 .. / 0% '75 - '90 ..	1,454	49.5	1,579	46.0	1,579	39.7	1,479	33.7	1,579	28.2
Industry—										
5.4% '70 - '75 .. / 6.1% '75 - '90 ..	456	15.5	594	17.3	799	20.1	1,074	22.9	1,444	25.7
Services—										
4.9% '75 - '90 ..	1,030	35.0	1,262	36.7	1,603	40.3	2,036	43.4	2,586	46.1
TOTAL ..	2,940		3,435		3,981		4,689		5,609	

Source: 1970, 1975: Second Malaysia Plan
Other years: Calculated

[1] These adjustments are needed to assure a growth of employment equal to the projected 3.2% growth of the labour force.

Another major conclusion derived from these projections is that if the agricultural sector is not to be too large in 1990 it must cease to grow in total numbers after 1975, or, if it grows for some time after that year, it must shrink in absolute numbers during some later period, so as to restore total agricultural employment to its 1975 level by 1990. To reiterate, this target does not mean that agricultural output will cease to grow after 1975, nor that no new settlement will be desirable. On the contrary, it implies an acceleration of the growth of agricultural output, by replacing relatively poor with relatively good land, increasing the average size of holding so as to permit technological improvements, elimination of traditional agriculture and continued adoption of new technology by all sub-sectors of agriculture.

All of the analysis presented above, including comparisons with other countries and investigation of detailed Government objectives leads to the same conclusion: if Malaysia is to have a satisfactory pattern of economic and social development over the next twenty years, it must aim at reducing the share of employment in agriculture to about 25% in 1990. The industrial and services sector, moreover, should not be permitted to drift too far apart. Probably neither should account for less than 35% or more than 40% of total employment, unless technological changes not now foreseen take place, or unless it becomes desirable and possible to reduce the share of agriculture below 25%. Even in advanced countries a services sector that is much bigger than the industrial sector usually reflects a push from the farm that is stronger than the pull to the factory, and a consequent transfer to "disguised unemployment" from agriculture to services. The targets for Pahang Tenggara, therefore, will reflect the target for Malaysia of an agricultural labour force amounting to some 25% of the total, and industrial and services sectors each in the range of 35% to 40% of the total.

3.0 REGIONAL CONSIDERATIONS

3.1 EXISTING REGIONAL AND RACIAL DISPARITIES

The Socio-Economic Survey of 1967 divides West Malaysia into five regions: the Southwest (Selangor and Negeri Sembilan); Central (Perak); North (Kedah, Perlis and Province Wellesley); South (Johore and Malacca); and East (Pahang, Trengganu and Kelantan). The regions are listed here in order of levels of per capita regional product. The figures for 1967 are as follows:

Table 3.1a—GRP Per Capita and % Malay Population

	GRP Per Head	% Malay Population
Southwest ...	M$1,214	33.8
Central ...	778	34.3
North	615	54.1
South	660	50.1
East	540	82.3

As may be seen from Table 3.1a above, there is a strong inverse correlation between the proportion of Malays in the population of each region and the level of per capita regional product. Both the regional and the ethnic disparities reflect in turn differences in occupational structure. As may be seen in Table 3.1b there is a high correlation between the level of per capita regional product and the share of the labour force engaged outside of agriculture. The richest region, the Southwest, has only 39% of its labour force in agriculture, and only 9.2% in traditional agriculture. In the sharp contrast, the East, the poorest region, has 61.5% of its labour force in agriculture and 37.3% in traditional agriculture. Conversely, the Southwest has 10.9% of its labour force in manufacturing and 59% in services, the East has 8.9% in manufacturing and 26% in services.

Similarly, the fact that incomes of non-Malays average 1.8 times those of Malays reflect differences in occupational structure more than differences in earnings in each occupation. There are, it is true, gaps between productivity (and so incomes) of Malays and non-Malays within broad occupational categories; M$3,245 vs. M$3,340 on rubber estates, for example, or M$4,025 vs. M$4,075 in "modern manufacturing".[1] But if these categories are broken down into narrow classifications, even these differences may well tend to disappear. The main factor in income gaps among ethnic groups, obviously, is that only 27% of employees in the modern agriculture sector and only 26% of employees in the modern urban sector (apart from Government) are Malays, while Malays account for 75% of the employment in the traditional urban sector (which in turn accounts for 16% of total employment) and 79% of employment in the traditional rural sector (with 41% of total employment).[2] In short, both regional disparities and ethnic disparities are caused mainly by differences in occupational structure, and by tackling regional gaps in the right way (bringing Malays into high productivity occupations in developing regions) ethnic disparities can be reduced at the same time.

1 Donald Snodgrass, *Income, Employment and Racial Disparity* (EPU) Table 12, p. 59.

2 *Ibid.*

Table 3.1b—Employment by Sector: Main Regions

	Industry	*Total*	*South West (1)*	*Central (2)*	*North (3)*	*South (4)*	*East (5)*
1a.	Agriculture, forestry, hunting and fishing	500,983 (21.1%)	52,835 (9.2%)	95,079 (22.2%)	121,606 (29.3%)	44,973 (10.1%)	186,490 (37.3%)
1b.	Agricultural products requiring substantial processing	718,741 (30.4%)	171,783 (29.8%)	114,798 (26.8%)	87,268 (21.1%)	223,873 (50.2%)	121,019 (24.2%)
1c.	Total agriculture	51.5	39.0	49.0	50.4	60.3	61.5
2.	Mining and quarrying	71,995 (3.0%)	23,504 (4.1%)	31,910 (7.4%)	2,775 (0.7%)	3,743 (0.8%)	10,063 (2.0%) (*1.6)
3. & 4.	Manufacturing	215,125 (9.1%)	62,512 (10.9%)	36,949 (8.6%)	37,229 (9.0%)	34,102 (7.6%)	44,333 (8.9%)
5.	Construction	79,004 (3.3%)	28,444 (4.9%)	15,482 (3.6%)	12,060 (2.9%)	10,867 (2.4%)	12,151 (2.4%)
6.	Electricity, gas, water and sanitary services	22,328 (0.9%)	7,175 (1.2%)	5,048 (1.2%)	4,143 (1.0%)	3,297 (0.7%)	2,665 (0.5%)
7.	Commerce	255,182 (10.8%)	71,609 (12.5%)	43,214 (10.1%)	52,913 (12.6%)	40,914 (9.2%)	46,532 (9.3%)
8.	Transport, storage and communication	86,065 (3.6%)	29,102 (5.1%)	11,332 (2.6%)	20,859 (5.0%)	11,547 (2.6%)	13,225 (2.6%)
9.	Services	413,313 (17.5%)	127,335 (22.1%)	75,282 (17.5%)	74,939 (18.1%)	72,468 (16.2%)	63,289 (12.4%)
10.	Industry not specified	3,194 (0.1%)	1,411 (0.2%)	30 (0%)	326 (0%)	617 (0.1%)	810 (0.2%)
	TOTAL ..	2,365,930 (100.0%)	575,710 (100.0%)	429,124 (100.0%)	414,118 (100.0%)	446,401 (100.0%)	500,577 (100.0%)
Per Capita Regional Product (M$) ..			1,214	778	615	660	540 (*500)

Source—Economic and Social Survey.

* Figures for the East region adjusted for closure of Rompin Mine.

3.2 PAHANG TENGGARA AS AN ECONOMIC REGION

While Malaysia is a regionalised economy[1], it is clear that Pahang Tenggara as such is not an *economic* region is a sense that is meaningful for economic analysis. It should be recognised that the borders of an economic region can change. Once the East-West highway is built, Kota Baharu may be more closely tied to Penang than to Kuantan, and "the East" would have to be redefined accordingly.

Analysis[1] indicates that the economic region of which Pahang Tenggara is a part is "the Kuantan region". However in relating the region to Kuantan a distinction should be made between two kinds of urban centres: true development poles, defined as aggregations of "propulsive industries" directed by dynamic innovating entrepreneurs, generating spread effects to an entire region; and "growth centres" which, while not themselves the basic source of economic expansion, are nonetheless strong reactors to "spread effects" to expand more rapidly, in terms of total population or of industrial employment, than the development pole itself.

It would seem to be obvious enough that Kuantan is a growth centre rather than a development pole. Since in Malaysia all major cities except Johor Baharu (suburb of Singapore) might be regarded as satellites of Kuala Lumpur, Kuantan is a dynamic, vigorously expanding provincial capital city; capable of becoming a city of 250,000 people by 1990. If it does, the chances for vigorous development of Pahang Tenggara will be enhanced with a spillover of branch plant activities to the urban centres envisaged for the region. Thus policies to attract footloose enterprises *away from* Kuantan in order to establish them within the region of Pahang Tenggara are not justified. It will be hard enough to get them to Kuantan on a scale that might convert Kuantan from a growth centre to a development pole in 20 years.

It might be argued that Malaysian policy should not be directed towards pulling footloose industries away from Kuala Lumpur until Kuala Lumpur's position as a development pole is assured, given the competition with Singapore. However, Kuala Lumpur's development is judged to have reached a point where some spillover can be expected, and policy might properly be directed towards overcoming barriers to the generation of spread effects to other parts of the country, and particularly to the east coast.

3.2.1 Alternative Strategies of Regional Development

There are of course possible alternative strategies of regional development. In terms of physical and present economic characteristics it is possible to divide Malaysia into three major regions: a northern, mountainous region with a "tongue" extending down the centre of the country to the west of Pahang Tenggara that has little potential other than forestry, recreation, and (in spots) mining; the West Coast region that is already highly developed; and a "region of opportunity" comprising the rest of the country, including most of Pahang and Johore, which has promising natural resources but is now thinly settled. The northern region is thinly settled and should remain so. The Penang-Kuala Lumpur-Johore Baharu axis is highly developed, thickly populated, and is likely to continue to progress economically under its own steam. A case can be made, therefore, for concentrating the governmental effort in the "region of opportunity".

Pahang Tenggara is the core of this "region of opportunity". If the accepted national strategy of regional development were to plan the development of this region as a unit, then from both an analytical and a policy point of view Pahang Tenggara should be treated as being tied economically to Johore and to the Southwest axis of development, rather than to "the East". Under this conditions Kuantan would cease to be the major growth centre and potential development pole of the region of which Pahang Tenggara is a part and a new urban centre of Pahang Tenggara would be a strong candidate for the role of growth-centre-ultimate-development pole. With this strategy, energetically and efficiently applied, the regional growth centre could replace Kuantan in the urban hierarchy of 1990. In theory, it could then be a city of 250,000 people, but it must be added that the site is not very suitable for a city that size. There are several dangers in this alternative strategy, dangers that would have to be eliminated or circumvented if the resulting pattern of regional development were to contribute to the stated goal of reducing racial disparities rather than aggravating them.

[1] Supporting Report "Economics of Development in Pahang Tenggara".

First, there would be a grave danger that the heavily Malay population on the northeast coast would be left stranded. To avoid this danger, it would be necessary either to empty this northeast region or to design development programmes for it, tailor-made for the needs and potentialities of this "fringe area". Second, this strategy could hardly avoid strengthening the existing urban centres on the Penang-Johore Baharu axis. In so doing it would automatically strengthen the existing economic and social structures of the cities in that axis. While immigrants into the region of opportunity could be Malay, the built-in opportunities for immigrants to move into high-level urban occupations, which is the core of our recommended strategy, would be lacking. Much would then depend on how the regional urban centre developed. To have favourable effects in terms of national unity, it would be necessary both to make a consolidated effort to create a dynamic and attractive city of some 250,000 people, and to see to it that the majority of high-level posts within that city were reserved somehow or another for Malays.

Such a strategy is not impossible but it would be more difficult to steer regional development so as to contribute to reducing gaps between Malays and non-Malays, than if development is pushed and pulled towards the East, with its heavy concentration of relatively poor Malays, by encouraging Kuantan as a growth centre and tying Pahang Tenggara to Kuantan rather than to the Penang-Johore Baharu axis. Since official statements also indicate a preference for reducing the gap between the East Coast and the West, rather than giving top priority to developing the "opportunity region" as such, the study has been guided by this concept of overall regional development strategy.

3.3 PAHANG TENGGARA 1990

A forecast of Malaysian population for 1990 indicates a total of 18 million or 15.4 million for West Malaysia. But how this population "should" be distributed geographically depends on the whole set of economic and social variables in the model of development. Thus with a West Malaysian population of 15.4 million and a labour force of 5.2 million in 1990 there might be 1.3 million in the primary sector, mostly farmers. How many of the projected 1.3 million workers in the primary sector might properly be employed in Pahang Tenggara in 1990?

Soils analysis and agronomic studies, indicate that of the 2,485,000 acres in the region some 1,148,000 are suitable for agriculture of one kind or another. In order to take advantage of the most efficient management available, and to make full use of technological advances in agriculture, so as to maintain per capita average, acres per worker must increase to an average of at least 12 by 1990. To this figure must be added a margin of at least 20% to allow for roads, communication lines, town sites, and small pockets of unusable land within the agricultural areas, giving approximately 15 acres per agricultural worker. There might then be some 80,000 agricultural workers plus perhaps 5,000 in forestry, and another 5,000 in mining and fishing, giving a total of 90,000 in the primary sector.

This figure is clearly subject to a large number of possible errors. Detailed soil surveys of the rest of the region may increase or decrease the area of land suitable for agriculture. Estimation of employment in mining is peculiarly subject to uncertainty. However, the errors are likely to be self cancelling. When setting such broad targets it appears reasonable to think of about 90,000 primary workers by 1990, while recognising that this figure may well be 5-10,000 above or below that actually attained.

Given the stated goals of modernisation, urbanisation, industrialisation and reduction of regional gaps, the targets set for Pahang Tenggara would imply that at least half of the labour force should be employed outside the primary sector in 1990. (Referring to "targets", not of what the multiplier might actually be with alternative patterns of development).

Study demographic projections suggest that in 1990, given the age and sex composition of the population, rising levels of education, etc. the labour force participation rate will be 1:2.7. That is, the total population will be 2.7 times the labour force. Thus the target (50% of the labour force engaged in resource-based activities, 50% in manufacturing and services) would result in a total labour force of 180,000 and a total population of 485,000.

A more acceptable figure might be 60% of the labour force in the secondary and tertiary sectors. That would mean that Pahang Tenggara would be on the margin between a "developed" and an "under-developed" region in present day global terms and have a population of 610,000. However, the 50:50 ratio is closer to what is likely to happen without a specific policy of attracting to the region "footloose" enterprises not tied to resources, energy, or local markets.

The Government of Malaysia is giving relatively high priority for employment-creation in the next five years, with income becoming about equally important in the Third Malaysia Plan period and top priority in subsequent Plan periods.

The masterplan for Pahang Tenggara, therefore, could properly give considerable weight to employment-creation during the first five or even ten years, provided:

(*a*) it is at a reasonably high level of productivity, and

(*b*) it does not result in an economy and a society which is "locked in" to a continuing pattern of development which would prevent incomes from rising as fast as in the country as a whole, and which would present obstacles to the absorption of increasing proportions of the labour force, particularly of Malays, into the modern sector.

The development of Pahang Tenggara with proper planning of education and training, and with attractive urban centres within the region, should be able to ensure proportionate participation of Malays in the modern sector, provided there is a modern sector to participate in.[1]

The essential requirement of the masterplan for Pahang Tenggara, therefore, is that it contributes to the solution of the employment problem over the next five to ten years by providing employment opportunities on the land; but that the pattern of development be flexible enough to permit structural change and technological progress thereafter, so that per capita income in the region (while starting from a somewhat lower base than the country as a whole) may nonetheless grow as fast as the national average. The pattern of development should also create a society that can attract and hold educated Malaysians, and particularly educated Malays. Finally, it should provide opportunities for all Malaysians, but especially Malays, to acquire the entrepreneurial, managerial, scientific and technical skills needed for employment in the modern sector, and should open up employment opportunities in the modern sector.

1 Working Paper No. 56 "The Potential For Malay Participation in the Development of Pahang Tenggara".

4.0 REGIONAL DEVELOPMENT

4.1 THE RESTRAINTS

There are two major categories of restraints which limit the freedom of choice of the Malaysian Government in allocating the available land in Pahang Tenggara: physical and legal. The legal restraints consist of existing agreements or alienations of land, most of which are allocated to specific land uses. The physical restraints consist of quality of soils, topography (particularly steep land and land subject to flooding) and characteristics of the terrain affecting transport costs, which are particularly important in the case of forestry-complexes.

4.1.1 Physical Restraints

Of the region's 2,485,000 acres, 592,000 acres have been found to be unsuitable for either agriculture or forestry given present technology. In addition there are some 165,000 acres of land which are not suitable for agriculture or forestry which are recommended to become park and conservation areas. There are also some 200,000 acres of peat swamp and 70,000 acres of steepland which have some future logging potential but no agricultural potential. Thus under present technology less than 1.5 million acres can be regarded as "productive".

Some half a million acres over and above the permanently wet areas (partially accounted for in the previous paragraph) were flooded in January 1971.

Of the 1.5 million usable acres, perhaps 700,000 consist of Class I and Class II soils. However, because of the way this land is distributed and the need to allow for roads, town sites, etc., only 550,000 might be regarded as usable for agriculture. This acreage may be regarded as the amount of land effectively available for oil palm and diversified agriculture. The prospective rates of return on Class III and IV soils are so low that they cannot be seriously considered for oil palm.

4.1.2 Legal Restraints

About 500,000 acres are already alienated or assigned to specific uses. These include the following:

(*a*) 143,000 acres are alienated to FLDA.

(*b*) 142,900 acres alienated to nucleus estates, all of which are allocated to oil palm.

(*c*) 60,700 acres alienated to the Ladang Pegawai, of which it is expected that 39,000 acres will be put under oil palm and 16,000 acres under rubber, the remainder left in forest.

(*d*) 19,700 acres assigned to the Mentiga forestry complex which will not revert to agriculture.

(*e*) About 145,000 acres assigned through miscellaneous Malay, and other reserves and Royal alienations.

4.1.3 Existing Development

Table 4.1a presents figures for agricultural land uses in 1966. At that time less than 40,000 acres were under cultivation, with rubber accounting for nearly half the total. Mixed gardening was second in importance. However, in terms of recent development, rates of clearing and planting oil palm was of much greater importance, as Table 4.1b shows. In early 1972 the acres alienated for oil palm were more than six times the total agricultural acreage in 1966, and the acreage already planted to oil palm was about three quarters the total acreage under cultivation in 1966.

Table 4.1a—Calculation of 1966 Land Use in Pahang Tenggara—Acres

	Pekan District	Pekan District North of S. Pahang (−) Subtract	Part of Temerloh District (+) Add	In Project Area
LAND USE:				
1. Building	1,406	309	54	1,150
2. Mining and quarrying	760	77	—	683
3. Mixed horticulture	6,137	2,172	1,113	5,078
4. Market gardening	4	—	—	4
5. Rubber	30,789	21,499	9,696	18,986
6. Coconut	4,252	642	50	3,678
7. Sago	34	31	—	3
8. Fish ponds	6	—	—	6
9. Orchards	27	—	—	27
10. Wet Padi	6,916	4,331	2,380	4,965
11. Diversified crops	320	12	—	308
12. Shifting cultivation	2,865	49	722	3,538

Table 4.1b—Estimated Oil Palm Development 1970

Site	Alienated	Cleared	Planted
Kemayan Area[1] ...	30,000	15,000	14,000
FLDA Bera Scheme ...	20,000	9,000	5,600
Keratong Basin ...	190,000	9,500	5,000
Mentiga Rectangle ...	24,600	—	—
Total ...	264,600	33,500	25,600

4.2 ALTERNATIVE STRATEGIES

To simultaneously consider all aspects of the development in the context of the social and economic policies of the government was impractical. Accordingly, in order to simplify work in this phase, the Study found it useful to consider what the course of development might be if individual aspects of the government policy had priority in the development programme i.e. if different "concepts" of development were followed.

Each "concept" was designed as a hypothetical regional development plan whose parts were selected by giving an over-riding emphasis to one aspect of government policy. Three alternatives were compared on this basis:

(*a*) EMPLOYMENT: To maximise employment opportunities in the region and particularly their contribution toward opportunities for Malays.

(*b*) INCOME: To maximise the growth of per capita income over the planning period while at the same time improving its distribution particularly as between Malays and non-Malays.

(*c*) TRANSITION: To maximise the diversification of opportunities in both income and employment. This concept examines the role of industrialisation and urbanisation within the region in providing such diversification and particularly methods of ensuring Malay participation in all aspects of the social and economic community.

To assess the impact of any development on the ecology of the region, a fourth concept was generated to examine the consequence of giving over-riding emphasis to this consideration. Although "ecology" does not express a goal

[1] Nucleus Estates.

comparable with the other policies it was included in the initial examination because otherwise this aspect could not be examined at a regional level, only for its constraints at a project level.

(*d*) ECOLOGY: To maximise development of the region which is complimentary to good environmental management and conservation. This concept examines both the direct and indirect consequences of individual activities on the natural equilibrium of the region.

To facilitate the cross referencing and retrieval of data and the evaluation of the masterplan through systematic consideration and reconsideration of the basic elements of the plan, the study designed what is called the "Regional Model". The term "model" is used to describe the total assembly of inter-related information resulting from individual projects, and their relationships with each other. It should be emphasised that the use of the model is complementary to and not competitive with purely economic techniques by providing a reference framework for assessing the implication of economic adjustments on other parts of the masterplan. The techniques used in this comparison are not discussed in detail since they are standard and involve the use of flexible priority formula to permit giving major weight to each of the four concepts in turn, and comparing the resulting pattern of programmes of development.

Alternative concepts, however, are not mutually exclusive and most activities occur in more than one concept. Thus, no one of these four alternative concepts could itself be selected as a masterplan.

The following is a brief[1] summary of the main features of this comparison which was performed in two stages (between January and June 1971). The matrix Fig. 4.2a indicates both the assumptions and the detailed aspects of development which were compared in each alternative.

The primary activities of Agriculture and Forestry were systematically examined as shown in Figures 4.2b and 4.2c to determine which operation was best suited to the objectives of the alternative concepts. In each case the chosen system was plotted from the resource through processing to record the statistical basis of the plan and to permit re-appraisal of decisions as field information and analysis became available. The other activities necessary to complete the economic spectrum and permit comparison were adapted from developed regions of West Malaysia. A major and intended, side effect of the exercise is to focus attention on weakness in data availability. The land use of the mature region was "mapped" in order to obtain realistic infrastructure estimates related to the settlement distribution pattern suggested by each concept. The differences in land use pattern which emerged from the "mapping" of each concept are shown in Figures 4.2d, e & f.

The "employment concept" resulted in a maximum area being cleared for agriculture assumed to be 1.6 million acres with allowance for sago proving feasible on organic clay and muck soils (fig. 4.2*d*). A heavy emphasis was given to rubber planting with no sustained yield forestry. This concept was statistically divided into 'high" and "low" employment to reflect the range implied between modern and traditional agricultural management.

The "income concept" land use (fig. 4.2e) was markedly different from that of employment reflecting the assumption that individual worker incomes in forestry were substantially higher than those likely to prevail in agriculture. Thus agricultural land use was limited to areas either subjected to "pre-study" commitment or presumed to have good soils on which the forest resource had already been depleted. The remaining agriculture had heavy emphasis on oil palm and diversified crops. Again it was assumed that sago would prove to be feasible on soils otherwise unsuitable for forestry or agriculture. Agricultural land use was assumed to be 1.0 million acres with .6 million acres in forestry production.

The "transition concept" provided the opposite landuse to that of "employment" in as much as forestry uses encompassed all land suitable for forestry which was not already committed to agriculture[1] (fig. 4.2f). This pattern reflected the over-riding emphasis given to diversity in the choice of jobs and a preference for jobs which facilitated the acquisition of skills (forestry preferred). Thus upward mobility in the employment hierarchy was paramount and the settlement and infrastructure of this regional plan were

[1] Working Paper No. 21 "Regional Model Rough Cut IB" April, 1971.
Working Paper No. 38 (and Appendicies I & II) "Regional Model Cut 2" August, 1971.

[1] therefore "sago land" was still shown as agricultural production.

designed to present "non-resource based" employment to settlers to the greatest degree considered practical. Acreages were 1.1 million and .5 million respectively for forestry and agriculture.

A significant feature which emerged during the study of the phasing of each concept was the time taken for each development to reach "maturity".[2] The employment concepts (*see* Table 4.2) required 25 years whereas the transition concept took only 13 years. The reason is immediately apparent from the population estimates.

[2] taken as the point in time when the last agricultural crop to be planted in the development program, could be harvested.

Table 4.2—Population and Employment at Maturity ('000)

	N (High)		N (Low)		Y		T	
Year of maturity ..	25		25		20		13	
Total population ..	585.1		344.7		350.6		248.1	
Total employment ..	245.1		144.9		140.3		107.6	
Workers/non-workers—								
Primary employ. ..	147.8	60.3%	87.4	60.3%	54.7	39.0%	26.9	25.0%
Manufacturing ..	18.6	7.6	11.0	7.6	16.3	11.6	16.6	15.4
Construction ..	5.9	2.4	3.5	2.4	7.2	5.1	5.3	4.9
Commerce	22.5	9.2	13.3	9.2	18.4	13.1	17.8	16.5
Utilities	1.7	0.7	1.0	0.7	1.8	1.3	1.7	1.6
Transportation ..	6.4	2.6	3.8	2.6	7.4	5.3	7.2	6.7
Services	39.9	16.2	23.5	16.2	32.5	23.2	31.3	29.1
Mining and Quarrying	2.0	0.8	1.2	0.8	1.5	1.0	0.9	0.8

The growth of employment provides probably the most revealing aspect of pursuing individual government objectives as shown in Fig. 4.2g. All concepts produce similar results through the first 8 years (i.e., until 1980), indeed the employment concept did NOT provide the most employment during that period! It is necessary to examine the composition of employment by concept to determine the true implication of an employment, income or transition policy in Pahang Tenggara.[1]

In drawing conclusions as to which alternative strategies are available in the final masterplan it is essential to amend the actual numbers shown in this section to those which *subsequently* resulted from fieldwork and further investigations. Although no changes resulted in the relative positions of alternative concepts, there were significant overall reductions.

[1] Supporting Report—"Economics of Development in Pahang Tenggara".

4.3 LANDUSE DEVELOPMENT ALTERNATIVES

Three fundamental options remain open for the usable land in the development of Pahang Tenggara:

(*a*) Maximise the amount of land planted to rubber, with the secondary processing, services, and urbanisation appropriate to this strategy.

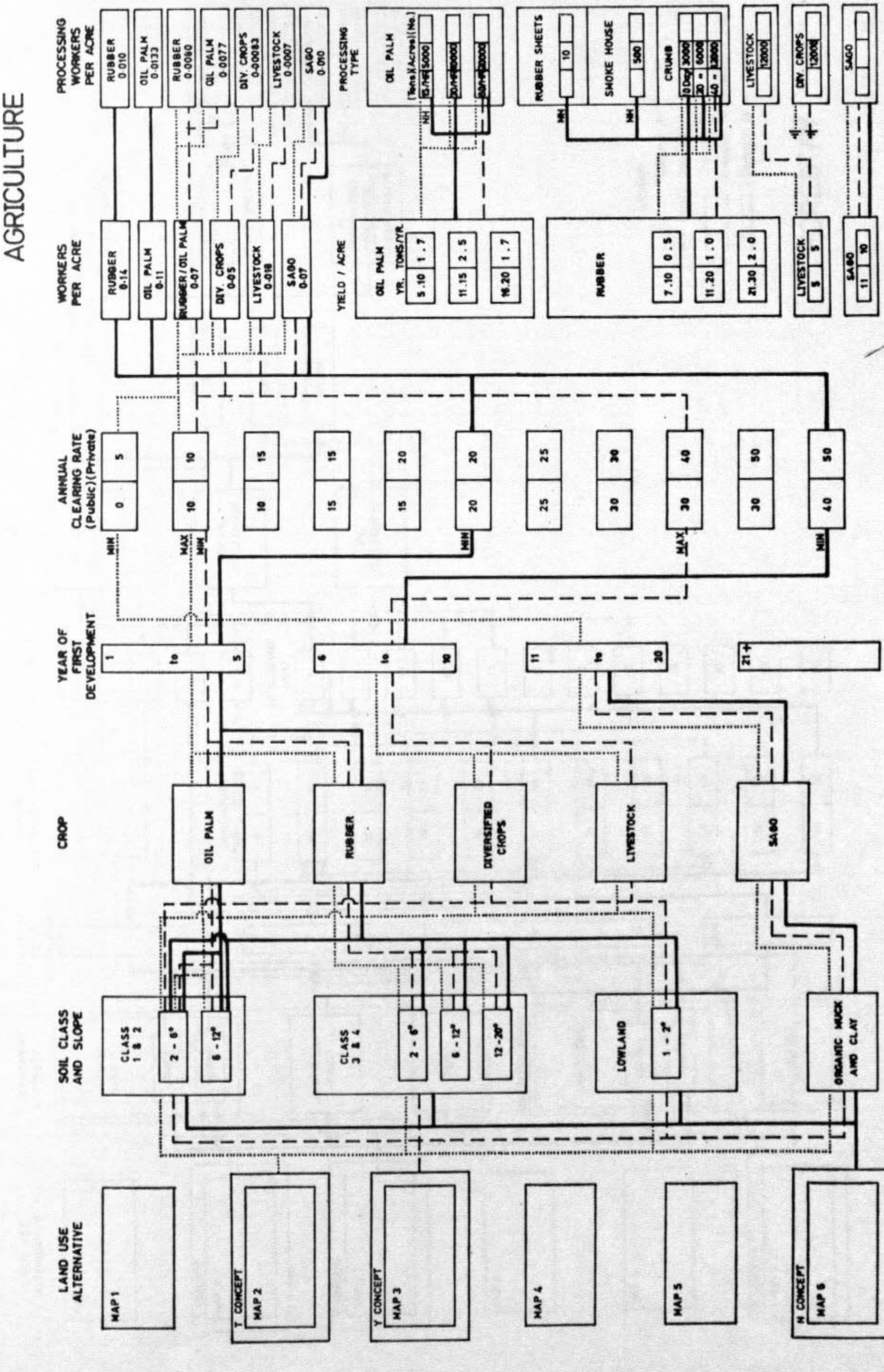
(*b*) Maximise the amount of land planted to oil palm, with the secondary processing, services, and urbanisation appropriate to this strategy.

(*c*) Maximise the amount of land devoted to support of forestry-wood-products complexes, with the secondary, services, and urbanisation appropriate to this strategy.

Fig. 4.2a

REGIONAL MODEL
INFORMATION MATRIX
MAP
SOCIO-ECONOMIC PLAN
EMPLOYMENT
SOCIAL
ORGANIZA-TION.
PHYSICAL PLAN
OPERATIONAL PLAN
COST
CONSTRAINTS
PHASING
BASE CONDITIONS
AREA RECONCILIATION
EXISTING CULTIVATION
EXISTING POPULATION
LAND USE ALTERNATIVES
AREA ALTERNATIVES 1-6
UTILIZATION ALTERNATIVES (AGRIC — FORESTRY)
PRIMARY ACTIVITY SECTORS
AGRICULTURE
CROP SELECTION
LAND CLEARING/PLANTING
PRODUCTION
PRIMARY PROCESSING
FORESTRY
INVENTORY
EXTRACTION
UTILIZATION
OTHER ACTIVITY SECTORS
ANALOGY ASSUMPTIONS
MINING
RECREATION
PUBLIC SERVICES
INFRASTRUCTURE
PRIVATE SERVICES
OTHER MANUFACTURING
CONSTRUCTION
SUMMARY TOTALS
ASSUMPTIONS
MAP DELINEATION OF AREA OF ACTIVITY
SOCIO ECONOMIC
EMPLOYMENT: WORKERS/UNIT, INCOME, LEVEL OF SKILL
SOCIAL: TOTAL POPULATION, AGE / SEX, FAMILY SIZE, WORKERS/ FAMILY, NATURAL INCREASE, IMMIGRATION
ORGANIZATION: BUSINESS STRUCTURE, LAND TENURE, MANAGEMENT.
PHYSICAL
TRANSPORT: ORIGIN, DESTINATION, MODE COST/ TON MILE, VOLUME.
PHYSICAL PLANT: SIZE, NUMBER, LOCATION, UTILITY REQUIRENENTS
OPERATIONAL
COST: CAPITAL COST, CONSTRUCTION COST, COST/JOB CREATED
CONSTRAINTS: PHYSICAL - SLOPE, FLOODING ETC; CAPABILITY - CLEARING, FINANCING, MANAGEMENT ETC.
PHASING: RESEARCH, TIME, YIELD TIME, PEAK PRIMARY EMPLOYMENT, LAND DEVELOPMENT SEQUENCE, PHYSICAL PLANT PHASING

Fig. 4.2b


AGRICULTURE
LAND USE ALTERNATIVE
SOIL CLASS AND SLOPE
CROP
YEAR OF FIRST DEVELOPMENT
ANNUAL CLEARING RATE (Public) (Private)
WORKERS PER ACRE
PROCESSING WORKERS PER ACRE
PROCESSING TYPE
YIELD / ACRE
MAP 1
T CONCEPT
MAP 2
Y CONCEPT
MAP 3
MAP 4
MAP 5
N CONCEPT
MAP 6
CLASS 1 & 2
2 - 6°
6 - 12°
CLASS 3 & 4
2 - 6°
6 - 12°
12 - 20°
LOWLAND
1 - 2°
ORGANIC MUCK AND CLAY
OIL PALM
RUBBER
DIVERSIFIED CROPS
LIVESTOCK
SAGO
1 to 5
6 to 10
11 to 20
21 +
RUBBER 0.14
OIL PALM 0.11
RUBBER / OIL PALM 0.07
DIV. CROPS 0.05
LIVESTOCK 0.018
SAGO 0.07
RUBBER 0.010
OIL PALM 0.0133
RUBBER 0.0080
OIL PALM 0.0077
DIV. CROPS 0.00083
LIVESTOCK 0.0007
SAGO 0.010
RUBBER SHEETS
SMOKE HOUSE
CRUMB
MIN
MAX

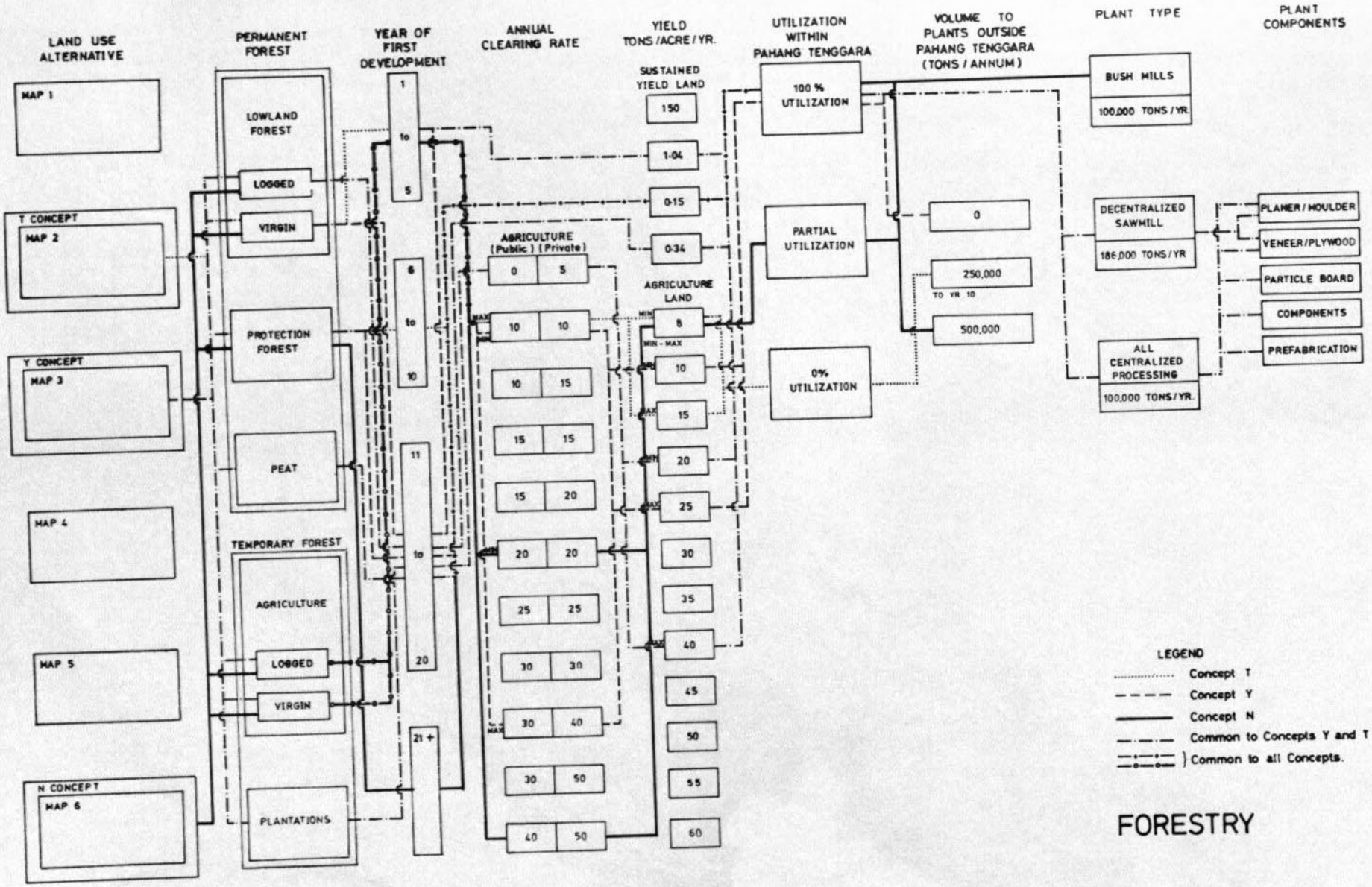
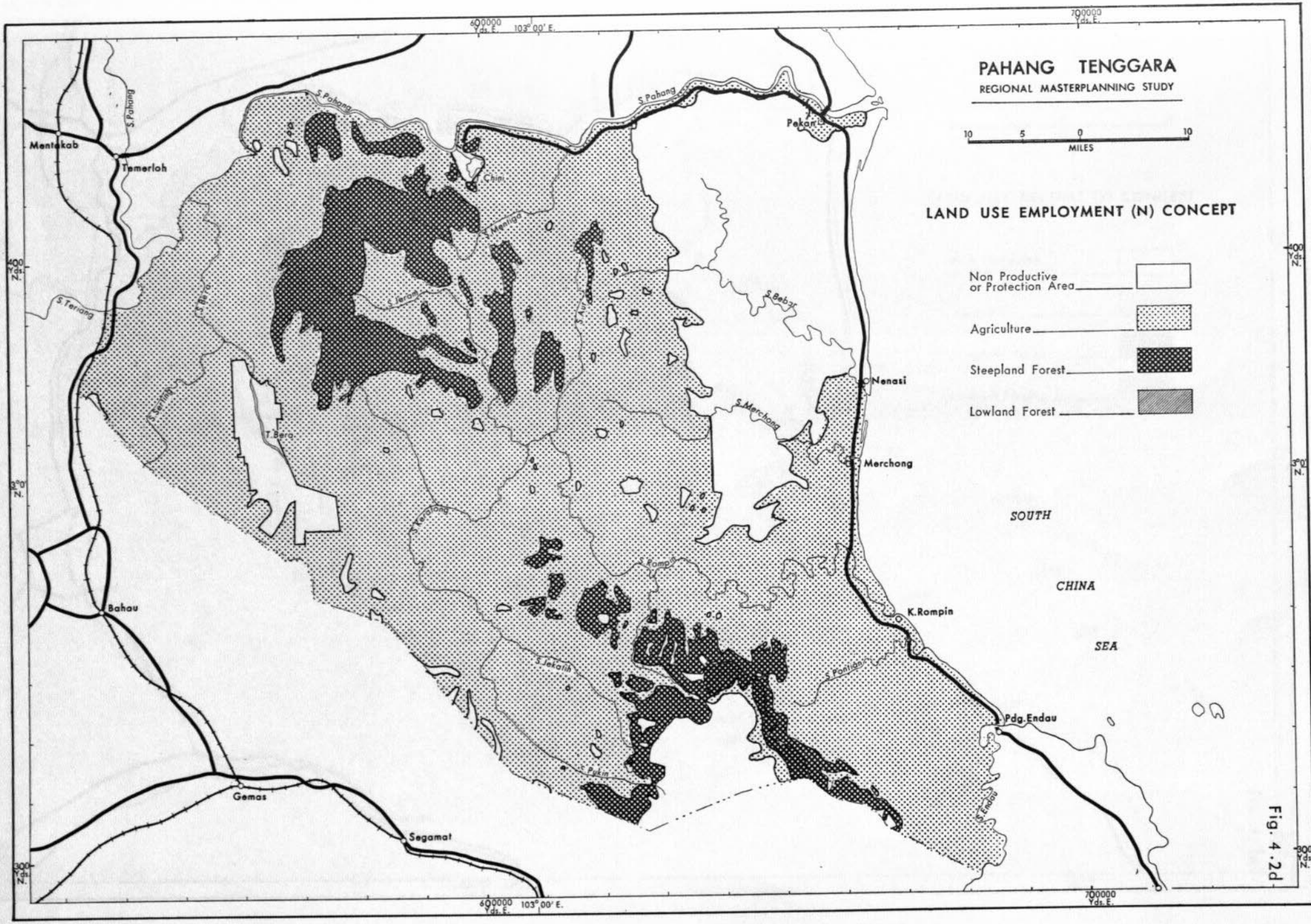

LAND USE ALTERNATIVE
PERMANENT FOREST
YEAR OF FIRST DEVELOPMENT
ANNUAL CLEARING RATE
YIELD TONS/ACRE/YR.
UTILIZATION WITHIN PAHANG TENGGARA
VOLUME TO PLANTS OUTSIDE PAHANG TENGGARA (TONS/ANNUM)
PLANT TYPE
PLANT COMPONENTS
MAP 1
T CONCEPT
MAP 2
Y CONCEPT
MAP 3
MAP 4
MAP 5
N CONCEPT
MAP 6
LOWLAND FOREST
LOGGED
VIRGIN
PROTECTION FOREST
PEAT
TEMPORARY FOREST
AGRICULTURE
LOGGED
VIRGIN
PLANTATIONS
1 to 5
6 to 10
11 to 20
21 +
AGRICULTURE (Public) (Private)
0 5
10 10
10 15
15 15
15 20
20 20
25 25
30 30
30 40
30 50
40 50
SUSTAINED YIELD LAND
150
1·04
0·15
0·34
AGRICULTURE LAND
MIN 8
MIN - MAX 10
15
20
25
30
35
40
45
50
55
60
100 % UTILIZATION
PARTIAL UTILIZATION
0% UTILIZATION
0
250,000
TO YR 10
500,000
BUSH MILLS
100,000 TONS/YR.
DECENTRALIZED SAWMILL
186,000 TONS/YR
ALL CENTRALIZED PROCESSING
100,000 TONS/YR.
PLANER/MOULDER
VENEER/PLYWOOD
PARTICLE BOARD
COMPONENTS
PREFABRICATION
LEGEND
Concept T
Concept Y
Concept N
Common to Concepts Y and T
Common to all Concepts.
FORESTRY

Fig. 4.2c


PAHANG TENGGARA
REGIONAL MASTERPLANNING STUDY
10 5 0 10
MILES
LAND USE EMPLOYMENT (N) CONCEPT
Non Productive or Protection Area
Agriculture
Steepland Forest
Lowland Forest
600000 Yds. E. 103° 00' E.
700000 Yds. E.
400 Yds. N.
300 Yds. N.
Mentekab
Temerloh
Pekan
Nenasi
Merchong
K.Rompin
Pdg.Endau
Bahau
Gemas
Segamat
Chini
T.Berg
SOUTH
CHINA
SEA
S.Pahang
S.Terriang
S.Merchong
S.Rompin
S.Jekatih
S.Endau
S.Pontian
S.Pukin
Fig. 4 - 2d

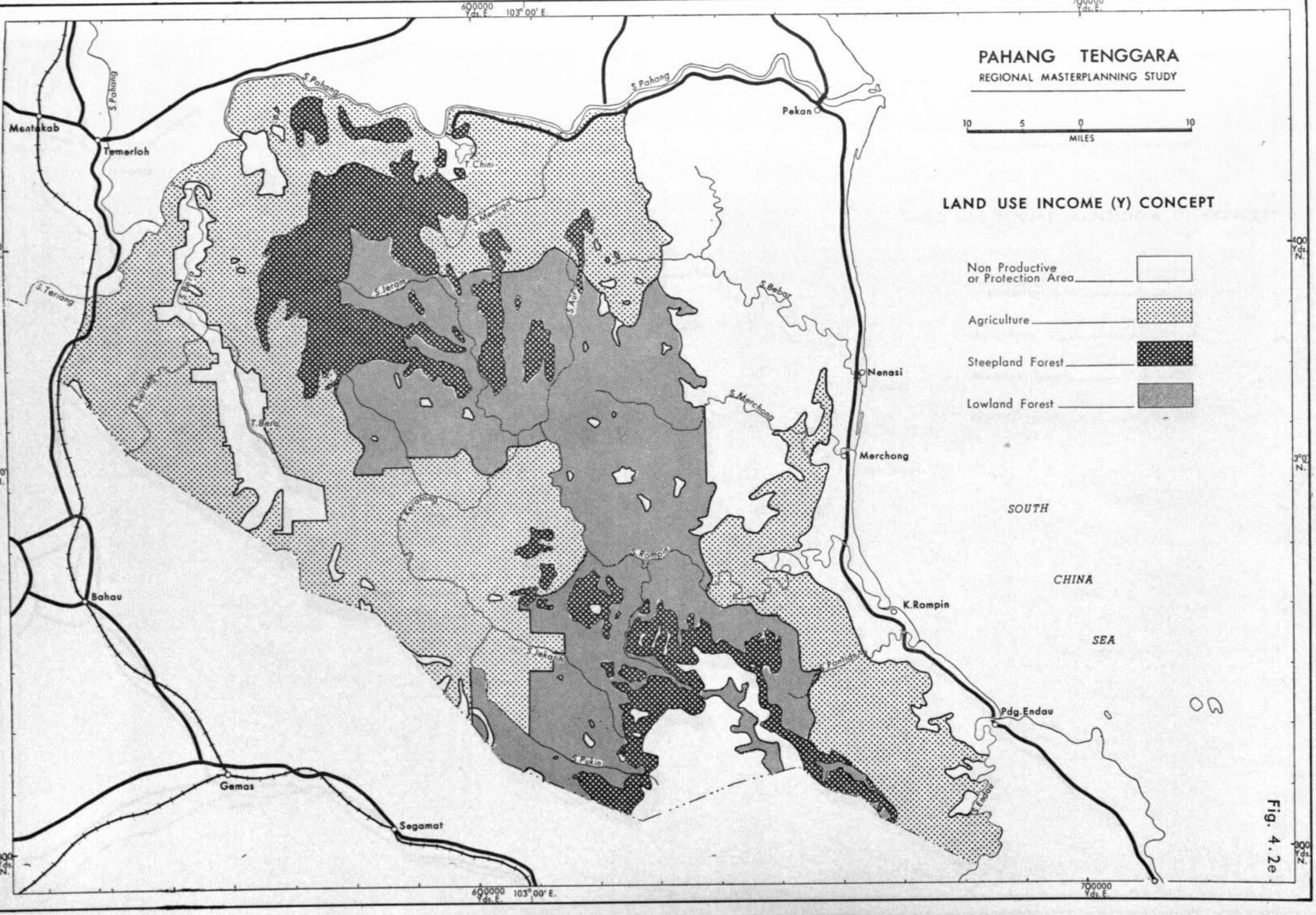

PAHANG TENGGARA
REGIONAL MASTERPLANNING STUDY
10 5 0 10
MILES
LAND USE INCOME (Y) CONCEPT
Non Productive or Protection Area
Agriculture
Steepland Forest
Lowland Forest
SOUTH
CHINA
SEA
Mentakab
Temerloh
Bahau
Gemas
Segamat
Pekan
Nenasi
Merchong
K.Rompin
Pdg.Endau
S.Pahang
S.Teriang
S.Serting
S.Bera
T.Bera
T.Chini
S.Jeram
S.Aur
S.Bebar
S.Merchong
S.Rompin
S.Jekatih
S.Pukin
S.Endau
600000 Yds.E. 103° 00' E.
700000 Yds.E.
400 Yds.N.
3°0' N.
300 Yds.N.

Fig. 4.2e

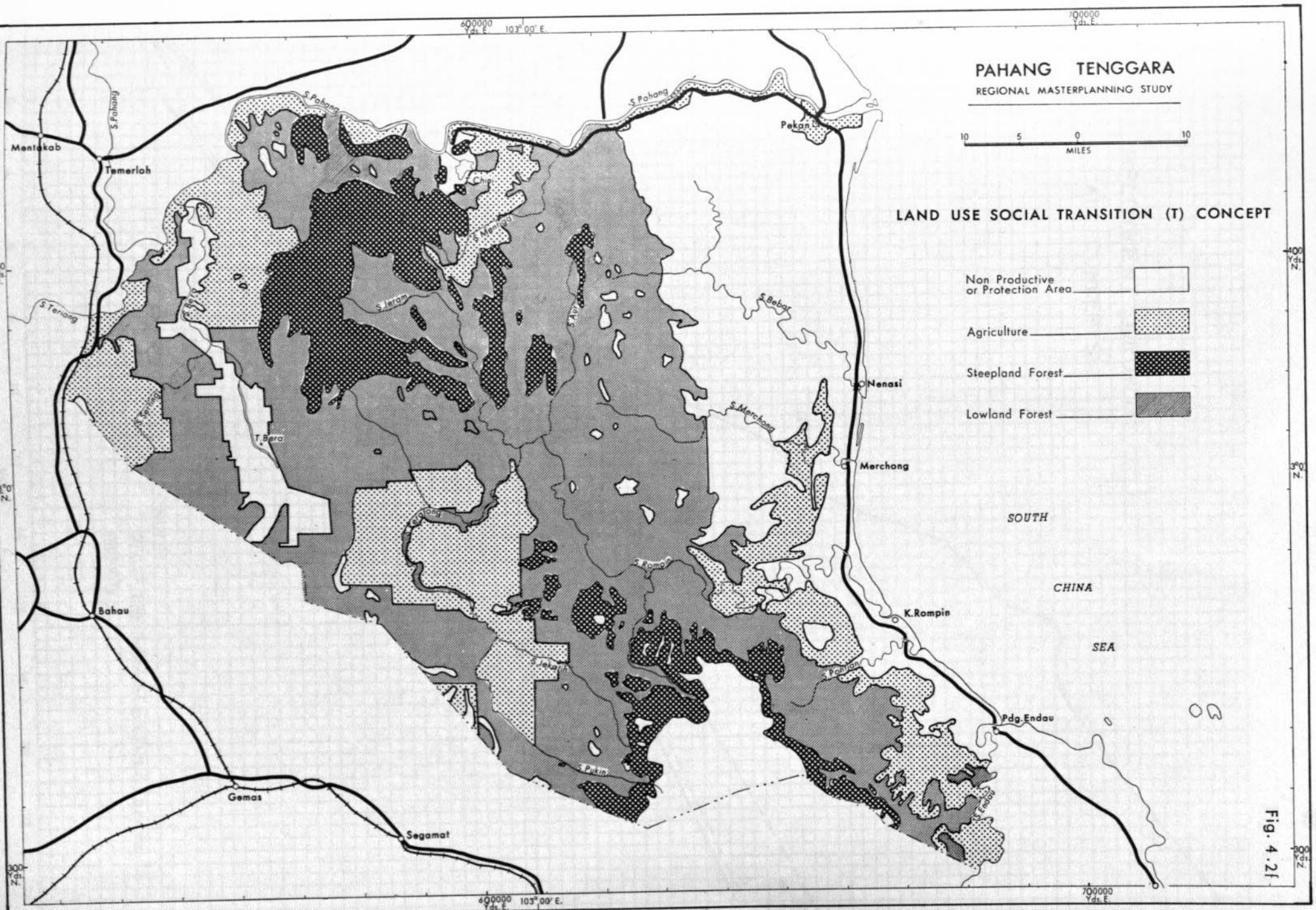
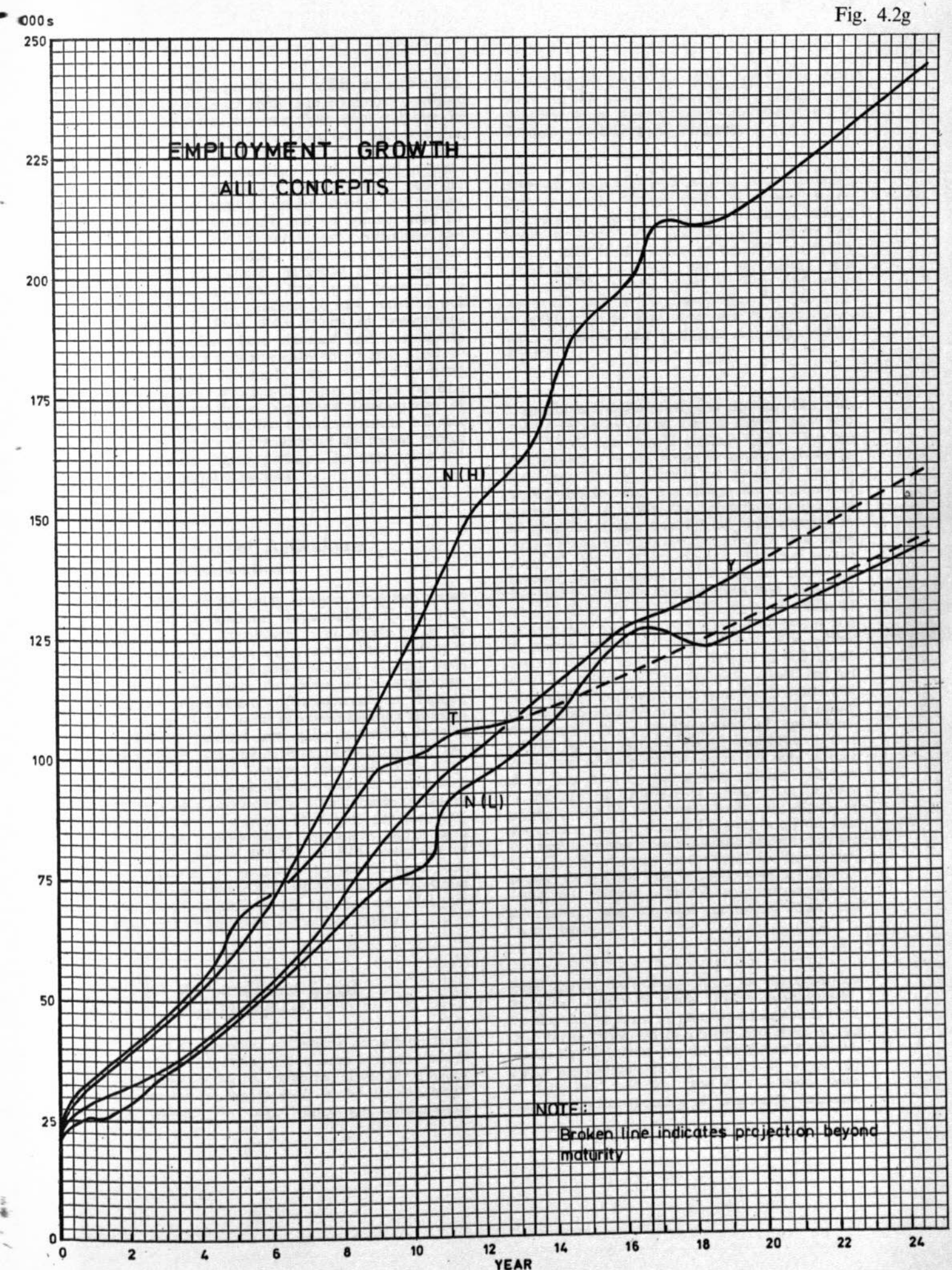

PAHANG TENGGARA
REGIONAL MASTERPLANNING STUDY
10 5 0 10
MILES
LAND USE SOCIAL TRANSITION (T) CONCEPT
Non Productive or Protection Area
Agriculture
Steepland Forest
Lowland Forest
SOUTH
CHINA
SEA
Mentakab
Temerloh
Pekan
Nenasi
Merchong
K.Rompin
Pdg.Endau
Bahau
Gemas
Segamat
S.Pahang
S.Teriang
S.Jeram
S.Bebar
S.Merchong
S.Rompin
S.Jekam
S.Pulai
S.Endau
T.Bera
600000 Yds.E. 103°00' E.
700000 Yds.E.
400 Yds.N.
300 Yds.N.
3°0' N.

Fig. 4.2f

Fig. 4.2g


000s
250
225
200
175
150
125
100
75
50
25
0
EMPLOYMENT GROWTH
ALL CONCEPTS
N(H)
Y
T
N(L)
NOTE :
Broken line indicates projection beyond maturity
0
2
4
6
8
10
12
14
16
18
20
22
24
YEAR

There are other possibilities within the region and there will be other significant economic activities within the region, however these other activities do not affect very much the basic land use strategies as was seen from the alternate concepts. For example, it is obvious that if rich mineral deposits are found they should be exploited; but the proportion of land devoted to mining uses in any one year will be small, and the mining must be done where the minerals are. Similarly, the masterplan includes recommendations for diversified agriculture, including cattle, poultry, tea, tapioca, sago, etc. Once again, however, the share of resources allocated to such activities will be small, at least until results of preliminary experiments have been obtained, and these efforts will not affect fundamentally the overall development strategy. No doubt there will also be some fishing activity which will engage a small fraction of the labour force. Significant development of tourism is expected, but this development will not compete for scarce resources of the region, except to a limited degree, perhaps, for entrepreneurial and managerial capacities.

4.3.1 Types of Agricultural Organisation

As a result of the study analysis, only two major types of agricultural organisation have been retained in calculating cost:effectiveness of alternative strategies and projects. One of these is mixed farming on a small-holders, self-help basis with ten acre units. As shown in the supporting report "Agricultural Development in Pahang Tenggara" some forms of mixed farming on small individual holdings seem quite promising, both in terms of income and in terms of employment. The other is efficiently managed farm units, on a large scale and with land:labour ratios consistent with high levels of productivity, both in terms of output per acre and in terms of output per manyear. Traditional smallholders' operations which rank at the bottom of the list of EPU estimates of value added per manyear by sector, have been excluded as inconsistent with the stated economic and social objectives of the Second Malaysia Plan and of the New Economic Policy.

4.3.2 Economic and Social Considerations

Table 4.3a presents a "macro cost-effectiveness matrix" which shows the various measures which have emerged for the valuation of the three major options for the development of the usable land of the region. The more important assumptions underlying the figures are presented in the footnotes to the table. More detailed figures are presented in the supporting report "Economics of Development in Pahang Tenggara".

However, interesting as it may be as an academic exercise to ask, "If the whole region were to be allocated to one of these three options, which would be best?" the question does not in fact present itself in this form. In the first place, the uncertainties involved are so great and so irreducible at this point in time that some degree of "hedging" is clearly called for. In so far as options can be kept open until more information is available, such "hedging" is clearly the best strategy.

It should be remembered that uncertainties with respect to prices are to a large degree built into the (COBE) cost/benefit analysis itself. Thus the likelihood of a breakthrough in synthetic rubber is translated into an impact on price of natural rubber, and in effect included in the estimates of internal rate of return and net present value. On the other hand the possibility of breakthrough in palm oil that would make it applicable to a wider range of uses and so improve its price is not included. Apart from this difference, there are two major variables for oil palm and three for rubber. With oil palm it is only a question of class of soils (which is not really a question) and of present versus experimental seed. For rubber there is a real question as to type of soil (since yields are lower on Class III and IV land but not disastrously lower as in the case of oil palm) and also a real question as to present versus future clones and as to reorganisation of operations. Finally there is the over-riding consideration that in the case of oil palm it is necessary only to wait about five years to start getting answers, whereas in the case of rubber it is seven years to start getting a product and fifteen before the results of stimulation can be tested. Thus all in all the risk attached to rubber is substantially greater than for oil palm. In moving from "best" to "probable" figures for internal rate of return and net present value, this difference in risk was introduced by subtracting one standard deviation from the "best" figure.

With respect to forestry there are uncertainties regarding sustained yield forest management, whether in the form of plantations or the limited long range management system proposed in the masterplan (at least on an experimental basis). There are possibilities but also doubts where use of steep land and peat land is concerned. With forestry too the accuracy of long range estimates

is vulnerable and closely tied to the future marketing outlook, particularly for new varieties of trees. Some of these uncertainties will be reduced in the next five years, some may disappear in ten. If irrevocable decisions that might misallocate land in future can be avoided without misallocation land now, then these decisions should certainly be postponed.

Table 4.3a—Macro Cost-Effectiveness Matrix

	INTERNAL RATE OF RETURN			NET PRESENT VALUE			VALUE ADDED YEAR 20			EMPLOYMENT (PER 1,000 ACRES YR 10)		
	Worst	Best	Probable	Worst	Best	Probable	Worst	Best	Probable	Worst	Best	Probable
Oil Palm ..	8.3[1]	17.0[2]	15%[3]	−$186	$1,103	$686	$7,024[8]	$9,552[9]	$8,500[10]	60[13]	67[14]	65[15]
Rubber ..	10.4[4]	16.0[5]	13.0[6]	$69	$1,287	$511[7]	$5,461	$8,590[11]	$7,000[12]	96[16]	146[17]	146[18]
Forestry ..	30.0[19]	34.5[20]	32			$677[20]			$30,711[21]			8

[1] Class III soils; present high-yield seeds.

[2] Experimental seed.

[3] Best minus 1 standard deviation.

[4] Present clones, no stimulant, limited soils.

[5] Experimental clones, best soils, stimulants.

[6] As in "3". With limited soils, new clones, stimulants, IRR = 14.3% ± 2.5.

[7] As in "3". With limited soils, new clones, stimulants, NPV = $854 ± 608.

[8] Present varieties.

[9] Present varieties, new methods.

[10] Average.

[11] With mechanization, stimulated present clones, best soils.

[12] Average.

[13] Present varieties.

[14] Future varieties.

[15] Guess.

[16] Present clones new techniques, Class 1 @ 2 soils.

[17] Present methods, present clones, limited soils.

[18] Employment year 5:

	Worst	*Best*	*Probable*
Oil Palms	84	92	96
Rubber	36	66	60

[19] Bukit Ibam. Forest Complex (proposed).

[20] Lesong. Forest Complex (proposed).

[21] Lesong, $18,675 at year 10, assumed increase of 5.1% per year.

However, the relative position of forestry complexes is more clearcut. It would seem that forestry offers opportunities for rates of return well above the other two options, for net present values per acre that are roughly comparable to the other two, for value added per manyear several times as high, and for employment-creation that is a small fraction of the employment potential in rubber and oil palm. Thus the choice between forestry and the other options depends on the relative weight attached to employment on the one hand and to income on the other.

4.4 URBAN DEVELOPMENT

In section 2.2 it is shown that by 1990 the West Malaysia should have a target of 25% of employment to be in agriculture with industrial and service employment each in the range of 35% to 40% of the total.

This target also implies that at least three quarters of the population or some 11 million people will be living in urban centres of more than 5,000 population by that year. Although it is relatively easy to substantiate how Pahang Tenggara's share of the national agricultural population can be justified, the region's "claim" to a share of the urban centres of the nation is not so evident.

The general economic analysis has shown that, for the incomes levels in Pahang Tenggara to stay close to the national average by 1990 it will be necessary to attain "regional" economy with an overall 50:50 ratio between resource and non-resource based employment. To achieve this ambitious target and to meet the broad objectives of the New Economic Policy it is necessary to adopt a policy of settlement and infrastructure within which the greatest benefits could be eventually derived in providing non-resource based employment.

Malaysia might be said to have a "normal" urban structure. Indeed the urban hierarchy seems to be moving towards a closer and closer approximation to the "rank-size rule". In its simplest form this "rule" states that the population of any city tends to be equal to the population of the largest city (sometimes called the "primate" city) divided by the city's rank in size. Thus if metropolitan Kuala Lumpur, including Klang, Petaling Jaya and Jinjang, has a population of 720,000, then metropolitan Penang as the second city, should have 360,000, Ipoh as the third city could have 240,000, etc. As may be seen in Table 4.3b Malaysia's four largest cities and also her middle-sized cities, confirmed rather well to this rule in 1970. However, cities between 70 and 100,000, and less than 40,000 were smaller than "expected" according to the rank-size rule.

The 1990 targets shown in Table 4.3b are part projection and part recommendation. In effect, it is assumed that within the next few years the Government of Malaysia will opt for a genuine policy of regional development, with regional planning undertaken for true economic regions such as the East, and with reduction of regional disparities as a major objective for such a policy. Within such a policy of regional development, it is assumed that the Government will formulate a National Urban Policy, with encouragement to particular urban centres as growth centres and ultimate development poles for the retarded regions such as the East. In making the recommendations implicit in the Table 4.3b both the increasing rigidity of the urban hierarchy, and the vastly differing strength of individual urban centres as reflected in growth rates between 1957 and 1970 have been taken into account.

The presence of an existing urban hierarchy that is already rather rigid and becoming more so means that the urban centres in Pahang Tenggara, if they are to thrive as growth centres, must be linked to the existing urban structure. This subject is considered in detail in the supporting report "Settlement on Infrastructure in Pahang Tenggara".

4.5 RANKING OPTIONS

The conclusion of the foregoing sections could be generally stated as giving a choice of strategy for resource based developments throughout the masterplan, but until 1980 little choice in the strategy to be applied to the non-resource based program. In this regard the ranking of regional options is in reality limited to considerations discussed in 4.3 plus a fourth option to reflect the urban and regional strategies to the discussion above for comparative purposes: to maximise the forestry-complex role in development, and to introduce as well a system of incentives to attract footloose enterprises to the region. This option would be justified if it were felt that the employment and population densities resulting from the forestry option remained too low in terms of national objectives, perhaps in terms of national security, while income maximisation was given high priority in terms of reducing regional gaps.

Table 4.3b—Projected Urban Structure in 1990 and Actual Structure in 1970 (Pop'n in thousands)

City[1]	Population 1990	Rank	Population 1970	Rank	% Growth 1957-70
Kuala Lumpur	2,000	1	720	1	110
Penang	1,000	2	340	2	20
Ipoh	667	3	257	3	96
Johore Baharu	500	4	175[2]	4	81
Malacca	400	5	100	5	23
Seremban	333	6	90	6	53
Alor Star	286	7	86	7	25
Kuantan	250	8	43	14	89
Kuala Trengganu	222	9	59	10	82
Kota Baharu	200	10	70	9	44
Keluang	182	11	60[2]	15	38
Batu Pahat	167	12	70[2]	11	35
Muar	154	13	70[2]	8	56
Taiping	143	14	55	10	13
Sungei Patani	133	15	36	18	57
Telok Anson	125	16	45	13	20
Bukit Ridan[3]	118	17	—	—	—
Ayer Itam	111	18	26	20	14
Bentong	105	19	23	21	21
Sungei Siput	95	20	21	22	38
Temerloh-Mentakab	91	21	17	27	41
Dungun	87	22	17	26	39
Raub	83	23	18	24	20
Segamat	80	24	18	25	−4
TOTAL	6,700				

			GRAND TOTAL
+ 20 towns avg.	50,000 =	1,000	9,500
+ 40 towns avg.	20,000 =	800	
+ 80 towns avg.	10,000 =	800	
+160 towns avg.	5,000 =	800	

[1] Metropolitan regions where available.
[2] Data obtained from Johore Tenggara Study.
[3] Proposed Pahang Tenggara regional centre.

4.5.1 Criteria

The masterplan is designed to maximise the contribution of development of the region to the achievement of stated goals. In other words, the "cost: effectiveness" of the development of the region should be minimised, with effectiveness measured, not only in terms of the four variables set forth in Table 4.3a but also in terms of the impact on the socio-cultural environment and on the physical environment (ecological balance). These objectives cannot be reduced to a single measure of "benefits". Internal rate of return is one way of expressing "benefits" in terms of money returns to capital. Net present value per acre measures "benefits" in terms of money returns to capital. Net present value per acre measures benefits in terms of money returns to land. Value added per manyear is an approximation to "benefits" in terms of national income, also measured in money, but with no direct indication as to who receives this income. Employment is measured in manyears per thousand acres, and there is no way of translating these "benefits" into money terms; nor are there "shadow prices" for all categories of labour skills that would reflect the relative scarcity of abundance of each category. Finally, the contribution to socio-cultural objectives and to ecological balance can be ranked, but cannot be directly measured.

4.5.1.1 Profitability, Value Added and Social Welfare

Since Table 4.3a presents three measures of income, one of employment, and nothing else, a word of warning may be in order. A strategy, sector, or project that ranked high on all three income criteria and low on employment might seem better than one that ranked high on employment but low on all three income criteria. However, such is not at all the case, given the Government's stated objectives. Employment is on the whole ranked higher than income as an objective, especially during the Second and Third Malaysia Plans; and highest priority of all is accorded to social objectives, particularly Malay participation, which do not show in the table. Value added per manyear is only a rough approximation of income to settlers, or of farmers, or of workers. In using it as a proxy variable for per capita income (which in any case tells nothing about income distribution) it is being implicitly assumed that the proportion of income not transferred out of the region (ratio of Gross Regional Product to Gross Domestic Product of the region) is the same as for the country as a whole (ratio of Gross National Product to Gross Domestic Product). Considering the importance of resources supplied from outside the region, particularly capital and top management, this assumption may be overly optimistic. The other two "income" criteria are really measures of profitability. Maximising profits is not among the stated objectives of the New Economic Policy or of the Second Malaysia Plan.

If land is the scarce factor, of course, maximising net present value per acre will maximise contribution to national income; and if capital is the scarce factor, maximising returns to capital will maximise contribution to national income. If labour were the scarce factor, maximising value added per manyear would maximise contribution to national incomes. But these figures tell nothing about income distribution—particulary, in the case of Malaysia, the distribution between Malays and non-Malays which is the Government's main concern. The potential for Malay participation is set forth as a separate consideration.[1]

4.5.2 Impact on the Malaysian Economy

On the basis of the study analysis the major options are ranked in terms of their contribution to the stated objectives of Malaysian development. For convenience, the objectives of the Malaysian Government with respect to development of the region can be summarized under four headings: creating productive employment opportunities (N); accelerating the growth of per capita income (Y); contributing the socio-cultural change (modernisation, urbanisation, upgrading levels of skills, especially of Malays, etc.) (C); and protecting and where possible improving the physical environment (E). From the analysis presented above the following matrix tabulates each of the options (strategies) ranked as "A", "B", "C", or "D" in terms of each of the four objectives.

Strategies	Objectives			
	N	Y	C	E
Maximise rubber	B	D	D	C
Maximise oil palm	A	C	C	C
Maximise forestry	C	B	B	A
Maximise forestry plus incentives for manufacturing ...	D	A	A	B

1 Working Paper No. 56 "The Potential for Malay Participation in the Development of Pahang Tenggara."

There are, obviously, large elements of judgement involved in such rankings, and they are directly related to government policy. For example, the ranking in terms of employment depends on the weights attached to employment creation in each five-year period. The oil palm option has been ranked "A", because it does not lag far behind forestry in the first ten years and is well ahead of rubber; while at year twenty it is not far behind rubber and is well ahead of forestry, with or without the "technological advance" assumptions. A greater concentration on manufacturing as a source of employment would be likely to raise the capital: job ratio significantly.

Similarly, if it were clear that high rates of return in forestry were the result of exercise of manipulation so that wages were low and prices to consumer high, the rate of return could be ignored altogether and consideration only given to value added. How much significance is attached to rates of return, in comparison with other indicators of contribution to national goals, also depends a good deal on how "scarce" capital is considered to be—to the region, to the State, to the country—in comparison with other resources.

Unless employment is weighted heavily, it appears that, across the board, the "maximum-forestry option" is best. Why not recommend it? There are two reasons. First, the amount of employment generated is unsatisfactory. Second, to justify additional forestry-complexes, one needs to be very optimistic about access of available timber to processing centres, about discovery of an effective forest management system involving sustained yield forestry, plantations, and systematic recuperation of logged over land, about use of steep land and peat land, about acceptability of new species, about markets for forest products in general. In short, the risks are too great to justify the sharp curtailment of agricultural uses of available land implicit in this region. The other options are inadequate in terms of overall economic and social development. As stated above, a blend of the three is therefore inevitable.

This "blend" is represented in the Masterplan which is described in the following section. However it has been shown that significant variations can occur as a result of alternative strategies after the first phase of development by approximately 1980. At that time the major alternatives still remain:

(*a*) The use of Class III and IV land for agriculture[1] or forestry.

(*b*) To a lesser extent—the use of some more Class I land for diversified crops or beef rather than oil palm.

(*c*) If the urbanisation programme is lagging either

— to plan for out-migration during the second decade of workers seeking non-resource based employment;

— to change government policy to provide special incentives for business, institutions, etc. to locate in the region.

Both (*a*) and (*b*) are measurable in terms of land use and economic impact and are described as part of the Masterplan. However item (*c*) would have little impact in terms of land use and is more closely tied to the economic welfare of the development programme.

[1] Probably rubber but with the possibility that livestock (beef or dairy) production could prove profitable also.

5.0 THE MASTERPLAN

Pahang Tenggara can emerge from an underdeveloped and underpopulated region to a mature and balanced economy within the next twenty years. In the process it's population will increase ten fold with per capita incomes approximating the national average resulting from a complete range of employment within the region. Over 2 million acres of land will become productive or protective through agricultural, forestry and conservation programmes.

5.1 THE STATISTICAL PROGRAMME

Table 5.1a shows the acreage of various land uses for the total region. Fig. 5.1a (in wallet) maps the landuse plan of the fully developed region. Although the landuse plan shows the sequencial five-year plan agricultural development Fig. 5.1b specifically illustrates the relationship of agriculture, forestry and research programmes throughout the development period. Particular reference will be made in section 7 to the obvious decisions affecting landuse which must be made in 1980. It will be noted that almost exactly half of the gross area of Pahang Tenggara will have been "allocated" by 1980 and that of the remainder only one quarter is known to be productive under present technology. However the phasing of development is discussed in Sections 6 and 7 following.

Table 5.1b shows the progressive employment creation within the region indicating the changing relationship between autonomous[1] and induced jobs.

Table 5.1b—Employment Creation in Pahang Tenggara

	1975	1980	1985	1990
Autonomous[1] ...	35,000	61,800	68,400	82,000
Percentage ...	70	62	57	54
Induced	15,200	36,200	51,100	70,100
Percentage ...	30	38	43	46[2]
Total ...	50,200	98,000	119,500	152,100

1 Included in the autonomous category are all workers employed in agriculture, agriculture processing, logging, forestry processing, mining and tourism. Usage of the term "primary" to describe this group of workers may be misleading since workers engaged in some processing are included here.

2 The Regional ratio is actually 50:50 but since the West and North Sub-Region induced employment will be located outside Pahang Tenggara the result is a lower percentage.

Table 5.1a—Landuse Allocation in Pahang Tenggara

			Acres
1.	LAND ALLOCATED PRIOR TO COMMENCEMENT OF MASTERPLANNING STUDY:		
	—Malay Reserves	106,500	
	—Nucleus Estates	142,900	
	—F.L.D.A.	143,000	
	—Ladang Pegawai	60,700	
	—Western Boundary Fringe Area	22,000	
	—Royal Alienation	10,000	
	—Pekan Town	6,500	
	—State Land Scheme	4,200	
			495,800
2.	OTHER LAND RECOMMENDED FOR ALLOCATION, 1971 TO 1980:		
	—Agricultural Development	315,200	
	—Forestry Complexes—Bukit Ibam	120,000	
	Lesong	116,000	
	—Mentiga Forestry Concession—		
	Total	102,800	
	Less Land for Agriculture and Chini Reserve	82,900	
	Net	19,700	
	—Parks and Conservation Areas	165,200	
	—New Townsite	4,000	
			740,100
3.	LAND AVAILABLE FOR ALLOCATION AFTER 1980:		
	—Agricultural Development	313,000	
	—Peat Swamp with Logging Potential	200,000	
	—Lowland Forest not Allocated	36,600	
	—Steepland and Protective Forest not Included in Above Allocations (Part may be Suitable for Logging)	221,400	
			771,000
4.	LAND NOT RECOMMENDED FOR AGRICULTURE OR FORESTRY:		
	—Coastal Sands	79,600	
	—Permanent Swamp and other Low Areas not Allocated	398,500	
			478,100
5.	TOTAL LAND AREA OF PAHANG TENGGARA		2,485,000

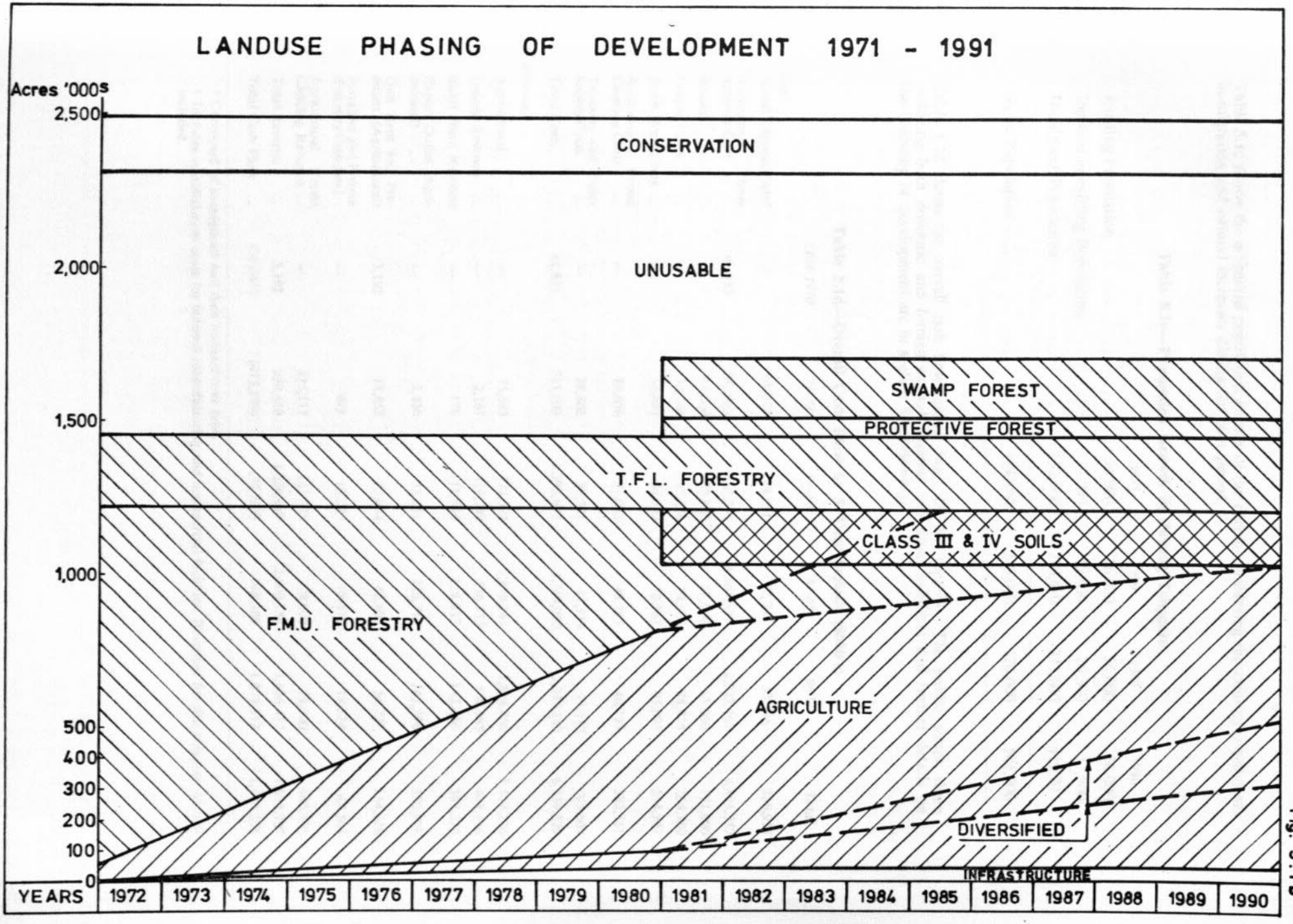

LANDUSE PHASING OF DEVELOPMENT 1971 - 1991
Acres '000s
2,500
2,000
1,500
1,000
500
400
300
200
100
0
CONSERVATION
UNUSABLE
SWAMP FOREST
PROTECTIVE FOREST
T.F.L. FORESTRY
CLASS III & IV SOILS
F.M.U. FORESTRY
AGRICULTURE
DIVERSIFIED
INFRASTRUCTURE
YEARS
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990

Fig. 5.1b

Table 5.1c shows the estimated population growth of the region considering the existing population, in-migration and natural increases during the plan period.

Table 5.1c—Population Growth in Pahang Tenggara

	1975	1980	1985	1990
Existing Population	56,000	56,000	56,000	56,000
Increase in existing Population	6,000	15,600	26,300	37,300
In-migrant Population[1]	132,800	276,400	337,600	411,70
Total Population	194,800	348,000	420,000	505,000

Table 5.1d shows the overall cash flow arising from all development. The public sector share including both domestic and foreign capital, Federal and State liabilities and further details on the financing of development are in section 5.6 following.

Table 5.1d—Overall Cash Flow by 5 Year Periods ($000's)

	1969-1970	*71-75*	*76-80*	*81-85*	*86-90*	*Total*
COSTS:						
Social Infrastructure[2]	—	61,073	69,551	52,765	53,546	236,935
Agricultural Development Cost ..	41,833	397,943	967,347	1,464,527	2,022,707	4,894,357
Roads	—	84,000	20,000	22,000	45,000	171,000
Lesong Costs ..	—	34,246	67,376	74,183	88,975	264,780
Bukit Ibam Costs ..	—	33,889	64,582	70,861	85,005	254,337
Agricultural Forest Clearing Costs ..	—	73,656	77,065	40,795	40,795	232,311
Telecom. and Water Supply Costs ..	—	28,802	27,771	17,919	11,117	85,609
Total Costs	41,833	713,609	1,293,692	1,743,050	2,347,145	6,139,329
REVENUE:						
Agricultural.. ..	—	75,693	777,301	1,879,381	2,814,859	5,547,234
Lesong Revenue ..	—	2,167	118,239	136,755	150,985	408,146
Bukit Ibam Revenue	—	176	111,646	129,037	142,466	383,325
Export Duties (Agricultural)	—	5,420	53,251	126,711	165,596	350,978
Quit Rent and Premium (Agricultural)	3,192	18,852	35,054	42,803	54,727	154,628
Royalties and Premia (Forestry Complex)	—	985	13,223	15,472	18,824	48,504
Agricultural Forest Clearing Revenue ..	—	135,117	147,775	79,000	79,000	440,892
Total Revenue ..	3,192	238,410	1,256,489	2,409,159	3,426,457	7,333,707
Total Cash Flow ..	(38,641)	(475,199)	(37,203)	666,109	1,079,312	1,194,378

[1] Composed of in-migrants and their increase over time.

[2] Includes establishment costs for induced manufacturing and commercial facilities. Revenues for this category are not included.

5.2 THE AGRICULTURAL PROGRAMME

Pahang Tenggara has several disadvantages compared with other areas of West Malaysia when considering its agricultural potential.

(*a*) There is a scarcity (i.e., low overall percentage) of known good soil.

(*b*) There is an absence of detailed climate information.

(*c*) There is an absence of experience (or research) in growing diversified crops locally.

The agricultural analysis is summarised in Section 13 of this report but the following statements help to underscore agricultural policies in the masterplan.

5.2.1 Agricultural Diversification

The recommendation of the study is to promote an immediate research programme in the region and to protect suitable soils until such time as research results and hydrological data are available to develop commercial projects in an optimum fashion. The research sub-station has already been started by MARDI.

Unfortunately the agricultural programme already committed to Pahang Tenggara could be described as a "maximum oil palm" strategy of development. Of 550,000 usable acres of *possible* Class I and II soils almost half have already been designated for oil palm. Within the area surveyed by the study only 281,700 acres of Class I and II soils are available for agricultural development of *any* kind and over half are committed to oil palm.

Under the circumstances it might be asked what portion of the national emphasis on crop diversification should be borne by Pahang Tenggara at a time when other areas of the west coast with known experience, soils and hydrological data are being replanted to oil palm and rubber. The Steering Committee asked for 15% of the total pre-1980 agricultural programme for Pahang Tenggara or some 75,000 acres to be given to a diversified programme. The study has been able to provide 14% of diversified crops without significantly limiting the future benefits to be derived from MARDI research as discussed further in 6.2 and Section 12 of this volume.

Since only 313,000 of agricultural land remain to be developed between 1980 and 1990 the overall diversification programme even in theory could not rise much above 20% of total regional agricultural acreage. To achieve that figure beef would have to displace rubber on the half of the area with Class III and IV soils and beef would have to be more profitable than forestry as discussed in Section 5.3. This and other long range prospects are discussed in Section 12 and the supporting report "Agricultural Development in Pahang Tenggara".

5.2.2 Production Agencies

Table 5.2 shows the production Agencies involved in implementing the programme to 1980. A discussion of the 8 types of agency is contained in Section 12.5 of this report. The two primary production agencies for developing rubber and oil palm are large estates and F.L.D.A. schemes. As presently organized, estates are estimated to give returns to land and capital about 1 to 2% higher than similar F.L.D.A. schemes. This is due primarily to the increased social infrastructure costs accruing to F.L.D.A. schemes because of their policy of relatively low initial acreages per settler family. Also oil palm planted in the next five years should yield a greater capital return than rubber planted during the same period. Thus, if the returns to capital objective is paramount, recommendations would favour oil palm on estates. On the other hand, F.L.D.A. schemes for oil palm are likely to achieve just as high returns to capital as rubber on estates during the next five years and will generate about the same employment opportunities.

Thus, a balance of the above objectives favours oil palm on F.L.D.A. schemes during the Second Malaysia Plan period. Also, the present land alienation pattern for the region includes a predominance of oil palm plantings and a heavy commitment for F.L.D.A. which fits in well with these objectives.

After 1975 the possible shifting of overall objectives to emphasize income and social mobility factors suggests an organizational structure which is flexible in terms of the numbers of workers employed and/or the number of settler families per given acreage of land. The cropping cycle in oil palm is such that there is significantly less labour required in the last 17 years. Therefore, in order to promote social mobility and higher per capita incomes it would appear desirable that

there be a marked reduction in workers and their families on oil palm schemes after year 10 from date of planting.

On estates, this mobility can be achieved by a reduction in the labour force and its dependents. The existing F.L.D.A. policy of paying compensation to settler families leaving after the initial period of development would be capable of achieving similar results if no ceiling were placed on the acres per settler family ratio. However, the Steering Committee has instructed that the maximum acreage per settler ratio that should apply in later years of F.L.D.A. schemes in 20. As a result it is projected that in certain settlements within the region where there is little induced employment, there will be considerable underemployment and unemployment in the later years of the scheme (*see* "Economics of Development in Pahang Tenggara").

Notwithstanding the above arguments the Steering Committee has specified that the proportion of F.L.D.A. development in the Third Malaysia Plan period should remain the same as that scheduled for the Second Malaysia Plan period.

The proposed organizational pattern is shown in Table 5.2. The pattern takes into account the present commitments and involvement in the region to F.L.D.A., private and nucleus estates, public estates and smallholders as well as the recommendations arising from analysis by the study. For the period up to the end of 1980, the recommended organizational structure is such that 37% of the agricultural land will be developed by the F.L.D.A. and 33% by large estates. For the period after 1980, it is suggested that joint venture, small estates and independent smallholder participation should increase with a corresponding reduction in F.L.D.A. and large estate participation.

Table 5.2—Proposed Agricultural Development in Pahang Tenggara—by Production Agency and Time Period

Agency	1971-75	1976-80	Total Net Crops Acres 1980	% of Regional Total 1980
F.L.D.A.	98,700	93,400	192,100	37
Joint Venture Estates ..	20,600	56,600	77,200	15
Public Estates	10,700	19,400	30,100	5
Private—				
Large Estates	102,600	69,200	171,800	33
Small Estates	—	13,900	13,900	3
Smallholdings	15,500	18,700	34,200	6
Sub-Total—Private	118,100	101,800	219,900	42
Other (MARDI, etc.) ..	2,200	—	2,200	1
TOTAL ..	250,300	271,200	521,500	100

5.3 THE FORESTRY PROGRAMME

Compared with agriculture, Pahang Tenggara would at first appear to have considerable advantages relative to other areas of west Malaysia when considering its forestry potential. Although this has proved to be true, the inventory results indicate that the once vast resources are being depleted at a rate equivalent to over 100,000 acres of virgin timber creamed EVERY YEAR. Of the 2.5 million acres it can generally be said that 1/3 is not usable under present technology, 1/3 is virgin forest and 1/3 has been cut over at least once or is under license for that purpose.

Pahang Tenggara embarked on a "maximum agriculture" strategy of development before the study began. The forests presently being logged are in areas presumed to have been destined for agricultural use. Although in most instances this assumption was correct the logging has resulted in numerous isolated pockets of virgin timber which are not large enough in themselves or close enough to others, to provide a resource for efficient use in integrated utilization industries.

The detailed forestry analysis is summarised in Section 13 of this report but the underlying policies can be reviewed here as they apply to the masterplan.

5.3.1 Integrated Forest Complexes

Wherever possible the study has designed integrated utilisation plants capable of producing a full range of timber products using an adjacent forest estate guarantying a minimum of 20 years economic life. Under the Malayan Uniform System of logging an area approximating 100,000 acres is required for this purpose and only two contiguous areas *of usable virgin* timber of this size remain in Pahang Tenggara. The Bukit Ibam Timber Company is already operating as a result of the study and the Lesong Forest Product Company is the subject of a detailed financial feasibility study for immediate implementation.

5.3.2 Sustained Yield

The study believes that with necessary research, it will be possible to extend the economic life of the two integrated complexes indefinately through the use of an intensive forest management system. Such a system is documented[1] and will be tested in the Lesong resource area and compared to natural regeneration within control cut blocks.

[1] Study Paper No. 11 "Intensive Forest Management System".

Further research through test silvicultural plantings is being carried out in the region. It is possible that this research could result in a sharp reduction in the acreage required to support the integrated complexes, or conversely that additional industries could be phased in. However no plantations will be commercially productive within the planning period of this study.

Dependant on the competitive position of forestry and agriculture on Class IV soils in 1980 it is possible the Mentiga forest products operation could be changed to harvesting in logged over areas on a sustained yield basis. It is possible that new soils surveys toward 1980 could yield further acreages of Class IV soils which, in the above, eventually could support *small* new industries on a sustained yield basis.

5.4 THE URBANISATION PROGRAMME

Table 5.4 summarises the growth of the "urban ladder" within Pahang Tenggara. By 1990 less than 7% of the settlements will be below 5,000 population and the regional centre will approximate 70,000 and still be growing.

Table 5.4—Urban Growth

	1975			1980			1985			1990		
	Town No.	Pop.	Pop. G. Tot.	Town No.	Pop.	Pop. G. Tot.	Town No.	Pop.	Pop. G. Tot.	Town No.	Pop.	Pop. G. Tot.
0- 4.9	16	47.29	34.26	9	21.67	7.44	8	24.89	6.84	9	29.41	6.56
5- 9.9	3	20.25	14.76	11	72.55	24.92	11	75.88	20.84	12	80.16	17.87
10-14.9	2	26.34	19.19	6	72.55	24.92	7	81.48	22.38	7	82.13	18.30
15-19.9	1	15.16	11.05	1	18.80	6.46	4	68.37	18.78	5	86.85	19.36
Over 20	1	28.22	20.56	3	105.66	36.28	3	113.56	31.19	5	170.23	37.94

All Population values are in thousands.

Total population[1] of towns 1 to 39 including F.L.D.A. settlement for the years:

1975 — 107,600
1980 — 215,900
1985 — 332,700
1990 — 392,000

[1] Includes all contract workers, and some existing population. *See* support report "Settlements and Infrastructure in Pahang Tenggara".

5.4.1 The Larger Centres

It has already been stated that the urban centres of Pahang Tenggara must be linked to the existing urban hierarchy of West Malaysia.

The study estimates that Bukit Ridan (tentative name for the major urban centre of Pahang Tenggara, located at the intersection of the existing Bukit Ibam-Rompin road and proposed North-South highway) could reach seventeenth place in Table 4.3b by 1990. In doing so it is assumed that policy will be directed towards encouraging the growth of Bukit Ridan as the major growth centre of Pahang Tenggara. It is also noted that the growth of cities which might be possible rivals for this position, such as Ayer Itam, Bentong, and Sungei Siput relatively slow during the past fifteen years, and that there is no good reason for encouraging their growth relative to that of Bukit Ridan. As it is, Ayer Itam and Bentong will need phenomenal growth to reach eighteenth and nineteenth position in 1990.

Pahang Tenggara's second major urban centre, tentatively named Lubok Baru, is not expected to rank among West Malaysia's first 25 towns by 1990. Its population is not expected to exceed 40,000. However, it is difficult to foretell what the interaction of Segamat and Pahang Tenggara's nearby south western centre might be. Segamat is likely to benefit from development both of Pahang Tenggara and of Johore, and as an already existing centre may benefit more from early development in Pahang Tenggara than Lubok Baru itself. Particularly since much of the early development will be in the south western portion of the region. Segamat also has the great advantage of being on both the railway and the main Kuala Lumpur-Singapore road.

However, from the start, Bukit Ridan should be recognised as the main regional centre. A conscious effort should be made to ensure that major regional institutions, such as the biggest hospital, educational institutions such as the first higher secondary school, regional post office, sub-district office and other government institutions are located in Bukit Ridan.[1] If any special projects are located in the region, such as one of the new science schools, it should also be located at Bukit Ridan. However, as the region population continues to grow, there will in many cases be more than one such government institution in the region. Lubok Baru, as the second largest town will be the logical place for the location for many second level facilities. If such a conscious effort is not made the result may well be that there will be no town in the region which can act as a real regional centre, with resulting inefficiency and loss of direction.

Some stress is given to this point because Lubok Baru is expected to initially have the larger population, although essentially an oil palm town, and for a year or two, better road connections outside the region. In the long run, Bukit Ridan will have the bigger hinterland in the region, greater range of diversified employment and better connections with the major growth pole at Kuantan and thus more able to tie the urban structure of Pahang Tenggara to the east.

5.4.2 The Smaller Centres

Both the eventual problem of insufficiency of natural-resource-related employment opportunities to absorb the growth of the labour force, and the more immediate problem, of uneven rates of job-creation in particular localities, can be more easily solved if most agricultural workers are living in fairly large and growing urban centres.

Study analysis has also indicated that there are net cost savings in concentrating population into fewer, intermediate sized settlements. It is simpler to establish a reasonable level of services in such centres which in turn will make them attractive to potential settlers to the region. It is also argued that a complete series of towns within the study region is a necessary element in the masterplan to afford upward mobility in employment to the population of Pahang Tenggara. The relationship between settlement size and manufacturing activity has been analysed and is referred to in the next section.

The manner in which the size and location of the smaller centres has been determined is described in some detail in the supporting report "Settlements and Infrastructure in Pahang Tenggara". The locations have been determined partly by employment creation directly and indirectly in each area, the need to keep travel time and travel costs within reasonable limits while taking advantage of the economies of scale of larger settlements, and partly by the physical characteristics of the terrain. The result is an internal urban hierarchy declining from the major growth

[1] *See* supporting report "Settlements and Infrastructure in Pahang Tenggara".

centre at Bukit Ridan, with less important ties to Lubok Baru, Segamat, Rompin, etc., and with a strong Bukit Ridan-Kuantan axis so as to contribute to and benefit from the expansion of Kuantan as a growth centre and its ultimate emergence as a development pole.

5.5 INDUSTRY IN PAHANG TENGGARA

The term "programme" has not been used because of the special conditions prevailing in Pahang Tenggara during the initial period in which the study is providing a detailed plan. Given that the region is virtually empty to begin with, the opening up and settlement of it will be essentially a frontier type activity.

In these circumstances, the nature of activities will be predominantly developmental for at least the first 5 years, with emphasis on clearing and planting of land, construction of infrastructure, and initial settlement of people. The main urban centre that is visualized for the region is expected to have a population in 1975 that would still be under 15,000 and, although there will be a number of other centres, they will be predominantly rural-oriented to begin with.

Evidently, then the region cannot be considered to have major advantages as a location for manufacturing activities; indeed the converse will be more generally the case, at least until enough time has elapsed for sizeable numbers of people to settle in the area provide a local market and labour force, and for the establishment of good internal and external communications.

Apart from the resource based projects the construction industry with its related product manufacture is likely to be the only "automatic" industry in the region until population concentrations have reached certain levels. The traditional levels at which manufacturing activity can be expected are discussed in detail in the supporting report "The Economic of Development in Pahang Tenggara".[1]

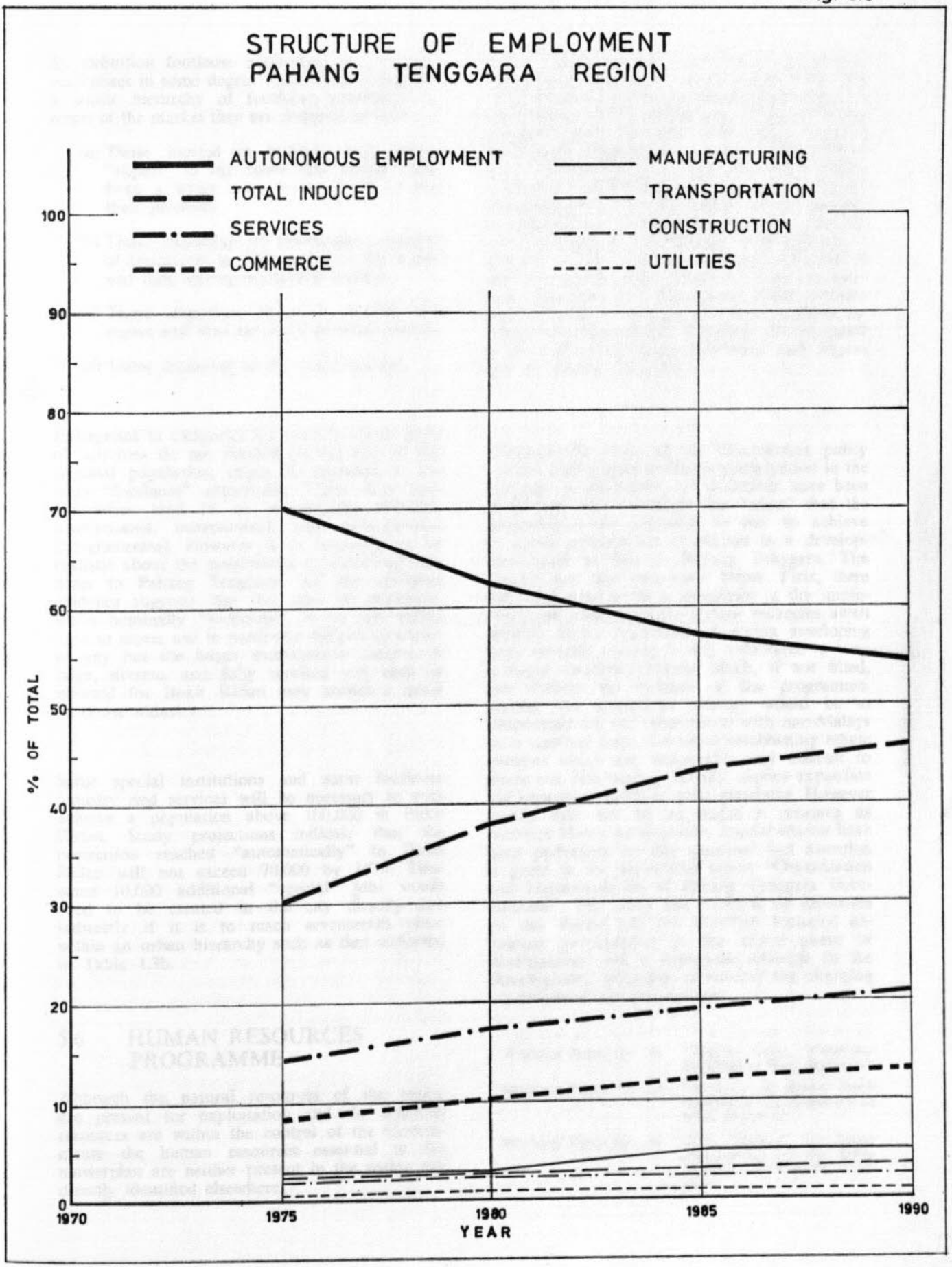
[1] Also Working Paper No. 39, "Town Sizes and Thresholds for Manufacturing Activities in West Malaysia".

The number and variety of enterprises that can be attracted to the region depends mainly on the size of cities in the region. The average number of manufacturing activities ranges from 10 for cities of less than 5,000 population, through 25 for cities of 15,000 to 29,999, and 61 for cities of 50,000 to 89,999 to 98 for cities over 90,000. Moreover, the scale of operation of manufacturing activities that are present tends to increase with the size of city, and the market becomes broader. The processing becomes more complex and more technologically advanced as cities grow, providing more opportunities for acquisition of skills. Wage rates tend to be higher. The share of resource-based manufacturing employment as a proportion of total manufacturing employment falls from 63% for cities under 5,000 population to 12% for cities of more than 90,000 people. When cities reach 10,000 population there are possibilities of attracting soft-drink manufactures, tobacco products, and footwear. At 15,000 medicinals and pharmaceuticals enter the picture. At 30,000 there is some motor vehicle assembly and some electrical goods. Petroleum refining appears only in cities of more than 50,000 population, and petroleum products only in cities over 90,000. The "activity profile" of a city of 50,000 to 80,999 can be reasonable sophisticated, the activity profile of a city of more than 90,000 considerably more so. Fig. 5.5 shows the growth of various employment categories which are expected in Pahang Tenggara throughout the development period as they relate to the overall percentage of total regional employment.

5.5.1 Footloose Industries

Once all the usable land is settled, there will be only a short time lag (while manufacturing and services respond to most recent immigration) before the demand for labour based directly and indirectly on exploitation of natural resources will stop growing altogether. If at this point unemployment and/or net emigration from the region are to be avoided, it will be necessary at that time to attract to the region some enterprises which are to some degree "footloose" (not tied to natural resources, energy, or local markets) such as high-level services and manufacturing enterprises drawing most of their resources from outside the region and serving a market broader than the region. Such enterprises are necessary also in order to produce the "style" of society, offering a wide range of employment opportunities and of sparetime activities, with possibilities for both children and adults to improve their knowledge and skills and change their way of life, which has been described above.

Fig. 5.5


STRUCTURE OF EMPLOYMENT
PAHANG TENGGARA REGION
AUTONOMOUS EMPLOYMENT
TOTAL INDUCED
SERVICES
COMMERCE
MANUFACTURING
TRANSPORTATION
CONSTRUCTION
UTILITIES
% OF TOTAL
100
90
80
70
60
50
40
30
20
10
0
1970
1975
1980
1985
1990
YEAR

By definition footloose enterprises are "export" enterprises in some degree. One might distinguish a whole hierarchy of footloose enterprises in terms of the market they are designed to serve:

(*a*) Those located in market towns which "export" in the sense that people come from a wider area to the town to buy their products.

(*b*) Those exporting to wholesalers, retailers of processors in other towns in the region and thus serving a regional market.

(*c*) Those exporting to cities outside the region and thus serving a national market.

(*d*) Those exporting to the world market.

Enterprises in categories (*c*) and (*d*), whose scale of activities do not depend on the size of the regional population, might be regarded as the truly "footloose" enterprises. These days such enterprises tend to be scientifically oriented, sophisticated, international, and multi-product (conglomerate). However it is necessary to be realistic about the possibilities of attracting such firms to Pahang Tenggara. All the available evidence suggests that this type of enterprise, while nominally "footloose", is in fact rather hard to move, and in particular difficult to attract to any but the larger metropolitan centres. A large, diverse, and fully serviced city such as planned for Bukit Ridan may attract a quasi footloose industry.

Some special institutions and some footloose industry and services will be necessary to ever achieve a population above 100,000 in Bukit Ridan. Study projections indicate that the population reached "automatically" in Bukit Ridan will not exceed 70,000 by 1990. Thus some 10,000 additional "special" jobs would need to be created in the city directly and indirectly if it is to reach seventeenth place within an urban hierarchy such as that indicated in Table 4.3b.

5.6 HUMAN RESOURCES PROGRAMME

Although the natural resources of the region are present for exploitation and the financial resources are within the control of the Governments—the human resources essential to the masterplan are neither present in the region nor directly identified elsewhere.

Over 235,000 in-migrants are required in various skill categories, most of them before 1985. The policy of the Government is to recruit settlers on a voluntary basis and in this respect Pahang Tenggara must compete with other regional development programmes over the country. There is no systematic policy of directing specific employment opportunities in one region toward the population of another region. As the number of programmes necessitating migration increase over the years it will become more difficult to speculate on the origins and age-sex structure of new immigrants. Unless such statistics are carefully monitored and adjustments made, services such as health, education, may have resulting inefficiencies. The origins of settlers are discussed in the supporting report "Sociology and Migration in Pahang Tenggara".

Although the intent of the Government policy is clear with respect to Malay participation in the economy of the region, no guidelines have been established which indicate the "price" that the governments are prepared to pay to achieve an equal participation of Malays in a development such as that in Pahang Tenggara. The "price" can take two main forms. First, there may well have to be a slowdown in the implementation schedule while certain vacancies await suitable Malay candidates. A region developing from virtually nothing is very vulnerable to even a single *essential* vacancy which, if not filled, can destroy the balance of the programme. Second, the alternative strategy would be to temporarily fill the vacancy(ies) with non-Malays on a contract basis. To avoid establishing ethnic patterns which are undesirable and difficult to phase out, this strategy usually implies expatriate participation—which is more expensive. However money may not be as scarce a resource as qualified Malay participation. Special studies have been performed on this question[1] and attention is given in the supporting report "Organization and Implementation of Pahang Tenggara Development". The study has received no directives on this matter and has therefore included expatriate participation in the initial phase of development, and a manpower division in the Development Authority to monitor the changing conditions of the programme.

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[1] Working Paper No. 27 "Higher Level Manpower Situation in West Malaysia".

Working Paper No. 30 "A Note on Malay Participation in the Economy of West Malaysia".

Working Paper No. 56 "The Potential for Malay Participation in the Development of Pahang Tenggara".

The supporting report "Sociology and Migration in Pahang Tenggara" discusses the likely ethnic composition of in-migrants to be 65% Malay, 24% Chinese and 11% Indian during the development period. However these percentages do not take into account any control of settlers implied in the previous paragraph.

5.7 MACRO COST BENEFIT

5.7.1 Returns to the Economy

In evaluating the economic impact of developing the Pahang Tenggara region on the national economy, no attempt has been made to calculate so-called accounting or shadow prices for various factor inputs and for outputs[1]. In the macro cost-benefit analysis therefore the plan has been evaluated using current and projected market prices. All transfer payments such as land premia, quit rent and export infrastructure costs necessary for the development of the region have been included. Not included on the grounds that expenditure would have to be made elsewhere in the economy regardless of whether or not Pahang Tenggara was developed, are costs for social services such as health facilities, schools, fire, police and postal services and religious facilities. Because an increase in the level of services over and above that usually supplied in Malaysia has been recommended for telecommunications and water supply these costs have been included in the macro cost-benefit.

As a basis for calculating the rate of return to the economy the overall cash flow for the region was developed. This is shown in Table 5.1d by Malaysia Plan periods. It includes all revenues from the sale of agricultural and forestry products and export duties and land charges. All infrastructure establishment costs as well as the agricultural and forestry establishment and operating costs are included. The region develops a positive cash flow early in the 1980's. Up to that time a net cash outflow of $551 million has occurred. By the year 1990 the region is projected to accumulate a positive flow of $1,194 million.

[1] Calculations have shown that a premium on foreign exchange of between 3 and 6% might be applicable. However, it was concluded that because of the aggregated nature of the data used and the crudeness of the technique that the results were not significant. Similarly an analysis of the market for unskilled labour in Pahang State and macro employment trends reveals that the application of a shadow wage would not have much merit.

After netting out from the cash flow the cost of social infrastructure facilities referred to above the rate of return to development of the region was found to be 11.8% over the planning horizon to 1990. If the opportunity cost of capital in Malaysia is assumed to be 10% the development of the Region is therefore economic on these grounds.

The sensitivity of the recommended development plan to changes in the price of major outputs was tested by increasing and decreasing revenues from oil palm sales, rubber sales, and forestry sales by 10%. The plan is relatively sensitive to changes in the price of palm oil and palm kernels, as the rate of return to the development increased to 14.2% when palm oil revenues were increased by 10% and decreased to 9.1% when such revenues were decreased by 10%[1].

When rubber revenues were changed by the same percentages the rates of return were 12.1% and 11.4% respectively. Forestry revenues are more significant for the viability of the region than rubber as the rates of return are 12.8% and 10.7% under the same assumptions as compared to the best estimate of 11.8%.

The calculations understate the rate of return to development of the region. This is primarily due to the fact that, for planning purposes, the time horizon has been limited to the year 1990. It should be recognized that net revenues will continue to accrue to the development well beyond this point in time.

Elsewhere in this volume it is suggested that the Government will face a major choice in development of the region around the year 1980. The choice is essentially one of reallocating some of the as yet developed agricultural land to forestry. If this choice were made in favour of the forestry option both the revenue and cost side of the cash flow would be altered by a reduction in agriculture costs and revenues and an increase in the forestry costs and revenues. Infrastructure costs would also change in 1980-1990.

With the necessary adjustments the rate of return to development of the region increases to 12.4%, .6% above the best estimate for the recommended plan. Net revenues are increased $159 million over the recommended plan. The net employment

[1] Revenues were taken to include export duties.

effect of choosing the forestry option is negative when compared to the recommended plan as it is projected that employment would decline by 11,800 during the period. Quantitative and qualitative aspects of the decrease in employment are discussed in the supporting report "Settlements and Infrastructure in Pahang Tenggara".

5.7.2 Government Revenues

Significant amounts of revenue will accrue to both the State and Federal Governments as a result of the development of the Pahang Tenggara region. The major sources of revenue are quit rent and land premia resulting from agricultural development, royalties and premia resulting from forestry operations and export duties on sales of rubber and oil palm grown in the region. Corporation taxes will be paid by the major forestry complexes in the region. All of these items are quantifiable and are shown by category in Table 5.1d in each Malaysian Plan period. Revenues in addition to these detailed in Table 5.7a could be expected from income taxes, corporation taxes from the induced manufacturing and estates which are expected to establish in the region and from import duties collected on some imported factor inputs. No attempt has been made to quantify these additional revenues.

Of the total estimated revenues of $716 million 66% or $474.5 million will accrue to the Federal Government and the remaining $241.3 million to the State Government. By far the most significant item, accounting for 49% of total Government revenues, is the export duties collected by the Federal Government on the sale of oil palm and rubber grown in the region. Also of significance is the $151.4 million to be collected by the State Government in the form of land rent and premia from the recommended pattern of agricultural development. Of the total estimated Government revenues 29.8% or $213.5 million accrue as a result the exploration of the region's forest resource and $502.4 or 71% because of recommended agricultural development.

Table 5.7a—Estimate of State and Federal Government Revenues by Malaysian Plan Period (000's)

STATE REVENUES	*1971-1975*	*1976-1980*	*1981-1985*	*1986-1990*	*Total*	*% of Total*
Agricultural Quit Rent and Premia	18,851.85	35,054.55	42,802.87	54,727.36	151,436.63	21.2%
Royalties and Premia from Forestry Complexes	984.6	13,222.62	15,472.44	18,824.27	48,503.93	6.8%
Royalties and Premia from Logging for Agricultural Clearing ..	17,124.0	21,405.0	1,425.0	1,425.0	41,379.0	5.8%
Total State Revenues ..	36,960.45	69,682.17	59,700.31	74,976.63	241,319.56	(33.8%)
FEDERAL REVENUES:						
Export Duties on Agricultural Products	5,419.69	53,251.82	126,711.1	165,595.97	350,978.58	49%
Corporation Taxes from Forestry Complexes	—	29,008.8	45,588.6	49,023.0	123,620.40	17.3%
Total Federal Revenue ..	5,419.69	82,266.62	172,299.7	214.618.97	474,598.98	(66.3%)
TOTAL GOVERNMENT REVENUES ..	42,380.14	151,942.79	232,000.0	289,595.6	715,918.54	

5.7.3 Foreign Exchange Implications of the Masterplan

To determine the total effect on Malaysia's balance of payments position of development of the Pahang Tenggara region would be a task of some magnitude and of questionable validity. Indirect effects such as purchases by consumers of the region, purchases of foreign goods by suppliers of factor inputs into the region's primary and induced activities are almost impossible to quantify. Therefore only the direct foreign exchange effects of the masterplan will be considered. Foreign exchange revenues will accrue from the sale of agricultural and forestry products of the region. Total foreign exchange revenues to total $5,730,705,720 over the period 1972-1990[1]. Of this amount oil palm sales are estimated to be $3,683,267,450 or 64% of the total. Rubber sales are estimated to be $703,247,540 or 12% of the total. Sales of processed timber are expected to be $474,882,540 over the same period representing 8% of the total foreign exchange revenues[2]. Foreign sales of tapioca and sago pellets and revenues accruing from export sales of the so-called composite crops will add another $518,330,410 to the foreign exchange earnings of the region or 9% of the total.

Foreign exchange outflows will be incurred primarily from the result of purchases of processing equipment and equipment for utilities and infrastructure components. Total estimated purchases in this regard are $240,860,190, the major component being processing equipment for oil palm and rubber in the amount of $94,654,490. The equipment and foreign expertise for the forestry complexes will require expenditure in the amount of $37,936,950. Supply of equipment for infrastructure facilities will require another $100,651,000 of foreign exchange.

1 On the basis of best price estimates.

2 There will also be significant sales of timber on local markets equalling approximately 40% of total forestry sales.

Table 5.7b—Estimate of the Direct Foreign Exchange Effects of the Masterplan by 5 Year Periods ($000's)

Category/Year	*72-75*	*76-80*	*81-85*	*86-90*	*Total*
REVENUES:					
Oil Palm Sales	67,067.40	574,614.54	1,433,129.78	1,608,455.73	3,683,267.45
Rubber Sales	—	22,870.30	159,393.02	520,984.22	703,247.54
Tapioca Sales	2,908.0	16,305.0	48,050.0	48,025.0	115,288.0
Sago Sales	—	600.30	4,849.30	33,223.90	38,673.50
Composite Crops Sales	—	—	48,899.01	315,469.90	364,468.91
Forestry Sales	1,405.86	137,931.12	159,474.96	176,070.60	474,882.54
Export Duties on Agricultural Crops	5,419.69	53,251.02	126,711.10	165,595.97	350,977.78
Total Revenue	76,800.95	805,572.28	1,980,507.17	2,867,825.32	5,730,705.72
COSTS:					
Oil Palm Processing Facilities	19,671.45	35,781.26	18,823.70	11,630.99	85,907.40
Rubber Processing Facilities	—	482.6	4,253.77	4,010.72	8,747.09
Tapioca and Sago Processing Facilities	608.94	3,530.46	748.14	2,729.17	7,616.71
Forestry Complexes Equipment and Personnel	29,938.48	7,998.47	—	—	37,936.95
Telecommunications	7,062.44	5,010.60	3,644.20	3,031.60	18,748.84
Water	9,500.0	13,885.40	8,959.45	5,558.55	37,903.40
Roads	21,000.0	5,000.0	5,500.0	12,500.0	44,000.0
Total Costs	87,781.31	71,688.79	41,929.26	39,461.03	240,860.39
CASH FLOW	−10,980.36	733,883.49	1,938,577.91	2,828,264.29	5,489,845.33

The direct foreign exchange effects of the development of the region are therefore very positive and are estimated to represent a net inflow of foreign exchange into Malaysia of approximately $5.5 billion over the period 1972-1990.

The direct foreign exchange effects of the master-plan are summarized in Table 5.7b.

5.7.4 Public Sector Development Costs

Of interest to Government planners will be the estimates of public sector expenditures required to implement the plan. Included in these costs are the people related infrastructure costs such as expenditures on education, health, post offices and public facilities. Also included are Government investment expenditures in the agricultural development plan, the forestry operations, public utilities and any Government activity in the induced commercial activity in the region. The latter item is difficult to estimate as it will depend to a large extent on the availability of Government funds for such investment, the previous success of Federal and State Government bodies in such enterprises and the degree to which the Government believes it can meet its objectives through such organization, such as PERNAS and the State Economic Development Corporations. Total investment costs for such activities have been estimated for the region and are included in the overall cash flow for the region in Table 5.7c below under the heading Induced Manufacturing and Commercial. For purposes of estimating Government development expenditures 50% of these costs have been included in Table 5.7c.

Estimated Government expenditures on agriculture and forestry are as prescribed by the development plan. Where joint venture organizations are recommended 50% of the development costs are assumed to be borne by Government.

Total public sector development costs for the period 1972-1990 are estimated to be $929,299,510. Of this 37% will be accounted for the FLDA which will incur expenditures in the amount of $346,000,000 before a positive cash flow for this organization is achieved.

Other major components of the total are the $57,713,800 of State Government financing for the two major forestry complexes, the $171,000,000 of J.K.R. expenditures on road construction and the $44,888,000 of expenditures by other Government Departments on social infrastructure facilities. Public sector development costs are summarized in Table 5.7c.

Table 5.7c—Public Sector Development Costs by 5 Year Periods and by Category

Category	*72-75*	*76-80*	*81-85*	*86-90*	*Total*
Social Infrastructure and Local Government	15,226.00	12,951.00	8,965.00	7,746.00	44,888.00
Induced Commercial Establishment Costs	12,400.00	14,500.00	7,600.00	7,100.00	41,600.00
Induced Manufacturing and Service Establishment Costs	10,526.00	13,800.00	14,300.00	15,800.00	54,426.00
Roads	84,000.00	20,000.00	22,000.00	45,000.00	171,000.00
Water Supply and Telecommunication Establishment Costs	28,801.6	27,770.8	17,918.90	11,117.10	85,608.40
Lesong Foresty Establishment Cost [1] ..	24,000.00	—	—	—	24,000.00
Bukit Ibam Establishment Cost [2] ..	33,713.80	—	—	—	33,713.80
FLDA Establishment Costs	115,542.65	177,563.94	52,003.39	890.30	346,000.28
Joint Venture Agricultural Establishment Costs	26,473.97	64,847.28	28,532.00	8,209.78	128,063.03
TOTAL ..	350,684.02	331,433.02	151,319.29	95,863.18	929,299.51

[1] Suggested Government Equity and Loan Portion.

[2] Year 1 and 2 Negative Cash Flow.

6.0 THE INITIAL PHASE

The foregoing sections have stressed the need to relate the existing commitments in development to the east coast. However this cannot be achieved at the expense of the feasibility of individual projects. The transportation linkage between Pahang Tenggara and the existing ports of Klang and Johore Baharu clearly requires that these initial developments must ship via the Kuantan/Segamat highway to the south and west until such time as there is a competitive port to the northeast. To offset this early emphasis the study has orientied its recommendation for the balance of the Second Malaysia Plan towards establishing links with the rest of Pahang and Kuantan through developments adjacent to the northern section of the Kuantan/Segamat highway.

6.1 THE CORRIDOR OF DEVELOPMENT

The prestudy alignment of this highway has been changed in its northern section (between the Rompin and Pahang rivers) as a result of the study analysis. Soil surveys indicated that the previous route divided a pocket of Class III and IV soils which now form the Bukit Ibam Forest Reserve whereas to the east (parallel to previous route) the soils are better and the area is already logged of commercial tree species (and therefore accessible). Furthermore the selected site of the main urban centre of the region is located on this more easterly alignment.

Due to the scale of commitments to agriculture in the southwest it will however take a rigid plan extending through the Third Malaysia Plan to 1980 before the area opened up by the highway is fully developed and the initial "draw" of development is neutralised. Fig. 6.1 illustrates the extent of the corridor which is designated. It will only be therefore towards 1980 that the Kuantan area to the north will play a major influencing role in the development and economy of Pahang Tenggara. If by that date Kuantan has a year round port then the considerable produce of the region will reverse its flow to the south and both agricultural and forestry produce will flow north along the Kuantan/Segamat highway.

6.2 THE AGRICULTURAL PROGRAMME

The masterplan calls for over 520,000 net crop acres of agricultural land to come into production in Pahang Tenggara in the Second and Third Malaysia Plans; approximately half the acreage being in each period.

The agricultural development programme summarised in Table 6.2 indicates that 14% of the total recommended for development during the period 1971 to 1980 is allocated to diversified crop and livestock enterprises involving an investment of between $60 and $70 million.

The detailed agricultural development plan is summarised in Part II Section 13 of this Volume. All of these areas are located within the central corridor except the two FLDA schemes; the Bera scheme (started before the study, 45,100 gross acres) and the new scheme south-east of Lesong, 39,800 gross acres (no suitable *large* pocket remaining in the "corridor" by 1978). Any minor balance of acreage outside the central corridor is a result of fringe schemes and instruction from the Steering Committee to increase smaller holder acreage of diversified crops.

Table 6.2—Summary by Crop 1971-1980

	1971-1975			1976-1980		
	Net Crop Acres		% of Total	Net Crop Acres		% of Total
Oil Palm	—	198,300	79	—	114,500	42
Rubber	—	27,900	11	—	107,000	40
Beef	5,600	—	—	8,700	—	—
Tapioca	1,300	—	—	15,700	—	—
Sago	500	—	—	4,300	—	—
Tea	700	—	—	300	—	—
Fruit (commercial)	1,300	—	—	1,900	—	—
Fixed Cropping and Other Diversified Crops	12,500	—	—	18,700	—	—
Research Station	2,200	—	—	—	—	—
Total Diversified crop ..	24,100	24,100	10	49,600	49,600	18
GRAND TOTAL ..		250,300	100		271,100	100

The major effort at co-ordinating existing development within this corridor in the Second Malaysia Plan must be directed to the Nucleus Estates and the Government Servants Cooperative the "Ladang Pegawai". The former oil palm estates are the subject of a special recommendation (Section 6.4) to change their status from private sector to Joint Venture (with the State). As will be noted from Table 5.1d, more than half the total costs of all development are in agriculture and more than half of these are borne by the public sector. Although the study has proposed eight types of management the following are considered publicly financed:

(*a*) FLDA.

(*b*) Public estates.

(*c*) MARDI.

(*d*) Small holdings.

It is assumed that small holdings will be financed by relatively small loans from the public sector but that the contribution of the individual smallholder is the savings that he makes as the project proceeds. By the time the smallholders' rubber is in production the value of the holding will be a multiple of the initial contribution from public funds. However, from the point of view of cash flow, the initial money is assumed to come from public funds, and therefore this is included in public financing.

The main difficulty in classification arises in joint ventures. It is assumed that half of the capital comes from public funds, and half from private funds. This is an over simplification made purposely to cover a bargaining position. It is possible that, for instance, early beef ventures will have to be financed largely from public funds. Later ventures may be entirely financed from private funds. On the other hand tea may be financed entirely from private funds, but is shown as a joint venture in the calculations.

6.3 THE FORESTRY PROGRAMME

Until 1980 the forestry activity in Pahang Tenggara will contribute in three main ways to the development of the central corridor of the region:

(*a*) A phased programme of logging to clear remaining commercial species from areas needed for agriculture.[1]

(*b*) The establishment of two major integrated complexes.

(*c*) The experimentation in both intensive management and silviculture.

[1] There exists the possibility of small manufacturing units which can be based on 15 or 17 years of "clearing schedule" but these plants would only be viable if the timber cannot be absorbed by existing industries outside Pahang Tenggara: *See* "Forestry Development in Pahang Tenggara".

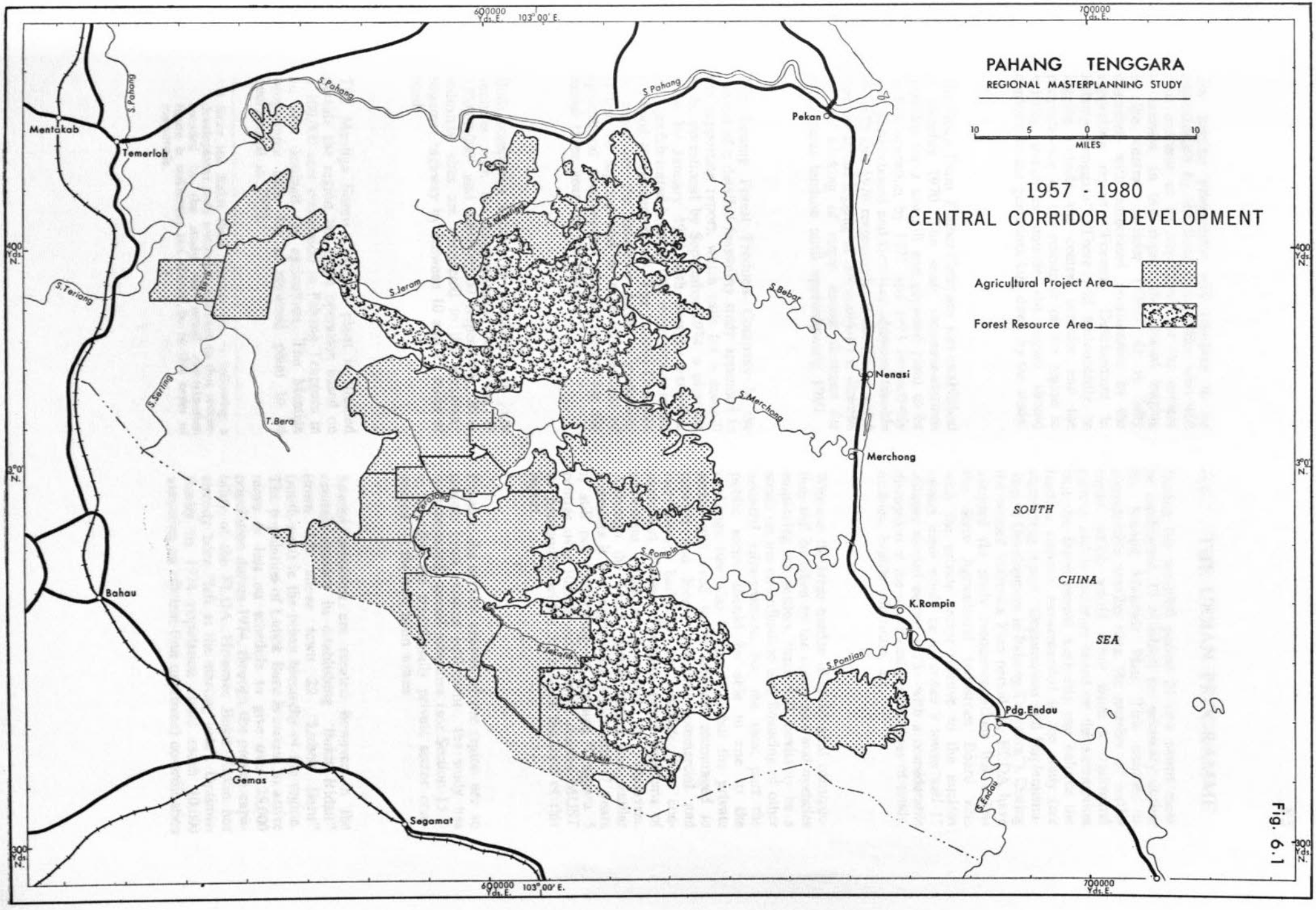

PAHANG TENGGARA
REGIONAL MASTERPLANNING STUDY
10 5 0 10
MILES
1957 - 1980
CENTRAL CORRIDOR DEVELOPMENT
Agricultural Project Area
Forest Resource Area
600000 Yds. E. 103° 00' E.
700000 Yds. E.
400 Yds. N.
300 Yds. N.
2° 0' N.
Mentakab
Temerloh
Pekan
Nenasi
Merchong
Bahau
K.Rompin
Pdg.Endau
Gemas
Segamat
S.Pahang
S.Teriang
S.Jeram
S.Bebar
S.Merchong
S.Rompin
S.Pontian
S.Endau
T.Bera
SOUTH
CHINA
SEA

Fig. 6.1

The logging programme will continue to be administered by the State forest office who will thus continue to be responsible for the control of licenses. In this regard the phased logging in the central corridor (FMU 6) is fully described with associated programmes in the supporting report "Forestry Development in Pahang Tenggara". There will undoubtedly be logging outside the central corridor and the proportioning of the resources of the region to existing industries outside the region should conform to the guidelines laid down by the study.

The Bukit Ibam Timber Company was established in October 1970. The study recommendations provided for a sawmill and plywood plant to be in full operation by 1972 and 1973 respectively with particleboard and furniture additions feasible by 1975 and 1976 respectively. It should be noted that the initial logging of this company is directed to the working of virgin timber destined for agricultural landuse until approximately 1980.

The Lesong Forest Products Company is the subject of a detailed feasibility study appended to the supporting report, which calls for a sawmill to be operational by September 1974, a plywood plant by January 1975 with possible extension into prefabricated housing and more sophisticated plywood component plants. The Lesong Complex is based on the intensive forest management system of logging and is thus independent of agricultural development phasing except for the initial three years of resource.

Both companies should be considered as joint ventures with the capitalisation amounting to $30,000,000[1] and $40,000,000 respectively. Both industrial sites are connected to the Kuantan/Segamat highway by between 10 and 15 miles of road.

The Mentiga Forest Complex plant is situated outside the region but is an operation based on a 100,000 acre concession in Pahang Tenggara in an area destined for agriculture. The Mentiga programme calls for a plywood plant to be operational in 1973.

[1] Since the Bukit Ibam Timber Co. is following a development path somewhat different to that recommended by the study the actual capitalisation figure is unknown, but should be in this order of magnitude.

6.4 THE URBAN PROGRAMME

During the pre-1980 period 24 new towns must be established, 17 of which are necessary during the Second Malaysia Plan. This number is considerably smaller than the number of settlements which would result from a traditional pattern and is therefore based on the assumption that the Development Authority can enforce the landuse controls recommended in the study (*see* supporting report "Organisation and Implementation of Development in Pahang Tenggara"). During the second Malaysia Plan period the FLDA have adopted the study recommendations but unless the State Agricultural Industries Board acts with the private sector relative to the nucleus estates there would be a further 9 towns and 17 villages needed before 1976—with a considerable disruption of the associated programmes of roads, utilities, health, education, etc.

Whereas the large burden of residential construction will be taken by the companies and agencies employing the settlers, there will inevitably be a strain on the co-ordination and financing of other essential infrastructure. For the most part the public sector should be able to rise to the challenge (*see* also Section 8.2) but the private sector will need to be actively encouraged to provide and locate business, commercial and recreational buildings on *schedule* (i.e. concurrently). Pahang Tenggara poses problems of settlement without precedent in Malaysia. Although the Jengka urban centre has similar restraints it is a single town which after 7 years is still not functioning—in Pahang Tenggara 5 centres over 10,000 and 12 other centres MUST be *functioning* within *3* years of the date of this report.

Because the service centres of the region are so remote from existing settlements, the study has recommended special measures (*see* Section 15.3) to establish the traditionally private sector component of the two main towns.

Special problems are created however in the central corridor in establishing "Bukit Ridan" (town 10) *above* town 22 "Lubok Baru" (south-west) in the urban hierarchy of the region. The population of Lubok Baru is certain to arrive more or less on schedule to give over 25,000 population during 1974, through the proven capability of the FLDA. However Bukit Ridan has already been "left at the starting gate". Optimistically its 1974 population could reach 10,000 assuming an efficient (but unproven) co-ordination

of over 20 separate participants in the development. Bukit Ridan could not surpass Lubok Baru in size until 1980. Thus it is only in Phase II that the regional centre will emerge and then only provided that it has both a speedy and efficient start. Recognising this need the Development Authority has commissioned town planning studies to commence in June 1972.

6.5 THE SETTLER PROGRAMME

6.5.1 Existing Population

The sociological surveys performed by the Study confirmed the need to make available to the existing population both inside and outside the region, the employment opportunities afforded by the initial development. However, in addition to those migrating into the region, it is important to comment on the impact of initial development on those already resident in the area. These people can be regarded in three major groups:

— Coastal communities

— Pahang river communities

— Orang Asli

Those dependent on fishing in the coastal communities have the choice to continue in this occupation. The only impact of the Pahang Tenggara development in this initial phase is the promotion of tourist facilities at Lanjut and sixteen beach parks, or the possible location of special forest complexes based on the processing of logs from inland agricultural clearing (*see* section 13.4). Although marine fishing is outside the study terms of reference it is anticipated that commercial fishing interests will eventually threaten the livelihood of these people and that during the 1980's alternative employment will be needed.

The Pahang river communities have been the subject of a special programme of rehabilitation by the State Government in 1972. As a result of this the inhabitants of kampongs in the vicinity of the proposed new Pahang river bridge (Kuantan/Segamat highway) are being relocated to a single village some 5 miles from the study proposal for Town No. 2 (Fig. 5.1a). The river kampongs in the western part of the study region are being relocated to three separate villages within 2 miles of each other adjacent to the Bera FLDA Scheme.

The Orang Asli in the study region are provided for in this initial period where-ever their present areas are affected by the early development in the central corridor. Specific measures are being taken to create reserve areas for aborigine agriculture at Batu Gong, and adjacent to towns 7, 12 (affected by Bukit Ibam Forestry) 9, 23 and 27. The FLDA Keratong scheme has developed around (but not including) the river settlements of Orang Asli in that area. In the Bera conservation area however the amount of shifting cultivation is proposed to be frozen at its present scale for ecological reasons. The provisions are discussed further in the supporting report "Sociology and Migration in Pahang Tenggara".

6.5.2 New Settlers

235,000 actual in-migrants are required in Pahang Tenggara by 1980. Since there is no evidence that Pahang State has either significant out-migration or unemployment very few of these in-migrants are expected to come from within the State of Pahang. However the total figure includes contract workers and is not therefore to be taken as the number of "permanent" settlers. The number of contract workers average 50% and all employment during this initial phase although this proportion will drop sharply to 38% and then 13% in the 1980's after the heavy planting and construction schedules have been completed.

6.5.2.1 Origin of Settlers

The study has performed a brief analysis of migration in west Malaysia in an effort to more reliably estimate the likely origins of settlers to Pahang Tenggara. This subject is discussed in detail in the supporting report "Sociology and Migration in Pahang Tenggara". The analysis endeavoured to distinguish between both urban and rural, and interstate migration by ethnic origin.

Certainly the dominant characteristic of the initial phase of development in Pahang Tenggara is it's high proportion of rural employment. During the Second Malaysia Plan over 30,000 new jobs are created in agriculture and forestry. The major employers during this period are the Nucleus Estates and the FLDA. The workers of the Nucleus Estates are estimated to read to be drawn largely from the adjacent southwestern neighbouring states of Negeri Sembilan and Malacca [1]. The FLDA experience in the Jengka Scheme was

[1] Less from Johore in view of other competing programmes in that State.

that most workers originated from Malacca and Kelantan (all Malay). However national migration trends are likely to influence estimates significantly.

It must be stressed that since this migration is completely uncontrolled at source, and accurate data not available, these estimates are subject to a wide margin or error. Nevertheless it is speculated that during the Second Malaysia Plan the majority of settlers will originate as follows:

— Perak	30,000
— Kelantan	20,000
— Malacca	20,000
— Negeri Sembilan	20,000
— Penang	15,000
— Others	11,000

6.6 COSTS OF DEVELOPMENT

The heaviest proportion (65%) of all expenditures for the entire development programme occur before 1980. This is to be expected in a masterplan of this type where the infrastructural costs of opening up a virgin area are enormous. Such infrastructural costs also determine that the majority of expenditures must be borne by the public sector. Since this report is submitted at a time which makes work before the 1972 monsoon virtually impossible there remain only 8 years before the fourth Malaysia Plan starts. During this time various public agencies will be spending at a rate of over $80,000,000 per year. It is logical to question whether such rates are realistic and this question is discussed in section 8.0 of this volume.

There is little that can be done to lighten this burden. The study is obliged to determine the projects within the development which qualify for international financing and to detail them accordingly. In this regard Table 6.6 summarizes the 6 projects which have been identified. It will be noted that the capitalisation of these schemes is $176,000,000 of which just over 60% will probably be "public sector".

However sources of finance are not considered to be the critical element in the success of the development as discussed in the supporting report "Economics of Development in Pahang Tenggara." The balance of the masterplan nevertheless is sensitive to the rate of investment. In this regard the Development Authority will play a key role in establishing confidence in the private sector to the extent that they will invest *simultaneously* with public sector investment and not wait until the Governments have paved the way (literally) for them. Unfortunately the developments to date in the area, limited though they are, do not create a good impression. Private sector (Nucleus) estates have been clearing and planting without the benefit of roads or services of any kind. It is now apparent that the "back-log" of work to be done in the area will hamper the effective start of the masterplan by competing for the manpower and equipment which are being mobilised for new developments. There seems little doubt that both the Federal and State Governments will have to actively assist the Development Authority in the regard. Unfortunately it is not always just a matter of providing funds. Much of the equipment needed not only requires funds, but also requires 2 or even 3 years of "ordering time" . . . . . and orders are not yet placed.

To obtain the necessary financial participation of the private sector the Second Malaysia Plan period may be marked by increased costs *not* reflected in Table 5.7a. These costs will be occasioned by the provision of "interim" or temporary services. If these provisions are not made then the success of the Third Malaysia Plan development may be undermined and the Initial Phase targets not met.

Table 6.6—Feasibilities Studies—Summary Comparison

	Acres	Capital M$ Million	Foreign Content M$ Million	Return on Investment % Before Taxes		Time Period of Investment Calculation Years
				I.R.R.	Comm.	
Lesong Forest Joint Venture ..	115,000	40.0	21.0	–	17.3	12
Oil Palm (OP 4) Private ..	13,000	18.8	4.0	13.3	8.0	20
Oil Palm Keratong FLDA ..	65,000	90.0	22.0	7.8	–	20
Tapioca, Rubber Public or Private	14,200	16.8	2.0	11.7	6.6	20
Beef Joint Venture	3,500	8.4	3.5	5.8	8.1[1]	20
Sago	600	2.0	0.4	6.5 (11.4)	1.7[2]	20 (30)
TOTAL ..	211,300	176.0	53.9			

1 Extra management and capital import as an experiment reduces returns.

2 Very conservative calculation. The return could be higher. Grant proposed to promote the development and increase the rate of return.

7.0 THE SECOND DECADE

If the development during the Second and Third Malaysia Plan periods has followed the master-plan then the landuse plan of the region is shown in Fig. 6.1. If there are any substantial variations from this plan then a revision would be necessary to assess the corrrect development path for the Fourth and Fifth Malaysia Plan period.

For the first phase of development, oil palm will have been the principal employer in the region, although towards the end of the Third Malaysia Plan, because of the sharp build-up of employment in rubber and the decline in oil palm employment after the seventh year, rubber will be assuming an importance as an employer comparable to oil palm. Because of their land-and-capital intensive nature, forestry-complexes do not become heavy employers during the Second or Third Malaysia Plans. As urbanisation takes place, however, opportunities for employment in manufacturing and services not directly related to natural resource development will expand rather rapidly, initially in construction and in public services and later in other activities. It is hoped that towards the end of the Third Malaysia Plan the numbers engaged in manufacturing and services of all kinds will be approaching half of total employment.

This is then likely to have been the nature of development in Pahang Tenggara. The developed areas of the region consisting of the central north-south corridor, independent agricultural pockets on the west and minor coastal development linked by the Bukit Ibam-Rompin road.

The significant features of this stage (1980) will be the *major* decisions necessary to launch the second decade of the region. The study has provided for a choice of programmes which will be determined by the performance of both the region and of West Malaysia by 1980. An appraisal of national objectives should be made to establish whether employment creation is still a top priority, whether commodity prices are as predicted, what are the results of research, etc. These aspects have been dealt with in the foregoing sections but it is worth dealing with the major options as they exist in terms of landuse and the pattern of development by now established in Pahang Tenggara.

7.1 NATURAL RESOURCES

7.1.1 The Agricultural Programme

It is expected that 313,000 gross acres (Table 5.1a) of potential agricultural land will be still available for development. Based on reconnaissance survey information it is expected that ½ of this acreage will be of Class III or IV soils and thus only ½ of the area or approximately 150,000 is without doubt being allocated for agricultural landuse.

These 150,000 acres are concentrated mainly to the west of the central corridor adjacent to the proposed E-W highway and development is phased accordingly. The crop or livestock use of these soils will depend in very large measure on the results of research and pilot projects in the initial phase. It is probable that the FLDA will claim a major role in bringing this remaining area into production and this may again limit the degree of diversification possible—depending of course on the extent to which the FLDA itself has expanded during the next 8 years.

If sago has proved to be a profitable crop it is also possible that ongoing soil surveys will have identified further areas of organic clay and mucks (probably to the east of the central corridor)

which would bring additional acreage into agricultural production since there would be no anticipated competition from other uses on this land.

The best use to which Class III & IV land will be put will not be known until closer to 1980 but the long range forecasts of the study favour forestry over rubber (the only competitive agricultural crop). However this projection is on the basis of improved techniques in forestry and is therefore based on successful research programmes. Conservatively, the statistics of development in this report are based on agricultural landuse throughout the 313,000 acres. Fig. 5.1a shows the landuse of this period assuming that Class III & IV soils are planted to rubber.

It is interesting that all the agricultural land of the region could be in production by 1985 based on the present capabilities. Although the masterplan spreads the agricultural programme over 10 years there is obviously a capability to make-up any lost progress which might have occurred in the Second and Third Malaysia Plan periods.

7.1.2 The Forestry Programme

Figure 7.1 shows the extent to which forestry operations within Pahang Tenggara might be expanded during the second decade *provided* Class III & IV soils could be proven to be more productive in forestry than in agriculture.

The FMU 2 to the west of the Mentiga forest concession of the initial phase is shown as being allocated to that company to provide a sustained yield resource and extend the life of the industry (plant at Pekan). In FMU 3, provided that in-growth is permitted from logging prior to 1980 and provided techniques of logging steepland have been developed, it is possible that a new integrated forest complex of 5 million cubic feet per annum could be designed and operated.

The impact on the development of the region of bringing in additional forestry instead of agricultural employment would be to eliminate town 29 and drastically reduce town 28 in size. The net reduction in population in this event is estimated to be 28,000.

If the intensive management system which had been used for 3 years in the Lesong complex is acceptable then it should be adopted by the Bukit Ibam complex when they terminate their logging for the agricultural programme and start utilizing their permanent reserve areas.

The results of logging research in the swamps to the east could result in the establishment of another 2 million cubic feet per annum complex sited north of Lanjut on the coast.

7.2 HUMAN RESOURCES

There will be close to 350,000 people in Pahang Tenggara by this time and it is hoped that manufacturing and services of all kinds will be approaching half of total employment. However, if there is a substantial variation in this predicted path then it will have become readily apparent by the time the Fourth Malaysia Plan is launched and appropriate action must then be taken.

If the urban growth in the region has not reached the projected levels then special programmes should be initiated at Bukit Ridan to provide extra employment in that location. The regional centre can be further assisted by a decision which must be made at this time concerning the primary east-west link between Pahang Tenggara and the west coast. Whereas traffic in the first ten years is concentrated on the link between settlement 22 and the west, there is a marked increase in the traffic during the second decade which should optimally proceed from Bukit Ridan via centres 3 and 34 to the west. Although this route should be the eventual primary road. (05 standard) to Kuala Lumpur this would necessitate and entirely new link through the mountains. It should be noted that such a route exists and is estimated by the study to require $40 million (Kuala Lumpur-Karak improvements are estimated at $100 million). This primary linkage is the means by which a deliberate promotion of the regional centre can be achieved relative to its place in the national urban hierarchy. The previous sections have discussed the merits and demerits of this option.

If "special programmes", such as institutions for higher education or "footloose" national industries cannot be "spread" for the regional centre and *if* both the centres and the region are lagging substantially in the provision of non resource based employment, it may then be necessary to amend the masterplan to anticipate out-migration from the region towards the end of the second decade (1980-1990).

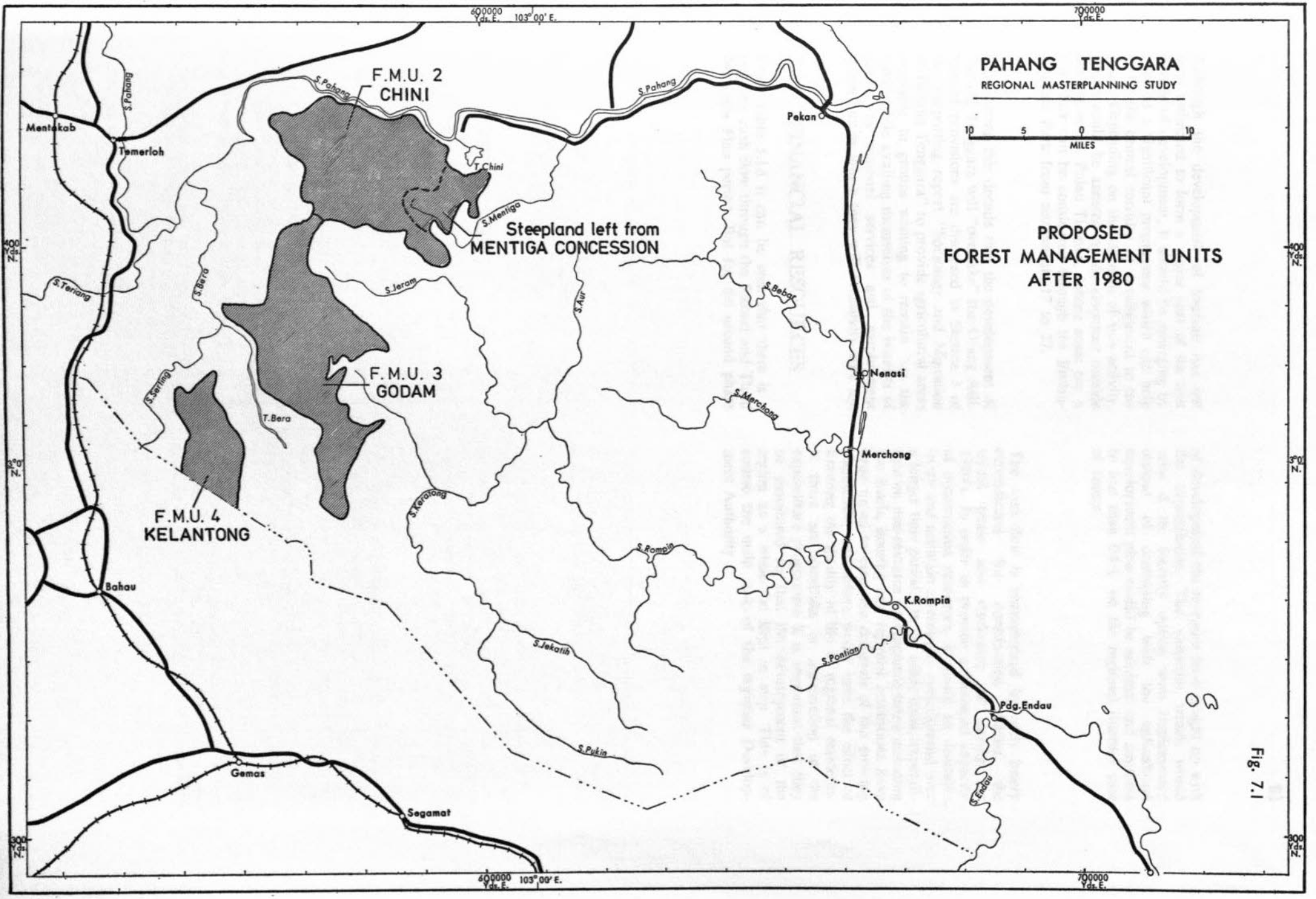

PAHANG TENGGARA
REGIONAL MASTERPLANNING STUDY
10 5 0 10
MILES
PROPOSED
FOREST MANAGEMENT UNITS
AFTER 1980
F.M.U. 2
CHINI
F.M.U. 3
GODAM
F.M.U. 4
KELANTONG
Steepland left from
MENTIGA CONCESSION
600000 Yds. E. 103° 00' E.
700000 Yds. E.
Mentekab
Temerloh
Pekan
Nenasi
Merchong
K.Rompin
Pdg.Endau
Bahau
Gemas
Segamat
S.Pahang
T.Chini
S.Mentiga
S.Teriang
S.Bera
S.Jeram
S.Aur
S.Bebar
S.Sering
T.Bera
S.Merchong
S.Kerotong
S.Rompin
S.Jekatih
S.Pontian
S.Pukin
S.Endau

Fig. 7.1

Although the development of tourism has not been estimated to form a major part of the first decade of development, it should be emerging by 1980 as a significant programme which can help to tie the central corridor of development to the coast. Depending on the strength of this activity, which could be assisted by development outside the region i.e. Pulau Tioman, Johore coast etc. a road link can be considered through the Endau-Rompin Park from settlements 17 to 27.

It is during this decade that the development of Pahang Tenggara will "overtake" the Orang Asli. Special provisions are discussed in Section 3 of the supporting report "Sociology and Migration in Pahang Tenggara" to provide agricultural areas available to groups wishing to remain "on the land" while availing themselves of the benefits of access to regional services and employment opportunities which they will eventually take up.

7.3 FINANCIAL RESOURCES

From table 5.1d it can be seen that there is a negative cash flow through the Second and Third Malaysia Plan period. But for the second phase of development the revenues have caught up with the expenditures. The variation which would arise if the forestry option were implemented instead of continuing with the agricultural development plan would be minimal and amounts to less than 0.6% on the regional internal rate of return.

The cash flow is characterised by early heavy expenditures for construction during the initial phase and slackening off during the 1980's. In order to provide a balanced capacity of construction resources, it would be desirable to try and maintain a relatively even demand over a longer time period. On the other hand, expenditure on non-resource development items including the roads, housing and regional institutions have been timed to meet the demands of the growing population, and delays would have the effect of lowering the quality of life of regional residents. If there are shortfalls or acceleration in the expenditure programme it is important that they be monitored so that the development of the region as a whole be kept in step. This is of course the main task of the regional Development Authority.

8.0 IMPLEMENTATION

The administrative machinery for the implementation of the masterplan of Pahang Tenggara should provide for the control of the three resources necessary for the development

(*a*) Natural resources.

(*b*) Financial resources.

(*c*) Human resources.

The design for this administration is summarised in this section and is discussed at length in the supporting report "Organisation and Implementation of development in Pahang Tenggara"[1]. The incorporating act establishing the Development Authority was passed by both State and Federal legislation in January and February, 1972.

8.1 THE PAHANG TENGGARA DEVELOPMENT AUTHORITY

8.1.1 Basic Principles

The management structure proposed for Pahang Tenggara is based on the notion of a single organization with three distinct missions and responsible for control and development but not operational functions in the region.

Operational functions in the region are left to the established supra-regional and sub-regional agencies of government and to the private sector. If existing agencies of government are unable to carry out their operational functions, these agencies should be strengthened rather than supplanted by the Development Authority. Or if it is felt desirable to create a new public responsibility for some activity in the region (such as urban development), then an appropriate agency or coordinating committee can be created. But operational functions should not be assumed by regional management authority itself. Far from weakening the proposed regional management structure, its avoidance of all but control and development functions will, in the long run, strengthen both the overall management of the region and the capabilities of the operating agencies in it.

8.1.1.1 Three primary management missions

Three primary management missions have been defined for the Pahang Tenggara region. These are: land control, regional control and development, and manpower development.

Land lies at the basis of regional development in Pahang Tenggara. Any activity in the region can ultimately be related to the use of land for a certain purpose. Land control is, therefore, defined as a primary management mission on the region.

But regional development is equally a question of the performance of activities in the region: what kinds of activities, how efficiently they operate, how well they are co-ordinated with each other, and so on. Thus, controlling and developing the performance of activities in the region is another primary management mission.

Thirdly, manpower will be a crucial matter in Pahang Tenggara. The kind of growth which is foreseen for the region will require a much greater

[1] Also Study Paper No. 10—"The Management of Development in the Pahang Tenggara Region".

number and variety of manpower skills than the region presently contains. Accordingly, manpower development is defined as a third primary management mission in Pahang Tenggara.

8.1.2 The Powers of the Authority

In place of operational functions of its own, the Development Authority has three important powers of control and development. These are:

(*a*) the power of approval over land use in the region;

(*b*) the power of financial evaluation and approval of capital expenditure by agencies of government in the region;

(*c*) the power to evaluate the need for and to arrange contracts.

8.1.2.1 The control of land use

Land use in Pahang Tenggara must conform to the provisions of the land use plan. It is recommended, therefore, that the Authority act as "watchdog" to ensure that all Federal/State fuctions with respect to land are and continue to be exercised within the framework of the land use plan. Any variances or changes in the land use plan should require the approval of the Authority who would base its recommendations on the regional programme as a whole.

8.1.2.2 Financial evaluation and approval

It is recommended that the Development Authority be given the right and the duty to keep regional accounts for Pahang Tenggara. On the revenue side, the Authority should have the power to obtain from all government agencies a statement of gross annual revenue derived by each agency from the region and to issue an annual statement of regional revenue. On the expenditure side, it is recommended that all current, committed and estimated capital expenditure by any agency of government in the region be reported to the Authority, and that the Authority be empowered to evaluate and (with as few exceptions as possible) to approve this expenditure in the light of the regional programme. To this end, the Authority has the duty to keep an annual regional capital account, showing current, committed and estimated capital expenditure by all agencies of government in the region.

8.1.2.3 Evaluation and contracts

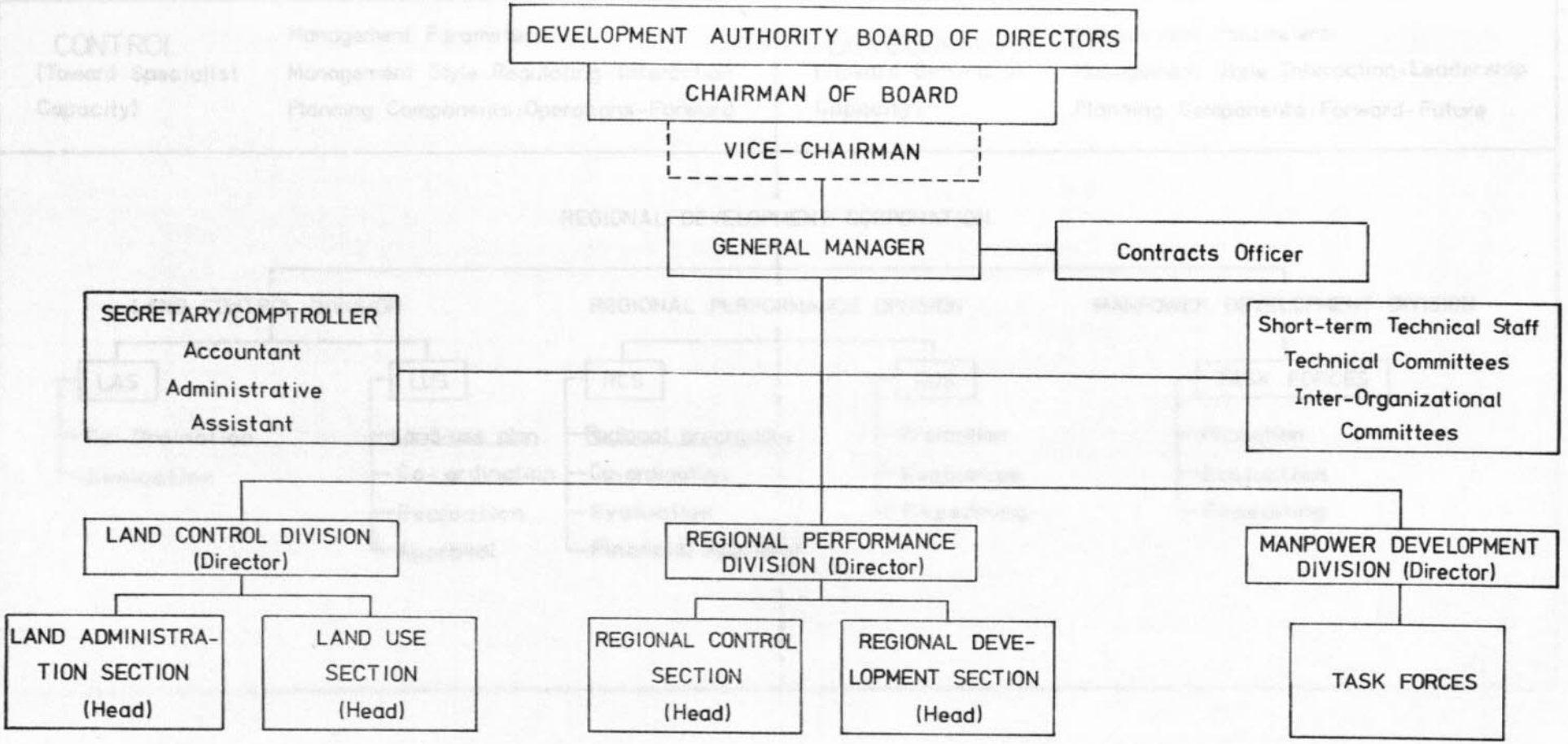
The third major power of the Development Authority is its power to evaluate the need for and to arrange (through the appropriate channels) contracts with domestic or foreign organizations of either a public or private nature. This includes both management contracts for the assistance of the Authority itself as well as contracts for management and other kinds of services for the assistance of other organizations in the region. To the maximum extent possible, the Authority should strive to arrange contracts for other organizations through those same organizations, so that they are strengthened rather than by-passed in the process.

In most cases, the Authority will have four different options for funding contracts which it arranges or helps to arrange. It may persuade relevant agencies of government to pay for the services; to this end, it may help these agencies to negotiate special grants from the Treasury. Secondly, the Authority may, through the appropriate channels, obtain funds from international development agencies. Thirdly, the Authority may make supporting grants to agencies out of its own operating budget or (if there is one) from a revolving fund. Finally, the Authority may similarly pay wholly and directly for a contract itself; but this should only be as a last resort, except in the case of contracts for its own use.

8.1.3 Management Structure

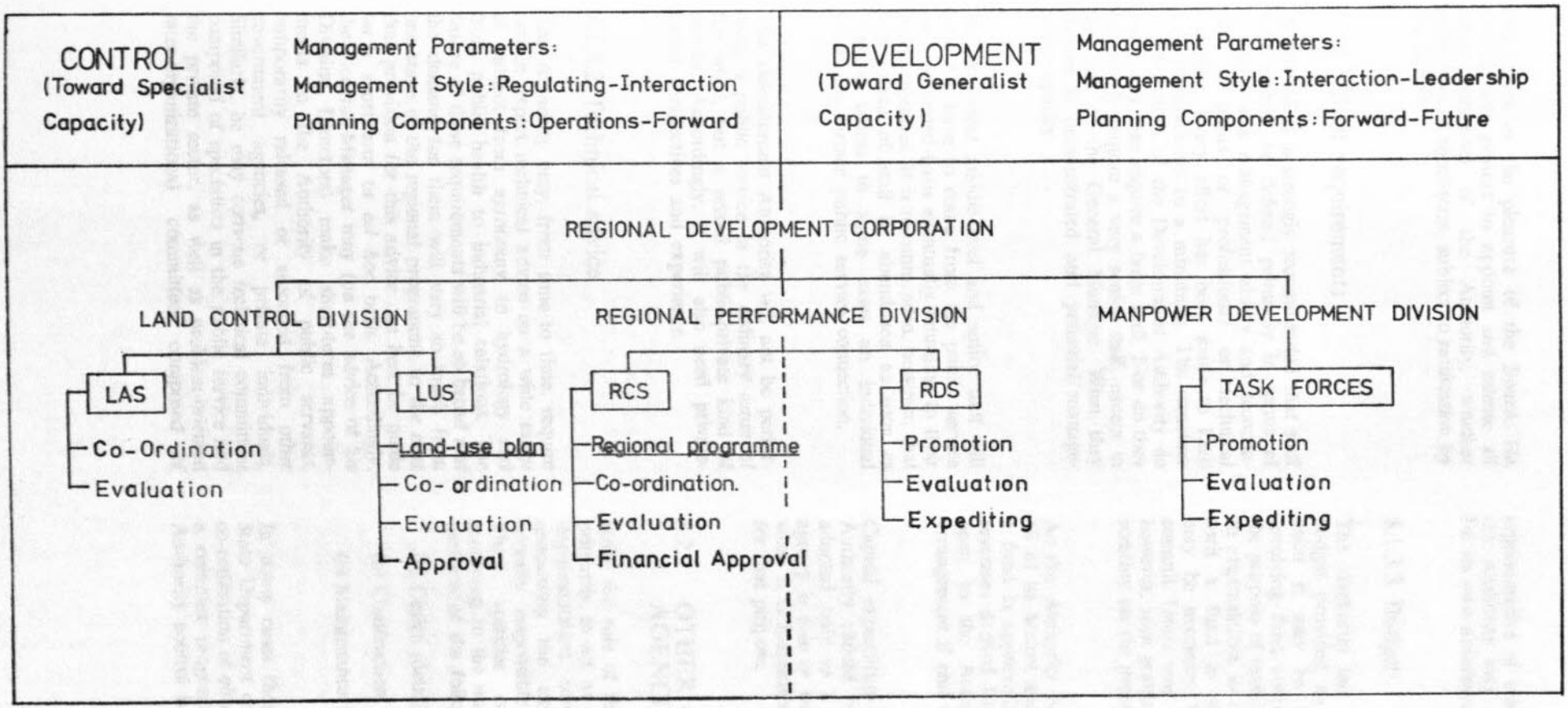
The structure and functions of the authority are illustrated in figures 8.1a and 8.1b respectively and are described in the supporting report. The first chart shows the organizational structure of the Authority and the second shows the functions of each of its Sections and Divisions.

The Board of the Development Authority determines the policy of the Authority. It also appoints the General Manager and ratifies the appointment of all other staff. The Chairman and the Vice-Chairman are both appointed by the Federal Government with the approval of the Pahang State Government. The Vice-Chairman may be a special adviser. The Chairman, the Vice-Chairman and the General Manager are recommended to be *ex officio* members of the Board. The rest of the Board is appointed by the Federal and State Governments. The General Manager is responsible to the Board for carrying out the policies of the Board and for translating them into plans and action. He is appointed by



THE ORGANIZATION OF THE PAHANG TENGGARA DEVELOPMENT AUTHORITY

Fig. 8.1a



LAS - Land Administration Section
LUS - Land Use Section
RCS - Regional Control Section
RDS - Regional Development Section

REGIONAL FUNCTIONS OF CONTROL AND DEVELOPMENT

Fig. 8.1b

and serves at the pleasure of the Board. He should have powers to appoint and release all other personnel of the Authority, whether permanent or short-term, subject to ratification by the Board.

8.1.3.1 Staff requirements

In general, it is strongly recommended that staff requirements be defined primarily in terms of executive and management ability and secondarily in terms of professional or technical expertise. Every effort has been made to keep staff requirements to a minimum. The structure and functions of the Development Authority do not in any case require a large staff. Nor do they necessarily require a very senior staff, except in the case of the General Manager. What they require is demonstrated and potential management capacity.

Initially, most middle-level and senior staff will probably have to come from the public service on a seconded basis eventually returning to their parent agencies. It is recommended, however, that this source of staff be abandoned as soon as possible unless in some cases an individual severs his former public service connection.

The Development Authority will not be performing a public service in the ordinary sense of the word, but a mixed public-private kind of service. Accordingly, it will also need private-sector perspectives and experience.

8.1.3.2 Technical advice

The Authority may, from time to time, require certain expert technical advice on a wide range of subject from agronomy to hydrology and from public health to industrial relations. The nature of these requirements will be so broad and the demand for them will vary so much from one stage of the regional programme to the next that provision for this advice can best be made on a short-term or *ad hoc* basis. Accordingly, the General Manager may (on the advice of his Division Directors) make short-term appointments to the Authority of public servants, temporarily released or seconded from other government agencies, or private individuals. Similarly, he may convene technical committees composed of specialists in the public service and the private sector, as well as problem-oriented inter-organizational committees composed of representative of relevant organizations. Finally, the Authority may also let technical contracts for its own assistance.

8.1.3.3 Budget

The Authority has an initial annual operating budget provided by means of grant. At some point it may be felt desirable to set up a revolving fund controlled by the Authority for the purpose of making operating or capital grants to organizations in the region. In the event that such a fund is established, special provision may be necessary to permit the Authority to commit funds over a period of several years; however, such grants should always be subject to scrutiny on the grounds of efficiency.

As the Authority becomes established, some or all of its budget and its revolving fund (if such a fund is approved) might be provided out of revenues derived from the region. It should be open to the Authority to propose such an arrangement if and when it is deemed advisable.

Capital expenditure on projects directly by the Authority should be avoided, if possible, and adopted only as a last resort when no other agency is able or willing to undertake them and when it is inappropriate to create a new agency for that purpose.

8.2 OTHER GOVERNMENT AGENCIES

Since the role of the Development Authority is primarily to act as a catalyst in the masterplan implementation, some comments are in order concerning the existing government agencies actually responsible for performing the work. These agencies can be generally grouped according to the number of services which they perform of the following:

(*a*) Design (detail).

(*b*) Construction.

(*c*) Maintenance (including staffing).

In many cases there is both a Federal and a State Department concerned and the task of the co-ordination of efforts by various groups in such a complex programme under the Development Authority control is considerable. The following

list of agencies is not intended to be complete, but to represent those carrying responsibilities to which the implementation is particularly sensitive.

8.2.1 Public Works Department (PWD)

In the Pahang Tenggara development the PWD will be heavily involved in the construction of new roads, bridges, water supplies and other construction works. In actuality the development programme for Pahang Tenggara began long before the Pahang Tenggara study started and has been proceeding without the construction of the necessary attendant services. The effect of such a backlog of requirements together with those of proposed development will produce a construction load which is very heavy and an exaggeratedly large amount of new construction equipment will be required. The PWD problem in Pahang Tenggara is further compounded by their involvement with the many other pressing commitments in the national schemes.

It will also require time for this new road programme to be set in motion. Road layout and design for the purchase of new equipment and the supply of the requisite skilled personnel are all prerequisites of construction. In the meantime PWD will have to take interim measures to improve the existing forest roads enough to serve development until the proper roads can be built.

With respect to the heavy road construction programme of the Second and Third Malaysian Plans[1], PWD may wish to consider letting some of the major work to private contractors in the foreign field, even though such measures are generally only used as a last resort.

In addition to roadwork for development there is a sizeable programme of construction for town water supplies, in the form of pumping stations and water supply lines. Design of such systems, the purchase of equipment and the installation require two to three years after a decision has been made to proceed with a specific project. Moreover the roads are prerequisite to such installations because water lines usually follow the same routes.

[1] *See* support report "Settlements and Infra-structure in Pahang Tenggara" and section 16.0 following.

Even after all the works constructed by the Federal PWD, there remains the problem of maintaining these facilities. Such maintenance is the responsibility of the State PWD, which is meagerly outfitted to carry out their present work load and who will require marked increases in equipment, personnel and funds if they are to meet their increasing responsibility.

8.2.2 National Electricity Board (NEB)

Although the NEB will play a major roll in the development of Pahang Tenggara at the present time there is no allocation of funds for the region nor detailed designs for the supply systems.

In general it may be said that the greater concentration of people planned for the Pahang Tenggara towns, in comparison with former developments, will greatly simplify the task for NEB in designing the distribution systems. Normally diesel plants would only be installed in towns which have reached 10,000 population, but the study has recommended that in the case of Pahang Tenggara service should be provided to towns of 5,000. Under Malaysian conditions diesel plant electrical supply to towns of less than 50,000 people is not a paying proposition and requires subsidy. The national grid system is being introduced to lower the cost of electrical supply but service will not reach Kuantan or Segamat until 1975 and it is most unlikely that such supply could be given to Pahang Tenggara any earlier than 1980.

The only site within Pahang Tenggara with any hydroelectric potential is in the Jeram River basin. The study has determined that this source is too small and the power output too expensive per unit to be considered in the foreseeable future. There are many larger and more economic sites available in West Malaysia outside Pahang Tenggara before the Jeram could be used. Moreover the value of the basin in terms of its forestry and agricultural use in considerable since any dam related to hydroelectric work would be comparatively shallow and involve the inundation of many thousands of acres.

The NEB is capable of supplying the personnel and equipment for development but would require additional capital funds. In general the design of services and the supply of equipment requires three years after a specific project has been authorised, i.e. the masterplan has been accepted.

8.2.3 Department of Telecommunications

Although the Telecommunications Department will be involved at an early date, at the present time there are no funds allocated to Pahang Tenggara and no specific designs have been made. Moreover Telecoms involvement in the national programme is very great and they are short of both personnel and equipment. Deliveries of telephone equipment require 1½ to 2 years after orders, which in turn can only be placed after designs have been made following approval of a given project.

Telecoms estimates that over $25 million capital is required for the 20 years development of Pahang Tenggara. Unlike the diesel generated electricity supply discussed in the previous section, the installations once made pay their way. In the early stages of development, radio systems of a limited nature would be necessary to provide interim service until it is physically possible to install permanent systems.

In respect to maintenance facilities, Telecoms is similarly hard pressed for both personnel and equipment. However their ability to cope with the present situation is vastly superior to that of many developing nations. Like NEB, Telecoms expects to benefit by the more compact nature of the proposed towns and the advanced planning which goes into their design.

8.2.4 Drainage and Irrigation Department (DID)

The installation of stream flow and rainfall gauges and their subsequent recording are of immediate importance since many projects, are dependent upon the DID. These installations are to be made not only within Pahang Tenggara but also in the entire catchment basin of the Pahang river. These installations and readings are of great significance as the region lacks basic long term information with which to design flood control and other necessary development works. DID has the installation of these gauging stations in hand.

For the future development and control of the water resources and for measures of conservation DID will have to make large increases in controls, services and staff. At the present time the State has only one technical representative and it is understood that such personnel are practically unobtainable in Malaysia.

8.2.5 Department of Mines

Mineral clearances for land development are required from the State Mining Department. There is however to be an extensive programme for exploration and development of the mineral resources of Pahang Tenggara. These negotiations will be both involved and unusual. Although the State Mining Department would have to be a party to the involvement, they cannot be expected to initiate or carry out such schemes. The Development Authority will have to undertake and execute such measures and will require expert assistance in this respect. Qualified economic geologists and mining engineers, to be useful, need to have a wide experience in the business and technical aspects of the mining industry. Because their advice, would only, be required from time to time the full time employment of such expertise is not merited and the engagement of consultants may be the only practical solution.

8.2.6 Commissioner of Lands

Lands are strictly a State ownership and control matter. However the Development Authority should be delegated some powers by the State to facilitate their role as Planning Authority for the Pahang Tenggara region.

Chief among the existing problems with respect to land is the slowness with which the land can be physically surveyed and title given. Special provisions are needed to speed up these processes as there is otherwise no way in which land can be released for use and reuse speedily enough to meet the development needs.

Land zoning, tax collection and many other land considerations require strict control measures in Pahang Tenggara if the very complex and rapid masterplan implementation is not to become disjointed. It is not expected that the State need expand their services, but rather that the Land Control Division of the Development Authority would fulfil the requirement. Nevertheless there is a need on the part of the State that they should appoint a special Assistant State Director of Lands to deal exclusively with the Development Authority to expedite the gazettement and alienation and land in Pahang Tenggara. This man

should have sufficient authority to forward applications to the State Secretary to be tabled in the Executive Council meetings, or preferably to a smaller group delegated to act on behalf of the Council.

8.2.7 Town Planning Department

The State Town Planning officer is responsible for the provision of designs and plans for all new settlements in the State of Pahang. Since he is the sole professional in his office, additional work which he is not able to deal with would be normally completed with assistance from the Federal Department of Town and Country Planning.

The additional work occasioned by the development in Pahang Tenggara is without precedence in the State and calls for special measures if the construction of settlements is not to be held up through lack of plans. Due to the rapid development of the Nucleus Estates of the region some 10 town plans are required immediately. A further 5 town plans are required in *1972*. However, beyond this date only approximately 2 settlement plans a year are needed. It would seem logical that the State Planning office should expand, but to the level required for the next 10 years rather than to the size required to produce all plans for the next 2 years. The immediate burden, or back-log of plans should be dealt with by the Federal Government or sub-contracted to some other group. At the present time the regional centre has been dealt with in this manner but all other plans are being designed within the State office.

8.2.8 Department of Education

The Department has recognized the need to adapt the normal educational system to the special needs of Pahang Tenggara as identified in the supporting report "Organization and Implementation of Development in Pahang Tenggara." However at the time of writing the details of the new system are not available and therefore this comment must remain at a fairly general level.

Although it may be at first thought that the children to be educated in Pahang Tenggara have been covered in national estimates and it would therefore merely involve the reallocation of resources to meet the needs of this developing region, this is not the case. The complete absence of either schools or teachers will involve extra costs in the construction of new facilities, the provision of equipment and extra teachers. In the early years of development it is inevitable that these amenities will be under-utilized compared with provisions elsewhere in the country.

Difficulties are expected to be encountered in obtaining enough qualified teachers, particularly during the early years of development when services are at a low level. There will be an understandable reluctance of teachers to move from the established communities of the west coast to a pioneer economy of the east coast. To compensate for this there may need to be special allowances or other incentives to attract staff until such time as the towns of Pahang Tenggara become attractive. Alternatively it may be more appropriate to actually train teachers within Pahang Tenggara so that their training is in itself an inducement to go to the region.

In any event it is felt that the training needs of several programmes and Departments may be worthwhile combining in order to reduce the problem of starting up a new system in a new region. The Development Authority should act as intermediary in co-ordinating such efforts.

8.2.9 Department of Health

The traditional rural health system of Malaysia has been redesigned[1] for application in Pahang Tenggara in recognition of the special conditions which will prevail in the region. This new system is described in the supporting report "Settlements and Infrastructure in Pahang Tenggara."

The Department is thus well prepared to meet its responsibilities on the masterplan and is presently amending its budgets to reflect the new system so that an immediate start can be made in the construction of new facilities and the recruitment of staff. An analysis for the restraints of the programme indicated that the shortfall was most likely to occur in the staff requirements for Public Health Nurses (65% shortfall) and Dental Officers (48% shortfall). However there could be additional severe disruption of the operation of the new facilities, should the essential utilities discussed in the other parts of this section not be

[1] By the Ministry of Health and the Project System Analysis (PSA) team of the World Health Organization.

available on schedule. It is also possible that special measures will have to be taken to ensure that suitable accommodation is available to the staff of hospitals and clinics. The same reluctance of professionals discussed in the last section, to locating in a pioneer community is equally valid (or more so) in the case of doctors and dentists. Once more, it will be up to the Development Authority to co-ordinate development in a manner which minimizes inconvenience to other agencies operating in the area.

8.3 THE MONITORING OF PROGRESS

8.3.1 Development Schedule

Each of the supporting reports to this study has provided a detailed schedule of development activities for specific aspects of the masterplan. In the second part of this volume these individual programmes are summarised. However, much can be learned by superimposing all the major activities of the masterplan on a common time scale.

Figure 8.3 enclosed in the pocket of this report, graphically depicts the major elements of the masterplan implementation. This chart is not intended to be a Critical Path Network or PERT network for the development. These systems are complex in their detail. This flow chart relates only the programmes which concern the decision making process of the implementation.

The main chart is presented at this stage because it underscores the need for a "mid-term" review of both the progress of development and the accuracy of forecasts. The most relevant aspect of both the agricultural and forestry development plans is their competition for common resources and their reliance on research.

The analysis leading to the placement of agricultural crops or livestock in the different categories is described in section 12.0 of this volume. The chart clearly shows however, the relationship between the diversified agricultural prospects and the major crops of rubber and oil palm. Whereas there is presently sufficient knowledge to justify small scale commercial plantings of tapioca, sago and tea plus establishing a beef scheme, the major research into other possible (category III) crops within the region will be undertaken by MARDI. The time lag needed to obtain results is significant since it becomes readily apparent from Fig. 8.3 that no additional diversification is realistic during the second Malaysia plan. But during the third Malaysia plan semi-commercial plantings may be possible for Cashews, Maize, Ramie, Sorghum, Cocoa, Groundnuts and Soybeans. It is also possible that initial diversified schemes can be expanded during the 1976-1980 period. The dates shown on the chart are critical in as much as the soils suitable for many of these crops are being used up as fast, if not faster than research is being performed. It will therefore be necessary for the Development Authority to control the commitment of available land in a manner which compliments the results of the MARDI research and early pilot projects.

Forestry research is similarly shown on the chart, both for silvicultural and management research. Results from both programmes are needed for the mid-term review, but the most cirtical of the two is clearly the management research. It will only be possible to start the trial harvesting in the Lesong Tree Farm License in 1977. For a 5 year cyclical cut system, 2 years of trials (before 1980 review) is an absolute minimum. Yet the system constitutes the basis for evaluating not only the sustained yield potential of the new integrated complexes of the region, but also the competitive position of forestry and agriculture in deciding the optimum allocation of the remaining usable land in Pahang Tengara.

The chart also underscores the timing of infrastructural requirements needed for both the resource development and the settlement programmes. The timing of road links, although of essential importance to the transport schedule shows up as critical when considering the provision of utilities which are sensitive to engineering design and equipment ordering delays. In most cases the distribution networks of these utilities follow the final road alignments and the interdependance of implementing agencies will be aggravated by their unequal capacities as discussed earlier in section 8.2 The chart shows clearly that temporary services must be provided for the initial two and possibly 3 years of development.

The flow of migrants and the increase in the regional population on the same chart provides a perspective for the enormous scale of the implementation programme. Although this information is provided in separate tables a new dimension is added by combining the major activities on a single, although simplified chart.

During 1973 and 1974 (before permanent utilities are installed) settlers will be arriving at the rate of approximately 1,000 per week.

This flow chart not only highlights some of the key issues of the implimentation but also shows the need for the monitoring of progress. Without up-to-date information on key programmes the Development Authority cannot hope to control and co-ordinate the masterplan.

8.3.2 Progress Evaluation System

The purpose of this system is to define the operational procedure that can be used in monitoring regional development progress with reference to the goals and targets set forth in the masterplan. This is not a common practise at the level of regional development. However, because of the size of the area to be developed; the amount of public capital to be invested in infra-structure, regional institutions and settlements; and the important role a developing Pahang Tenggara will play in the national economy, the plan progress must be monitored. Without the up to date knowledge of the achieved targets in the region it would not be possible to choose the correct options in the flexibility of the plan which are so essential if the overall objectives are to be attained.

A three tier system for monitoring is suggested. At the most general level, the plan is monitored by a few key indicators each representing a larger group of secondary indicators. If there is evidence of problems at the overall level then other indicators are suggested for closer examination. Finally, if these indicators in turn suggest further examination, a series of interrelationships can be revealed through a complex of other indicators. It is only the first two monitoring levels that are detailed in the supporting report "Organization and Implementation of Development in Pahang Tenggara". The third level can be identified most directly by returning to the relevant working and study papers. (*See* Appendix A Section 18 of this volume).

This three tier approach is necessary because it would be too costly, time consuming, and complex to monitor all indicators together in a continuous manner. It would be extremely difficult to identify the interdependence of decisions for all variables. The complexity in the collection of data, volume and level of data manipulation required and personnel needed to carry out such a monitoring process would be both beyond the short term planning capacity of the Authority and would not produce a reasonable level of return for the costs associated with such a system. A simpler, more direct and more flexible monitoring system should

(*a*) observe progress

(*b*) compare actual progress in development to planned progress and

(*c*) identify important decisions that must be made but not to produce a continuous system of replanning.

The revalidation of basic assumptions, goal priorities and variable interrelationships is suggested as part of the "mid-term review" approximately in 1980.

8.3.3 Sensitive Monitoring Categories

The categories most critical to plan progress are the factors of production over which greatest control can be exercised. Simply stated these include the general categories of land, labour and capital.

Since the plan at the outset is essentially resource based, landuse has been treated by the study as the major indicator of progress. This is the best measure of progress at least until 1980 before any substantial non-resourced based activity becomes easily measurable.

Labour, in this context, is intended to be the generic term for the entire population. Since considerable variation may exist in the size and compostion of the total regional population and since it may be distinctly different than the normal national experience, it is certain to influence the structure, prosperity, and productiveness of the work force itself. Consequently monitoring categories are suggested; general population, and employment.

Capital easily subdivides into investment capital and social overhead capital. The need for monitoring capital is self-evident. Of particular significance to Pahang Tenggara will be the rate of private investment. Consequently some effort should be made to determine the level of enterpreneurial activity within the region. Aside from budgeting, it is crucial to the settlement pattern that the social overhead capital be established in phase with the population build-up. Private investment may also hinge on the schedule development of social overhead capital.

8.3.3.1 Boundary Values

In each of the categories to be monitored, values have been extracted from the masterplan to serve as measures against which actual progress can be assessed.[1] For monitoring purposes, a range of tolerable limits has been set which reflects the degree of sensitivity of each aspect being monitored to changes in the projected path. Values occuring outside this range would be indications of deviation from the plan.

It is suggested that a narrow percentage range of fluctuation be fixed for the initial five year period and that this range be expanded for the projected values of later periods. Up to 1975 a $\pm 10\%$ range is proposed. The projected values for 1985 and 1990 must be revised at the mid-term review based on the then current situation. The main reason for proposing an admittedly conservative initial range is that it is only actual experience that can determine precisely those categories where tolerance is allowable.

8.3.3.2 Frequency of data collection

The frequency with which information is needed to monitor the progress of development is a function of both the category of information sensitivity and the boundary values within which it is expected to perform. If all categories remained within the tolerable limits of initial estimates then it would be sufficient to monitor them all at regular intervals, more frequently perhaps for sensitive categories, say twice a year, but less frequently for less volatile categories, possibly only at 5 year intervals. The boundary values discussed in the previous section therefore constitute a safety feature of the system in as much as they define the need for *irregular* plan monitoring. If for example the price of rubber drops below the lower boundary value then a plan assessment is immediately called for regardless of whether there was 3 months or 3 years to go before a regular check was made.

[1] These are presented in Section 7.0 Appendix A of the supporting report "Organisations and Implementation of Development in Pahang Tenggara.

8.3.4 Opportunities for Plan Adjustments

Towards the end of the Third Malaysia Plan the results of specific developments should be known or their feasibility indicated. The development after 1980 will partly be determined by this experience and the success of research and experimentation during the initial phase. Furthermore, any change in plan objectives or priorities should be incorporated into the mid-term review at the same time. There are only limited options available to accommodate such changes in terms of landuse development before 1980 aside from either delaying or accelerating development.

The actual options which could result from the re-assessment of the cost benefit analysis of the individual programmes and the overall economic objectives have been referred to earlier. The purpose of this note is therefore to stress that the data collected during the monitoring of progress in the initial phase of development forms an essential base for this re-assessment. It is also suggested that the monitoring system itself be re-assessed at that time. Much will have been learned concerning the most revealing data, the most incisive sources of information etc. It should be recognised that

(*a*) the masterplan must be flexible because it is not possible to forecast accurately for 20 years in a comprehensive regional plan.

(*b*) Because the masterplan is flexible, its progress must be monitored or else the flexibility is meaningless since changing conditions will not be recognised.

(*c*) The monitoring system is only meaningful when it is used. Since its purpose is to measure changing conditions, it too must be capable of change. If the system is too cumbersome it must be simplified; too general it must become more specific; covering the wrong subject it must alter its scope etc.

PART II—TECHNICAL STUDIES

9.0 CLIMATE AND WATER RESOURCES

9.1 CLIMATE

All available data was collected for wind, rainfall, temperature, relative humidity, sunshine, evaporation and cloud cover applying to the Pahang Tenggara region. There is very little such data available for the actual area and as a consequence records from adjacent recording stations as far away as Singapore were also used to interpolate the information presented on climate.

The Pahang Tenggara normal winds are gentle, averaging 8 mph on the coast and only 1.5 miles per hour in the interior at Temerloh. Even the monsoon winds in december are of moderate velocity with only 3 to 4 days in that month gusting to over 30 mph. Rainfall is highest on the coast at 130 inches per year decreasing in the western interior to 80 inches. The most significant factors with respect to rainfall are firstly that there is no distinct and dependable dry season, which phenomenon markedly reduced the number of agricultural crops that can be grown commercially. The second factor is that the heavy monsoon rainfalls of december and january cause serious flooding. The annual mean temperature for the region is 79°F with april to june being the warmest months. The mean monthly evaporation is 3.7 to 4.5 inches of water. All climatic information is recorded in detail in the supporting report "Climate and Water Resources of Pahang Tenggara".

Fig. 9.1 "Climate and Water Resources" indicates wind and temperature data together with the locations of the hydrological stations of the area.

9.2 WATER SUPPLY

Pahang Tenggara has many rivers, and tests of these indicate a good quality of potable water for domestic and commercial uses. Supplies of such water are adequate to serve the region beyond the foreseeable future. There are no known or expected subsurface fresh waters which could be tapped. Along the coast salt water penetrates as much as five miles inland and ten miles up some of the tidal rivers.

Water supply systems have been designed for the towns of the region which are scheduled to be established prior to 1980, by means of seven pumping stations each of which would provide water to one or several towns. The largest of these systems would utilize the Rompin River as its source. Fig. 9.2 shows the details of the capital and operational costs of the proposed water supply systems and these are analysed in the supporting report on Water Resources.

The water supply systems are designed to furnish 10 cubic foot of water per day per capita. The delivery costs through pumping stations, pipe lines and storage systems are estimated costs based on the design. The distribution system capital costs have been estimated at a standard $100 per capita. The costs of the construction, operation and maintenance are summarized in Table 9.2. Cost of operation and maintenance includes costs of material, labour, depreciation and repayment of capital in 30 years at an interest rate of 6 percent.

Table 9.2—Water Supply System Expenditure ($ million)

	Delivery	Distribution	Construction	Operation and Maintenance	Total
Until 1975	13.0	11.4	24.4	5.3	29.7
1975-1980	6.8	10.4	17.2	28.3	45.5
1980-1985	3.2	8.9	12.2	36.4	48.6
1985-1990	0.5	5.5	6.0	46.3	52.3
Total ...	23.5	36.2	59.8	116.3	176.1

9.3 FLOODS

9.3.1 Pahang River Floods

In January 1972 the most severe flood since 1926 was experienced and it is estimated that the expected frequency of recurrence of such a flood is 30 years.

No increase in volume by reason of cutting the forests and developing of the land is expected in future floods but the runoff in the dryer season will be faster in certain areas. However as development progresses and there are more people and property in the region, the effects of the floods will be more severe in terms of damage and disruption. At the time of the 1972 January flood the Study took some readings on the extent of the floods and as far as was possible, with the meagre information available, drew a map of the extent of the flooding. (*See* Fig. 9.3 1971 Inundation of S. Pahang).

The solution to the Pahang River flooding is very complex and the answer cannot be obtained through piecemeal corrective works. The river collects its waters from the lands of practically the whole State and Pahang Tenggara forms only a part of the flood affected area. A two year study is required to define an overall integrated programme of dam building, levees, river correction, land recovery, zoning for future development and controlled land building of the deltaic river deposits. There presently exists practically no basic data on river flows, rainfalls and even the topographical information is not sufficiently detailed on which to base works of construction.

On the basis of proposals made by the Study the Government is now installing gauging stations for rainfall and river flows not only in the Pahang Tenggara region but as well in the Pahang River basin (*see* Fig. 9.1). Such data collection will need to be carried out for a number of years before it will be representative enough to serve as a basis for the design of the river controls. Based on this fact and the 1971 inundation information and the existing topographical maps, the Study laid out the various programmes within the master plan to minimize the impact of future floods. Towns and villages are placed above peak flood levels; roads as far as economically feasible are placed on higher ground and agricultural crops are located where they will not be submerged beyond their capabilities of recovery. Many of the existing settlements are consistently flooded and the State has embarked on a resettlement programme in 1972 to resite such communities on higher ground.

9.3.2 Rompin River Floods

The Rompin is the second largest river in the region, but unlike the Pahang, the Rompin flows entirely within the region. This river also causes flooding over a wide section of the coastal area, but design of corrective measures is less complex than in the case of the Pahang River. It is proposed that the choked river channel be cleared of obstructions by dredging. More detailed surveys are required of lands adjacent to the river to determine which can be utilized for agricultural crops or livestock since the available 50 foot contour maps are inadequate for this purpose.

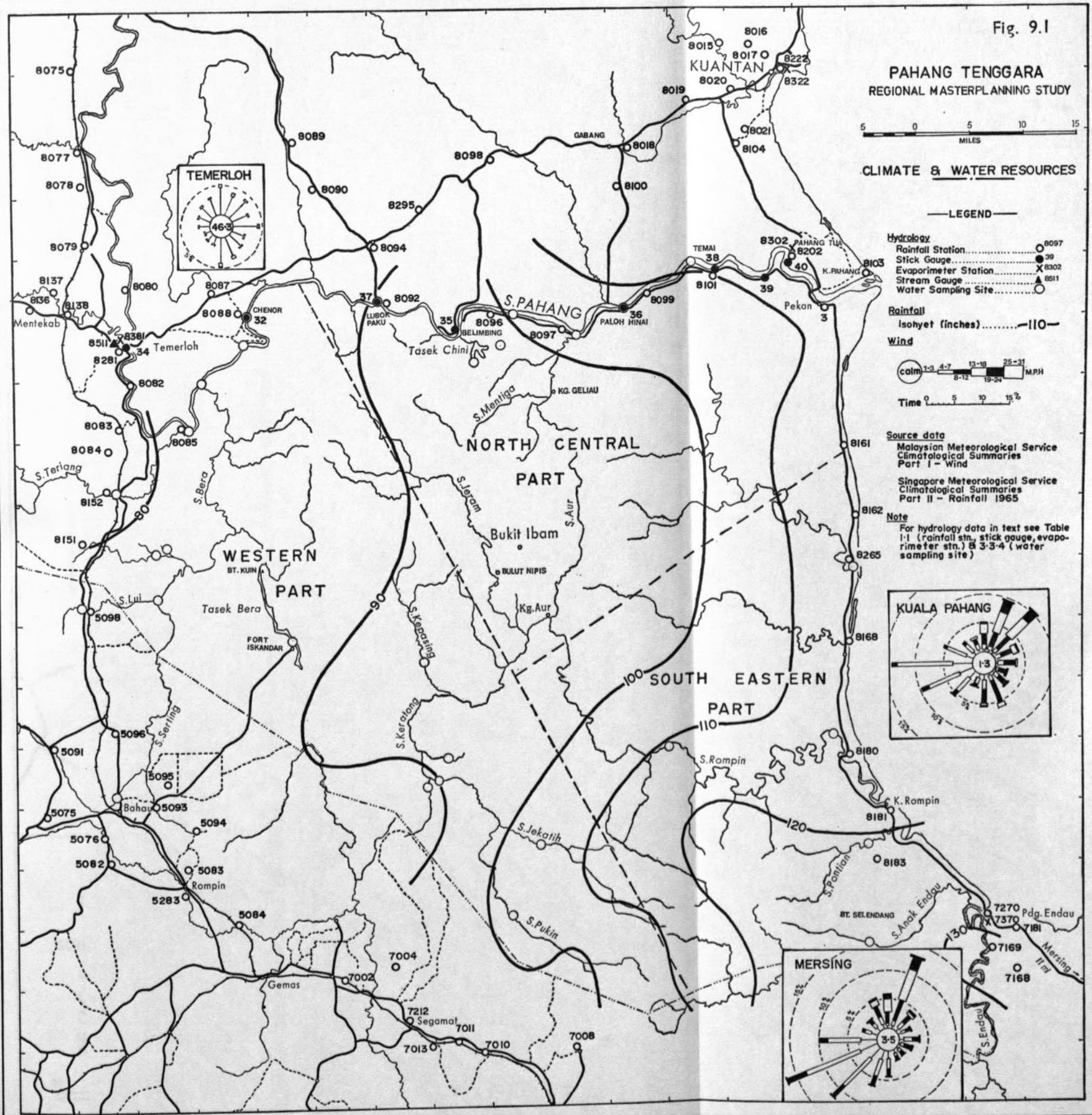


Fig. 9.1
PAHANG TENGGARA
REGIONAL MASTERPLANNING STUDY
5 0 5 10 15
MILES
CLIMATE & WATER RESOURCES
—LEGEND—
Hydrology
Rainfall Station
Stick Gauge
Evaporimeter Station
Stream Gauge
Water Sampling Site
Rainfall
Isohyet (inches)
Wind
calm 1-3 4-7 8-12 13-18 19-24 25-31 M.P.H
Time
Source data
Malaysian Meteorological Service
Climatological Summaries
Part I - Wind
Singapore Meteorological Service
Climatological Summaries
Part II - Rainfall 1965
Note
For hydrology data in text see Table 1·1 (rainfall stn., stick gauge, evaporimeter stn.) & 3·3·4 (water sampling site)
KUANTAN
GABANG
TEMERLOH
TEMAI
PAHANG TUA
K.PAHANG
Pekan
Mentekab
Temerloh
CHENOR
LUBOK PAKU
BELIMBING
PALOH HINAI
S.PAHANG
Tasek Chini
KG. GELIAU
S.Mentiga
NORTH CENTRAL PART
WESTERN PART
SOUTH EASTERN PART
Bukit Ibam
BULUT NIPIS
Kg.Aur
S.Jeram
S.Aur
S.Bera
S.Teriang
S.Lui
Tasek Bera
BT. KUIN
FORT ISKANDAR
S.Kepasing
S.Keratong
S.Serting
S.Rompin
S.Jekatih
S.Pontian
S.Pukin
S.Anak Endau
S.Endau
K.Rompin
Bahau
Rompin
Gemas
Segamat
BT. SELENDANG
Pdg.Endau
Mersing
KUALA PAHANG
MERSING
8016
8015
8017
8222
8322
8020
8019
8021
8104
8018
8100
8098
8089
8090
8295
8094
8077
8078
8079
8075
8137
8136
8138
8080
8087
8088
8092
8096
8097
8099
8101
8103
8302
8202
8361
8511
8281
8082
8083
8084
8085
8152
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8265
8168
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5082
5083
5283
5084
7004
7002
7212
7011
7013
7010
7008
7270
7370
7181
7169
7168
9
100
110
120
130
11 mi

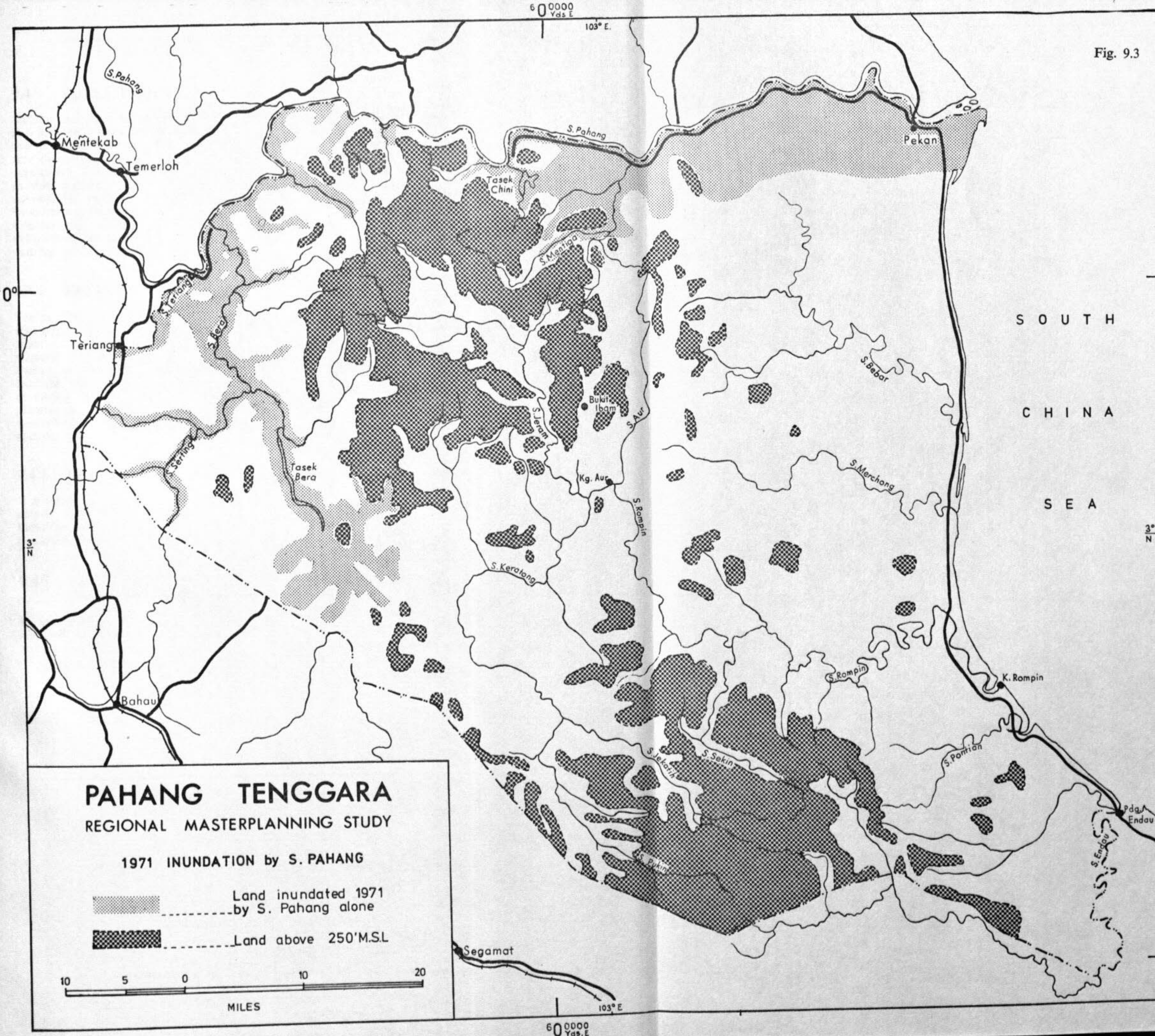

Fig. 9.3
PAHANG TENGGARA
REGIONAL MASTERPLANNING STUDY
1971 INUNDATION by S. PAHANG
Land inundated 1971 by S. Pahang alone
Land above 250'M.S.L
MILES
10 5 0 10 20
SOUTH
CHINA
SEA
S. Pahang
Mentekab
Temerloh
Tasek Chini
Pekan
S. Mentiga
S. Teriang
S. Bera
Teriang
Bukit Ibam
S. Jeram
S. Aur
S. Bebar
S. Serting
Tasek Bera
Kg. Aur
S. Rompin
S. Merchong
S. Keratong
K. Rompin
Bahau
S. Jekatih
S. Sekin
S. Pontian
Pdg. Endau
S. Endau
S. Pukin
Segamat
103° E.
4°0
3° N
3°0

9.4 POLLUTION

Streams samples taken throughout the region indicate the waters are at present largely clean except in one instance where village and agriculture discharges are causing the Sertiang river to degenerate. To maintain the water of the rivers in this condition and usable for domestic and commercial purposes specific recommendations have been made in both the Water Resources and Conservation supporting reports. Appropriate action must be taken at an early date to monitor and regulate these conditions.

9.4.1 Erosion

The regional development has been designed to minimize erosion by various means. On the steeplands of over 20° slope the forests have been retained. On the 12° and 20° slopes only tree crops are proposed using contour drainage. Ditching and runoff controls are specified for all developed land, where clearing and sequential planting is required. Mining operations must be controlled as to the effluents entering the river system, especially in the dry weather periods.

9.4.2 Sewage

It is proposed that piped water be supplied to all centres of population and that all houses and buildings be serviced by septic tanks. Sewage treatment plants are not proposed.

9.4.3 Insecticides, Fertilizers and Industrial Waste Disposal

In that Pahang Tenggara is a virgin area, controls, if instituted at the plan inception can work. Any delay however can make it difficult or impossible to implement controls effectively. Regulations should be written and regulatory bodies should be preferably established nationally at an early date. Regular chemical checks should be made on the streams and effluents of the region to ascertain the effectiveness of such controls.

9.5 HYDROELECTRIC POWER

A possibility has been identified and analysed for a hydroelectric scheme with a dam and power house on the headwaters on the Jeram River. This system could be a supplemented in reservoir capacity by a second dam on the headwaters of the Mentiga River. This proposal would require further study of the dam site before its feasibility could be proven in as much as no foundation investigation has been carried out at this time.

The hydroelectric cost estimates and design are dealt with in detail in the supporting report on Water Resources. The Jeram River reservoir would utilize 186 square miles of catchment area impounding an average of 452,400 acre feet per annum. The dam would be a mass gravity dam with a flood spillway capacity of 36,000 cusecs. The power house would have an installed capacity of 2,150 horsepower and would produce 11.25 million KWH yearly, operating with a 68 foot static head. The cost of this capital expenditure would be $6,350,000 for an energy cost of $0.197/KWH. The auxiliary dam on the Mentiga River would be an 85 foot high earth fill structure costing $3,672,500 and the overall cost of power with this addition would then be $0.20/KWH.

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10.0 GEOLOGY AND MINERAL RESOURCES POTENTIAL

10.1 GEOLOGY

The Geological map included in the supporting report "Geology and Mineral Resources of Pahang Tenggara" was made jointly by the Geological Survey and the Study, and represents the first attempt to bring the available information together to produce a stratigraphic section applicable to the whole area. The Study however did no field work with the exception of a few inspection trips, and all the basic data for mining and geology was supplied by the Federal Geological Survey Department or the State Mining Department.

In general the geology of the region consists of a north-south central backbone instrusive granite, flanked on the east by older sediments and volcanics and on the west by newer sediments. Tin deposits have been found at the eastern contact of the granites with the older rocks. Mineralization other than tin appears to be related to northerly faulting and to younger granodiorite intrusives which follow the main granitic intrusion.

An aeromagnetomic survey was carried out by Government and many of the magnetic anomalies defined therein were investigated by the Geological Survey Department. However these investigations were surface only and further exploration is merited.

10.2 MINING

The information on past mining, operational mines, mineral claims, is summarised and maps of mineral resources potential are provided in the supporting report.

Records of prospecting and mining indicate that such operations have been going on in many parts of Pahang Tenggara area since the early 1900's. By the end of 1970 approximately 10% of the area has been prospected in varying degrees, chiefly for alluvial tin, iron and ferro-manganese.

10.2.1 Exploited Minerals

Only four minerals have been mined in the area. These are in order of importance iron, tin, manganese and barite.

Iron Mined:

Rompin[1] ...	1962-1970	17,210,158 tons
Tasek Chini	1965-1968	572,915 tons
Pontian ...	1961-1964	369,436 tons
		18,143,509 tons

Tin Mined:

Bukit Payong Area	1965-1970	10,135 piculs
Lesong Forest Reserve	1965-1970	6,756 piculs
		16,891 piculs

[1] The largest mining producer for the area was closed in 1971 when the Rompin ore reserves were exhausted.

10.2.2 Unexploited Minerals

No commercial tonnage has been found for other minerals in the region. Low grade bauxites of small tonnage have been found. Tungsten and titanium occur associated with tin. No radioactive minerals have been found. There are no exploitable limestone deposits within the region although there are three deposits nearby. Glass sand has been noted on the beaches but they are probably not of pure enough quality for commercial use.

10.2.3 Construction Materials

Laterite deposits are widespread and are commonly used as a road surfacing material. Stone aggregate can be quarried from granites and tuffs. One such developed quarry is located at Bukit Ridan and a second on the coastal road.

10.3 PROPOSED MINERAL EXPLORATION

As a result of the Study analysis of geological and mining information, the Government formed a working group comprised of representatives of Federal and State Agencies and the Study to consider the schedule for mineral prospecting, so that exploratory work could be progressively carried out in the Study region to free the land in the correct sequence for masterplan development. These proposed prospecting blocks are shown on Fig. 10.3, which indicate three general categories of prospecting.

(*a*) Small prospecting areas of placer tin potential of 2,000 acres each, which should be explored in the normal way and are suitable for exploitation by small local mining interests. There are approximately 100,000 acres of such potential.

(*b*) Three larger areas for placer tin exploration of 8,000 to 10,000 acres each are suitable for mining by dredge. The number of these blocks might be added to by the consolidation of three or more smaller 2,000 acre blocks. Prospecting and mining of these 10,000 acres blocks must be undertaken by local or foreign companies capable of dredging. The agreements for such ventures were visualized as joint ventures with the Pahang Tenggara Development Authority or other Governmental Agency. There are 30,000 to 40,000 acres of such potential.

(*c*) Very large areas having base metals potential were considered as being prospected and developed as two large ventures of 100,000 acres each. These ventures would of necessity require the involvement of large experienced mining corporations who would employ sophisticated methods of exploration, and would further be capable of high capital involvement if finds were such as to merit large development. As such, these companies would require long term guarantees to cover prospecting, development, operation and marketing.

Present regulations require that land development only take place after mineral clearance has been given by the State Mining Department. In the case of the massive development requirements in Pahang Tenggara it was agreed that mineral clearances would be given for land 2 years in advance of it's proposed development in the masterplan. So that the mineral exploration programme could be completed as fast as possible, it was decided that the Pahang Tenggara Development Authority should take the initiative and that tin mining exploration should be *immediately and publicly invited* in categories *a* and *b* above. Approximately 50,000 acres of this land overlap agricultural programmes in the Second Malaysia Plan period and 30,000 acres in the Third Malaysia Plan period. The urgency for "disproving" surface deposits is thus paramount. Category *c* subsurface deposit potential, although not interfering significantly with land use programmes could drastically alter the economy of the region if new mines were developed. Thus any commercial resource should be identified as soon as possible before infrastructure commitments are too rigid to be able to respond to later discoveries. In this regard it is recommended that the Development Authority approach three or four large international mining firms to negotiate contracts.

Fig. 10.3

600000 Yds. E.

103° 00' E.

PAHANG TENGGARA
REGIONAL MASTERPLANNING STUDY

PROPOSED MINERAL PROSPECTING AREAS

Outline of proposed prospecting areas likely to contain tin which could be mined by open cast methods

Outline of proposed prospecting areas likely to contain tin which could be mined by dredging

Outline of proposed prospecting areas likely to contain base metals

10 5 0 MILES 20

Mentekab
Temerloh
Teriang
Bahau
Segamat
Pekan
Kg. Melayu
Bt. Bam
Kg. Aur
Nenasi
Merchong
K. Rompin
Pdg. Endau

S. PAHANG
S. Mentiga
S. Jeram
S. Teriang
S. Bera
S. Sering
Tasek Bera
S. Keratong
S. Aur
S. Bebar
S. Merchong
S. Rompin
S. Pontian
S. Jekatih
S. Pukin
S. Endau

SOUTH CHINA SEA

400 Yds. N.
3° 00' N.
300 Yds. N.

11.0 SOILS

11.1 INTRODUCTION

Prior to this study the entire Pahang Tenggara region had been surveyed at a reconnaissance scale with selected areas surveyed at semi-detailed and detailed reconnaissance scales[1]. On the basis of these surveys and locations of land already alienated for agriculture, approximately 500,000 acres forming a corridor along a section of the proposed Kuantan to Segamat highway was selected for semi-detailed soil and terrain mapping.

Soil survey studies indicate that the region contains a wide variety of soil and landform types, capable of supporting a range of agricultural enterprises. The entire region consists of approximately 2.5 million acres, over half of which has land with potential for agriculture. Areas which are not considered to be suitable for immediate agricultural development include approximately 0.4 million acres of steepland (slopes over 20°) and approximately 0.5 million acres of peat swamp.

In the semi-detailed survey area it was possible to make detailed recommendations for agricultural development based on the soil survey information. The same detail of assessment for the remaining areas was not possible. The original reconnaissance surveys, more recent surveys, recent topographic maps, and extrapolations from the semi-detailed area were used, but more exact information of these areas must await future surveys.

1 Reconnaissance soil survey—Rentis lines spaced 2 to 3 miles apart with soil observations at ¼ mile intervals. Maps published at 1 inch = 4 miles. Reconnaissance areas which have been resurveyed at a reconnaissance scale are regarded as detailed reconnaissance.

11.2 SEMI-DETAILED SOIL SURVEY AREA

11.2.1 Soils

The acreage of the various soils within the semi-detailed soil survey area is shown in Table 11.2a. The soils are listed according to the parent material from which they have formed because this is the usual way in which soils are viewed in Malaysia. Soil phases, associated soil series or terrain data are not included in the table. A Soil-Terrain Map at (1″ = 1 mile) has been prepared (*See* supporting report. "Soil Survey Studies and Interpretations in Pahang Tenggara").

Steepland and peat have been precluded from the first phases of agricultural development. However, steepland must be considered within the context of agricultural evaluation since it occurs, to some extent, dispersed throughout areas of more suitable land. The peats in the area are of very low agricultural potential because they are poorly drained, fibrous, extremely acid, deep and usually overlie sand.

An overall assessment of soil fertility indicates the soils have a very low nutrient status. Chemical properties of nearly all soils are very similar, being characterized by very strongly to extremely acid conditions (all of pH < 5.0) low caution exchange capacities ($< 10\%$ meq/100g), extremely low base saturation ($< 10\%$) and low organic matter contents. The relationship of high clay contents and low nutrient status, indicates that the clay minerals may be primarily amorphous. Applications of fertilizer and possibly lime will be necessary to maintain sustained yields for most crops.

Semi-detailed soil survey—Rentis lines spaced ½ mile apart with soil observations at 1/8 mile intervals. Maps produced at a inch = 1 mile.

Table 11.2a—Acreage Distribution of Soils in the Semi-Detailed Soil Survey Area

A. SOIL SERIES:	Acreage	Percentage
Developed on igneous rocks—		
Jerangau	2,350	0.4
Katong	2,110	0.4
Rengam	114,490	20.4
Segamat	1,570	0.3
TOTAL	120,520	21.5
Developed on sedimentary rocks—		
Bungor	87,320	15.6
Durian	8,700	1.5
Jempol	1,220	0.2
Kedah	1,790	0.3
Munchong	200	<0.1
Serdang	28,190	5.0
TOTAL	127,420	22.7
Developed on metamorphosed rocks—		
Kemuning	670	0.1
Marang	12,240	2.2
Pohoi	16,540	2.9
TOTAL	29,450	5.2
Developed on older alluvium—		
Harimau	15,050	2.7
Tampoi	140	<0.1
Ulu Tiram	90	<0.1
TOTAL	15,280	2.7
Developed on subrecent alluvium—		
Holyrood	8,130	1.4
Lunas	10,980	1.9
Rasau	16,970	3.0
Serok	9,680	1.7
TOTAL	45,700	8.0
Developed on recent alluvium—		
Akob	33,130	5.9
Kampong Kubor	1,920	0.3
Telemong	4,050	0.7
TOTAL	39,100	6.9

Table 11.2a—Acreage Distribution of Soils in the Semi-Detailed Soil Survey Area—(*cont.*)

B. SOIL COMPLEXES (VARIABLE PARENT MATERIAL):	Acreage	Percentage
Alluvial Complex	7,460	1.3
Local Alluvium	19,760	3.5
Malacca Complex	34,320	6.1
Organic Clay and Muck	360	<0.1
Riverine Alluvium	10,070	1.8
TOTAL ..	71,970	12.8
C. LAND UNITS (NON-AGRICULTURAL):		
Disturbed Land	60	<0.1
Peat	64,670[1]	11.5
Steepland	46,970[1]	8.7
TOTAL ..	111,700	20.2
GRAND TOTAL ..	561,140	100.0%

[1] Peat and steepland acreages have little relative meaning since the area is largely fringed by these units and their extent is dependant on where the area boundary is placed.

11.2.2 Terrain

Table 11.2b shows the acreage of the different terrain classes within the semi-detailed soil survey area.

Table 11.2b—Acreage Distribution of Terrain Slope Classes in the Semi-Detailed Soil Survey Area (excluding deep peat areas)

Terrain Class	*Slopes*	*Acreage*	*Percentage*
C1 Level ...	0-2°	122,710	24.5
C2 Undulating	2-6°	147,730	29.6
C3 Rolling ...	6-12°	136,730	27.4
C4 Hilly ...	12-20°	45,640	9.1
C5 Steep ...	20°	46,970	9.4

Areas of undulating and rolling terrain exist throughout the area. Land in these slope classes may be considered the most suitable for both agriculture and infrastructure development, with the areas of undulating terrain being well suited for a wide range of development.

Although a large acreage of level terrain exists, these areas are generally scattered throughout the region and are characterized by variable soil deposits, poor soil drainage conditions, and flood hazard. Only a small portion of this area will be suitable for development.

Hilly and steep terrain classes occur in relatively small proportions, but they are important because they are distributed throughout the areas of more favourable terrain. Under good management and with proper conservation methods, hilly land can be used for tree crops. Steepland should not be cultivated.

11.2.3 Assessment for Agriculture

Classification of the soil survey information for agriculture has been based on the Soil Suitability Classification (Wong, 1970). Wong's system was modified and expanded specifically to the type of assessment necessary for the Pahang Tenggara region and to the soil information which was obtained in the area covered by the semi-detailed soil survey. The system has been used as a guide to assess the capability of the land for agricultural uses and crop suitability. The revised system has been connotated as a Soil Capability Classification.

The Soil Capability Classification is fundamentally a method of grouping similar soil and terrain combinations into units on which predictions for crop suitability, production potential and management can be made. Figure 11.2 shows how the soil survey information was organized into groupings which can be interpreted within the Soil Capability System. The main building block of the system is the soil mapping unit. Each soil mapping unit consists of a unique combination of soil and terrain conditions which have been identified and mapped in the field. These mapping units have been grouped into interpretive classes at three levels. The Soil Capability Class is the broadest category in the classification. These Classes are based on the severity and number of permanent limitations to agricultural use and as such indicate the relative suitability of the soil-land areas for agricultural development. No indication of the kind of limitation to crop growth is made at the Class level.

The Classes have been further divided into Soil Suitability Sub-classes. Sub-class units group soil-land areas which possess similar kinds and severity of crop limitations. Sub-class units are fairly similar in their limitations to crop production and as such each indicates similar needs for management and conservation.

Soil-land areas within each Sub-class have been divided into Performance Groups. It is at this level that agronomic predictions on crop performance have been made. These evaluations form part of the supporting information for the development decisions based on agriculture. The units can also form the groundwork for future planning in the region because they can be used to predict possible kinds and combinations of management and crop yield potential. This type of assessment however must await the results of more research.

Detailed explanations of the entire system are presented in the Soil Survey Supporting Report. A soil Capability Map (1″ = 1 mile) is compiled as part of the soil survey supporting material for agricultural recommendations made by this study.

Soil Capability Classes reflect the relative potential of the area for agricultural development (Table 11.2c). Class I soils are suitable for the widest range of crops, and they can be profitably cultivated under a moderate level of management. These soils generally occur on flat to undulating terrain and possess the fewest number and the least serious soil limitations for crop growth. They are deep, well-structured soils with good water and nutrient-holding capacities.

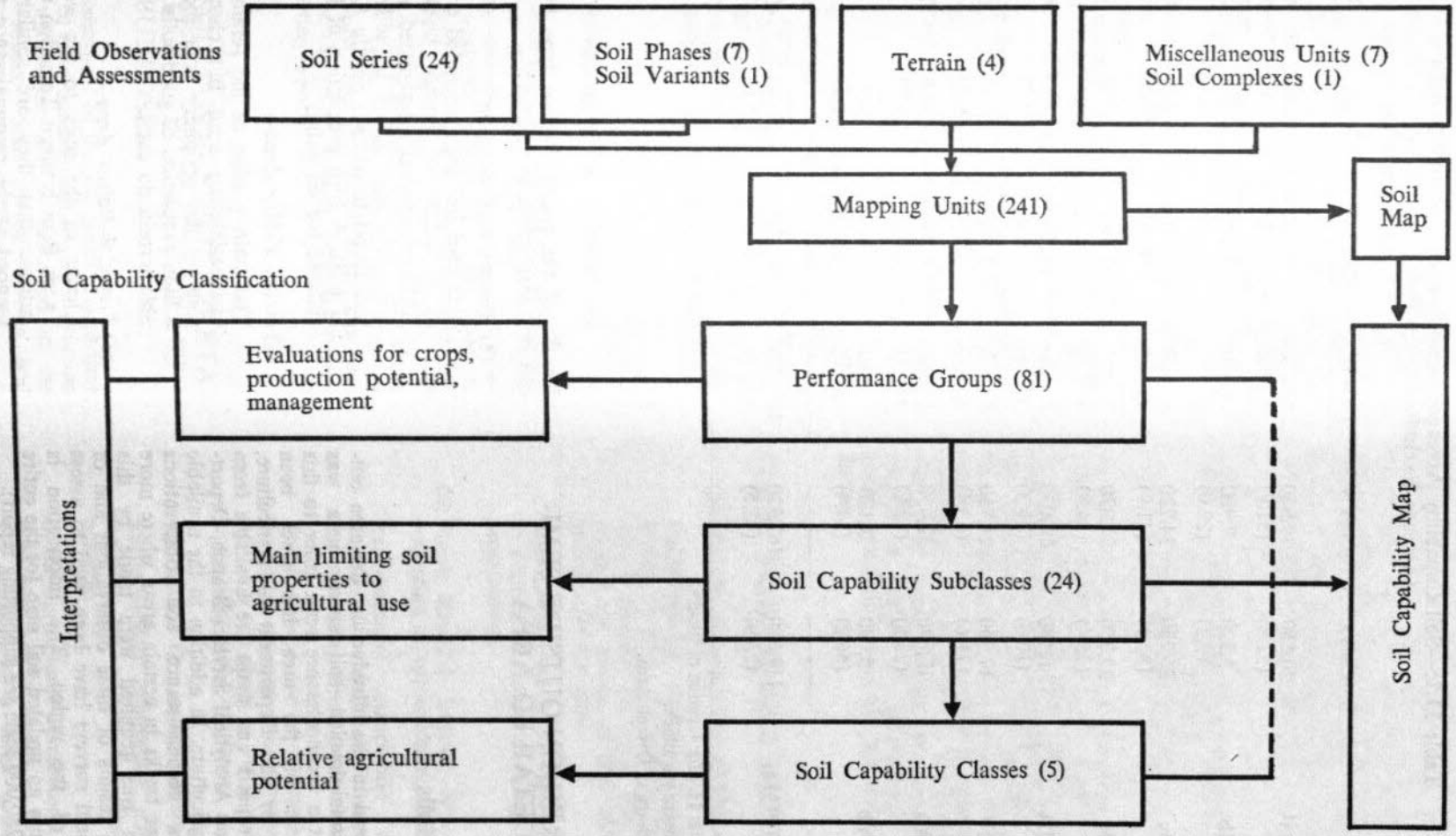
Class II soils are suitable for a narrower range of crops than Class I soils. A moderate level of management is necessary to obtain economic yields. Management practices may include erosion control, minor drainage and irrigation, or improvements in soil air and water relationships. These soils generally occur on undulating to rolling terrain and possess moderately serious soil limitations for crop growth.

Class III soils are restricted to a narrow range of crops. A high standard of management is required to develop or conserve them for long term crop production. Yields may be lower than comparable soils in Class I or II. Necessary management practices may include erosion control, an intensive fertilization and/or drainage or irrigation involving moderate expenses. These soils generally occur on rolling to hilly terrain and possess serious soil limitations for crop growth.

Class IV soils are limited to a very narrow range of crops and often only single crops. A very high level of management is required to maintain a moderate level of continuing productivity. Major conservation or amelioration measures are necessary if these soils are to be cultivated on a long term basis. These soils are generally on hilly terrain and may possess a number of serious soil limitations for crop growth.

Class V soils are least suitable for crop growth. Where they are not excavated for mining or quarrying purposes, they are best left in primary or protective forest.

Fig. 11.2—Diagram showing Relationship between Soil Survey Information and Soil Capability



Numbers in brackets indicate the number of individual categories

Table 11.2c—Soil Capability Acreages Semi-Detailed Soil Survey Area (Acreage Excluding Deep Peat)

	Class I	Class II	Class III	Class IV	Class V	Total
Block Ia[1] ..	20,560 (32.8)[2]	19,960 (31.9)	12,270 (19.6)	3,180 (5.1)	6,660 (10.6)	62,630
Block Ib ..	3,320 (9.2)	7,920 (22.0)	4,650 (12.9)	7,720 (21.4)	12,410 (34.4)	36,020
Block Ic ..	26,230 (32.1)	34,220 (41.9)	20,150 (24.7)	110 (0.1)	930 (1.2)	81,640
Block II ..	22,350 (25.4)	21,870 (24.8)	25,790 (29.3)	6,390 (7.2)	11,730 (13.3)	88,130
Block III ..	6,580 (10.0)	16,030 (24.3)	17,380 (26.4)	11,280 (17.1)	14,610 (22.2)	65,880
Block IV ..	17,360 (21.6)	26,750 (33.4)	23,340 (29.1)	7,720 (9.6)	5,090 (6.3)	80,260
Block Va ..	17,890 (23.5)	32,450 (42.6)	14,550 (19.1)	4,500 (5.9)	6,760 (8.9)	76,150
Block Vb ..	5,090 (56.2)	3,120 (34.4)	540 (6.0)	310 (3.4)	— (0.0)	9,060
TOTALS ..	119,380 (23.9)[3]	162,320 (32.5)	118,670 (23.7)	41,210 (8.3)	58,190 (11.6)	499,770

[1] *See* Fig. 11.2 for location of Blocks.

[2] Percentage per Block.

[3] Percentage of Overall Area.

11.3 REGION OUTSIDE SEMI-DETAILED AREA

11.3.1 Soils

As mentioned in the introduction, the area outside the semi-detailed soil survey area was surveyed at a reconnaissance scale prior to this study. Some of the area has since been resurveyed by the Department of Agriculture, K.L. The reports and maps are available from the Soils and Analytical Services Branch, Department of Agriculture. In addition to the available information, reconnaissance soil observations along timber tracks in certain areas where more information was required were made by this study. The results of these observations and of the additional surveys have been used to assess the soils of the region. The information is compiled into an updated soil map for the entire region. (1:250,000 scale *see* supporting report).

Results of the reconnaissance type field checks can be summarized as follows:

(1) *Rompin Plateau Area*—

This area has been upgraded considerably as a result of timber track surveys. Although originally designated as Class III soils with some Class II, soils, the area was found to contain mostly Class I and II soils. A high proportion of the area is suitable for oil palm.

(2) *Jeram Valley Area*—

The main portion of the Jeram Valley is inaccessible by road but checks of the soils in the periphery area indicate that a high proportion of good soils on favourable terrain do exist.

(3) *Temerloh-Bahau Area*—

Checks of the soils to the west of the Tasek Bera between Temerloh and Bahau indicate that they are similar to those mapped at the reconnaissance scale.

The updated results of the surveys completed by the Soils and Analytical Branch, Department of Agriculture can be summarized as follows:

(1) Pekan D.I.D. Scheme (approximately 101,500 acres). The most pertinent result was the remapping of a small area of organic clay and muck as deep peat. Minor changes in soil distribution and soil types were made.

(2) Endau—Rompin D.I.D. Scheme (approximately 121,000 acres). In this area large acreages of soils mapped as organic clay and muck were remapped, mostly as deep peat. Other minor changes in soil distribution and soil types were initiated.

(3) Bukit Ibam Area (approximately 32,000 acres). The information is basically similar to the reconnaissance findings with more accurate delineation of soil patterns.

In addition to the areas resurveyed by the Department of Agriculture, the Ladang Pegawai Area has been resurveyed by the company concerned. Some of this information has also been used in the updated map. Their information is generally similar to the reconnaissance surveys with more accurate delineation of soil patterns.

11.3.2 Assessment for Agriculture

It has not been possible to define the agricultural potential of the entire area with the same accuracy as was done within the semi-detailed area. All available information was used to group the soil and terrain conditions into Soil Capability Classes. Future soil surveys will indicate more accurately the extent and usefulness of the soils outside the semi-detailed area. A Soil Capability Map (1:250,000 scale) has been prepared for the entire Pahang Tenggara region. (*See* supporting report).

11.4 SOIL SURVEY INTERPRETATION FOR ENGINEERING PURPOSES

A broad assessment of the soil conditions as they are related to road building and town construction has been undertaken and is described in the supporting report "Soil Survey Studies and Interpretations in the Pahang Tenggara."

In general, soil conditions in most of the region and especially in the eastern portion are favourable for road building. In the extreme western part of the region some limitations exist because the soil and underlying mantle consist of massive, firm clays. Several limitations exist in the peat and steepland areas.

11.5 AREAS REQUIRING MORE SOIL SURVEY INFORMATION

In the context of regional development over the next two decades, more soil survey information is required for effective implementation and complete fulfilment of the goals and objectives of the masterplan. In this regard the study recommends various soil surveys throughout the region to fill present gaps in information. An assessment of the purposes, detail required and timing of these surveys is provided in the supporting report. A generalized breakdown giving some indication of priority is presented below.

11.5.1 Future Detailed Soil Surveys

(*a*) MARDI Research Site (2,500 acres).

Recommended completion date: Either before clearing commences or after the area is cleared. Timing of this survey will depend on timing of the MARDI programme for the area.

This area should be surveyed immediately to facilitate detailed planning of research programmes.

(*b*) Forest Research Institute Sites (five sites consisting of approximately 120 acres).

Recommended completion date: As requested by the Forest Research Institute but not during clearing operations.

These areas should be surveyed to confirm that they contain soils representative of the main soil series in the Bukit Ibam and Lesong Forestry Complexes.

(*c*) Agricultural Development Units.

Recommended completion dates: After clearing but within the first year of planting.

In the agricultural development areas, the need and type of survey to be completed will depend to a large extent on the

implementation agency in individual areas. Private holdings may be surveyed on a request basis through the Department of Agriculture, or privately. It is assumed that governmental agencies such as FLDA will continue their policy of having detailed surveys carried out by the Department of Agriculture. Phasing of these surveys should follow the masterplanning phasing for the agricultural development units. Priority should be given to areas designated for diversified agriculture as well as an area along the Rompin River where a detailed study is being proposed.

11.5.2 Future Semi-Detailed Soil Surveys

It has not been possible to assess the entire region at a semi-detailed level of soil survey. Although all of the agricultural areas to be phased in during the Second Malaysia Plan period and almost all of the areas for the Third period have been surveyed in semi-detail, further semi-detailed surveys should be attempted for this latter period and for the second decade of development to verify the predictions made from the reconnaissance information. This is particularly true for areas which have soils developed on sedimentary or metamorphosed sedimentary rocks.

The requirements and timing of such surveys have been based on the projections for future land use. The required surveys have been grouped into 9 individual units according to access, purpose of survey, timing and detail required. Approximately 135,000 acres should be completed so results can be incorporated into planning for the Third Malaysia Plan Period (1975-1980). Results from a further 237,000 acres of semi-detailed soil surveys together with results from 200,000 acres recommended for detailed reconnaissance should be available for the second decade of regional development (1980-1990).

12.0 AGRICULTURE

12.1 METHODOLOGY

As called for in the terms of reference one of the main objectives of the Study was to draw up an agricultural development plan which minimized the acreage allocated to the traditional crops of rubber and oil palm. Thus the terms of reference instructed the consultants to "assess the agricultural potential of the region and identify specific areas for cultivation of a wide range of economically attractive crops—with particular attention given to the suitability of the area for crops other than rubber and oil palm".

The initial approach therefore was to determine, on the basis of soil and climatic data available, the limiting constraints to the agricultural development of the region. A number of agriculturally suitable areas within the region were defined on the basis of predominant soil classes, roughly similar rainfall patterns and a general suitability rating. A preliminary list of approximately 60 crops and livestock opportunities that were considered to merit further attention was refined by detailed investigation and sorted into four general categories—those with the best overall rating and the greatest potential for production on a relatively large acreage, those which appeared to have potential only on a relatively limited scale, those that did not warrant further study and those upon which the decision was reserved pending more detailed investigation into critical factors described in the preliminary analysis. For details of preliminary crops evaluated but not contained in this section see Working Paper No. 9 "Possibilities for Agricultural Development in Pahang Tenggara".

The agronomic investigations included an assessment in general terms of the land preparation requirements as well as the requirements for fertilization, planting, drainage, irrigation, total water supply, cultivation methods, disease and pest control measures for each of the preliminary select crops. Further, the existing land tenure systems and management systems were critically examined in order to determine any changes that should be recommended. Also included was an examination of the existing agricultural credit policies and facilities and an assessment of the training requirements of any agricultural programme that might be recommended.

The detailed economic evaluation took the form of a cost benefit analysis of the crop in question on a size of farm operation that was large enough to permit economies of scale to be gained. It was agreed between the client and the consultants that no attempt would be made to calculate so-called shadow or accounting prices. All benefits and costs were formulated in terms of current and anticipated market prices and all costs associated with bringing the crop into production except social infrastructure costs were assigned to the crop being analysed. Considerable emphasis was given to the sensitivity of the economics of the crop in question to changes in the values of major inputs and outputs. Again in consultation with the client, it was decided that the net present value of the discounted benefits would be the main micro economic decision making criterion with 10% being the so-called cut off rate. The internal rate of return for each crop was calculated and in order to aid in the master-planning, value added per worker employed was also calculated and used in decision making. In addition to the cost benefit analysis of sole crop or livestock enterprises, linear programming models were used to examine the variables involved in mixed cropping estate or smallholder agricultural operations.

12.2 PROSPECTS FOR DEVELOPMENT

Consideration of the above factors by an analysis of 31 enterprises resulted in the classification of agricultural prospects as shown in Table 12.2a.

12.2.1 Category I—Opportunities for Large Scale Commercial Production

The Government's agricultural policy is to establish new enterprises and to reduce the present dependence of the economy on rubber and oil palm production. In spite of this the proposed cropping plan is dominated by these two crops during the Second and Third Malaysia Plan periods. The reasons for this are as follows:

(1) The amount of alienated land in the project area which is being developed in the region at the present time. Much of this land is committed to oil palm and comprises a large portion of agricultural development during the 1971-1975 period.

(2) The desire to attain a rapid rate of land development in order to have the Pahang Tenggara region contribute to the employment goals of the Government. The immediate opportunities for establishing other agricultural activities on a scale to meet this goal are limited because of the risk inherent in planting unproven crops.

Through time as the potential of other crops and livestock enterprises is proven, the diversification acreage could be increased by diverting land now scheduled to be planted to rubber and oil palm after 1975. It is therefore important not to consider the proposed plan of development as fixed with regard to land use, but to evaluate potential agricultural opportunities periodically as the plan is being implemented in order to take advantage of new opportunities which arise as the result of changed technical and economic conditions.

Under the cost, yield and price assumptions used by the consultants (see Study Papers No. 18 and 19) oil palm is likely to be more profitable than rubber planted in the next five years but after that date, if stimulation and improved clones are successful in increasing rubber yields, the profitability of the two crops is about the same. However rubber is estimated to give a higher net return than oil palm on Class III and IV soils. Thus, land of this class rating is recommended for rubber. Whereas land of Classes I and II is recommended for oil palm and diversification crops.

12.2.2 Category II—Opportunities for Commercial Production on a Limited Scale

The most promising new activities for the region are considered to be the development of a beef cattle industry; tapoica and sago production for conversion to pellets for animal feeds, fruits for fresh consumption and for canning; lowland tea, dairy cattle and pigs and poultry to supply the local demand for these products. Beef cattle, tapioca and sago pellets and canned fruits could be produced in the area to supply West Malaysian and export markets since the climate and soils are suitable for these products, relatively large areas of land are available in Pahang Tenggara to develop these industries; and transport of marketing disadvantages do not limit their profitability. Dairy cattle, pigs, poultry and fresh fruit production may be limited in scope for the Pahang Tenggara region for at least 10 years, since the major markets of Singapore and Kuala Lumpur are quite some distance from the region and producers of these products will be at a transportation disadvantage compared to producers located closer to these markets. Thus, future areas recommended for these enterprises depend mainly on the built up of population within Pahang and the pressure on land use close to the population centres of West Malaysia. Lowland tea is suggested for a small area to supply a product which will find a market in West Malaysia.

The ultimate scale of these enterprises will be determined by market constraints and by the pace of adaptation of technical knowledge rather than by suitability to the physical environment. Enough is known about them to warrant their early introduction in the region on a limited commercial scale.

The following sections describe in more detail the enterprises recommended for immediate development.

12.2.2.1 Beef Cattle

A commercial beef industry in Malaysia will be able to provide for an expanding market both within Malaysia and in South-East Asia and Japan. Such an industry would have to utilize both improved cattle and feeds. Cultivated grasses and legumes are available which have a high yield potential in Pahang Tenggara. The establishment of improved cattle will involve a long breeding and multiplication programme. This development period is also necessary to prove the technical aspects of production under Malaysian conditions and to train managers and workers. Major expansion of the industry especially for export markets will occur therefore only after this development period. The plan suggests that three projects be started before 1980.

Table 12.2a—Classification of Agricultural Prospects

CATEGORY DESCRIPTION	CLASSIFICATION OF ENTERPRISES BY CATEGORY
CATEGORY I	
Crops which offer immediate opportunities for large scale commercial production	Rubber Oil Palm
CATEGORY II	
Crops and livestock which provide opportunities for commercial production on a limited scale at present, with possibilities for expansion later. Some additional research is required for this group and should accompany early production efforts.	Beef Cattle Dairy Cattle Pigs and Poultry Fruits for Fresh Consumption and Processing Tapioca Sago Lowland Tea
CATEGORY III	
Crops which require an initial programme of research and field testing under local conditions before commercial production can be recommended. It is considered that sufficient interest and potential exists to justify the necessary investment in research for the crops in this category.	Cocoa Maize Sorghum Groundnut and Soyabeans Cashews Ramie
CATEGORY IV	
Crops which were considered but are not recommended for commercial production for a variety of reasons. In some cases, however, there is scope for production on a relatively small scale to meet local consumption needs.	Bananas Pineapples Coconuts Rice Vegetables Sugar Cane Nutmeg Cinnamon Castor Brazil Nuts Coffee Grass Meal

12.2.2.2 Tapioca

Climatic conditions in the project area are suitable for successful cultivation of tapioca. Domestic demand for tapioca based starch products will expand slowly but the major potential demand is for pellets for the livestock feed industries in Europe and possibly in Japan, as well as for the expanding domestic livestock industry.

The consultant's analysis of the crop indicated that if yields can be obtained in the range of 14-15 tons of raw roots per acre under continuous cropping in rotation with a green manure crop it is profitable at the expected export market price for pellets. However, a research programme is necessary to prove the varieties and cropping systems which are best suited to this programme. The plan recommends the development of an initial area of 1,300 acres under a commercial research programme with expansion of up to 17,000 acres planted to the crop by 1980.

12.2.2.3 Sago[1]

Sago thrives under ecological conditions which are unsuitable for other crops. The wet equatorial climate of the project area is suitable for the crop and the consultants have recommended that the areas of Briah and Akob Soil series which cannot be drained economically and which are subject to flooding are suitable for the cultivation of the crops.

The product obtained from sago is similar to that from tapioca and has the same market potential for livestock feed. Sago is not grown as a commercial plantation crop anywhere in the world but the analysis made indicated that a reasonable potential exists. Therefore, the plan recommends that 600 acres be planted as soon as possible on suitable soils in the area in order to test the potential of the crop under commercial conditions. If the crop proves successful the plan includes another 4,300 planted to the crop by 1980.

1 The Steering Committee suggested that sago should be a Category III crop but the Consultants concluded that the best method of testing the commercial feasibility of the crop would be through a small sized public estate and that this should be established within Pahang Tenggara because of land availability.

12.2.2.4 Lowland Tea

High rainfall without prolonged dry periods make the study region very suitable for cultivation of lowland tea The soils of the region are also quite suitable for the crop. High yielding clones of good quality lowland tea are available for planting. The export market is limited for this product but potential exists for import substitution for the lower quality teas. The analysis of the corn indicated that potential profit of such an estate is very good if yields are in the 4,000 lb. per acre range and also that the crop is quite labour intensive. The plan includes provision for developing one estate during the 1971-80 period.

12.2.2.5 Fruits

Annual rainfall and rainfall distribution within Pahang Tenggara allow successful cultivation of a wide range of fruit tree species and fruit plants. Most fruit species require deep, well-drained soils and most soils in the area will satisfy this requirement. Commercial production is possible provided that lime and fertilizers are applied, improved planting material is used, and husbandry is at a reasonable level.

New settlers in the area will grow fruits for family use and for local markets but the area provides conditions for the establishment of a fruit industry. The analysis of this industry indicated that a commercial canning factory linked by contract with smallholders providing the fruit would be profitable and 3,000 acres have been recommended for this use by 1980. The fruits recommended as a basis for an early production programme include banana, pineapple, papaya, passion fruit and guava. Other fruits suitable to the area which would have a market either in the fresh state or for canning but for a number of reasons cannot be recommended for immediate planting on a commercial scale are soursop, pomelo, musk lime (limau kasturi), common lime, durian, rambutan, duku and langsat, chempedak, nangka (jack fruit), rambai, chiku, avocado and kundangan. It is recommended that the research programme for the area include as many of the above fruits as possible to evaluate their potential.

Table 12.2*b* summarizes the economic evaluation of Category I and II crops.

Table 12.2b—Summary of Economic Evaluation of Category I and II Enterprises[2]

	Oil Palm	*Rubber*	*Beef*[1] *Multiplication Unit*	*Tapioca*	*Sago*	*Tea*
Internal Rate of Return	13.2%	11.8%	9.5%	13.6%	11.4%	+25%
Net Present Value Per Acre @ 10%	$ 430.	$ 311.	$ 8.	$ 240.	$ 229.	$ 5,595.
Undiscounted Negative Cash Flow per Acre	$ 1,353.	$ 1,650	$ 2,570.	$ 914.	$ 1,520.	$ 3,368.
Total Employment at Maturity	531	1,283.	55	169	157	707
Planted Acres Per Estate Worker at Maturity	18.1	7.1	54.5	20.7	4.1	1.6
Scale of Enterprise Evaluated	10,000 ac.	10,000 ac.	3,500 ac.	3,500 ac.	640 ac.	1,150 ac.
Class of Soils	1 & 2	3 & 4	1 & 2	2	4	2-3

[1] In about five years when better quality foundation stock are available within Malaysia and the Unit does not incur imported prices for this stock, the I.R.R. of these units increase to 13.9% and N.P.U. per arce 10% to $623.

[2] Fruits for processing were not evaluated as a combined enterprise but net returns for a small processing plant were in excess of 20% per annum and returns to smallholdings planting fruits were above 25%.

Dairy cattle established after 1980 to supply local markets gave an I.R.R. of about 15%. Similarly poultry and pig enterprises to supply local markets gave I.R.R.s in the range of 12–17%.

12.2.3 Category III—Crops Proposed for Further Research before being Planted on a Commercial Scale

The crops listed under category III in Table 12.2a are those which in the preliminary analysis are indicated to be potentially profitable but which for technical reasons could not be recommended for immediate plantings on a commercial scale.

The first of these crops is cocoa. The preliminary analysis of this crop indicated that the crop is less profitable than rubber or oil palm when planted on new land even if reasonably high yields are assumed. The crop has proved to be profitable when planted as an intercrop under established coconuts on the west coast of West Malaysia and also has been successfully grown as a sole crop in East Malaysia. However, in view of the extra cost associated with establishing cocoa as a sole crop on newly cleared jungle land and because of the problems which still exist for the crop in the project area, the crop is recommended for further research before commercial plantings in the region are recommended.[1].

[1] The Steering Committee suggested that cocoa should be a category II crop but the consultants concluded that further research results are needed before it can be recommended for planting commercially within Pahang Tenggara.

The second group of crops in this category were the annual crops of maize, sorghum, groundnuts and soyabeans. The preliminary analysis of these crops indicated that the economic return using existing varieties and yields was less than for rubber and oil palm. These crops were included in the linear programming analysis under both smallholder and estate systems of operation. In the L.P. analysis the category I and II crops were all more profitable unless either labour or capital were restricted enough to limit the land used by the category I and II crops. Planting of them on a large scale depends upon obtaining varieties which have a higher yield potential and with a lower yield variability under Pahang Tenggara conditions.

Cashew has been tried on the east coast of West Malaysia with the results to date being disappointing. The preliminary analysis of the crop using yield levels which have been obtained in only one year in four from existing plantings gave a low return to land and labour and an intermediate return to capital.

Ramie is a crop which thrives in the climate and soils of the project area. If yields can be maintained at the 20-30 tons of green material per year and if the technical problems of extraction and

degumming of the fibre are overcome the crop provides a good capital and labour return. However, a full range of management and production studies is required before the crop can be recommended.

12.2.4 Category IV—Crops Considered but not Recommended for Commercial Production

The crops listed under category IV were not recommended for commercial production for a variety of reasons. Pineaples, coconuts, rice, sugar-cane and grass meal were not recommended because of low expected returns to land and capital compared to category I and II crops when planted on the predominant soils in the region. The climate of the region is unsuitable for sugar-cane, vegetables, castor bean and coffee. Market availability will limit the production of bananas, vegetables, nutmeg, cinnamon, coffee and grass meal. Lack of research data about the crop was the main reason for not recommending Brazil nuts and castor beans.

It is expected that some of the crops in this category will be grown by smallholders for family use and to supply local markets. These crops are bananas, pineapples, coconuts, vegetables and rice.

In order to test diversification possibilities under as wide range of conditions as possible, it would appear that appropriate arrangements should be made with the Pahang State Department of Agriculture and interested production agencies to participate in the establishment and supervision of field trials for the crops mentioned. It will also be desirable for these bodies to have full access to all research results generated by MARDI.

It is essential that maximum use be made of research findings and to help achieve this end, it is recommended that one person or agency be assigned the task of assembling research results and putting them in a suitable form for use by extension workers, agriculturalists and farmers. Research officers have a prime responsibility to co-operate in this effort by making information readily and regularly available.

It is also recommended that the Government give full manpower and financial support to this effort including long term guaranteed funding for a period of up to seven or eight years.

12.3 REQUIREMENTS AND PROPOSALS FOR RESEARCH

A thorough well managed programme of agricultural research is needed before agricultural diversification on a large scale could take place within Pahang Tenggara. The required research is essentially of three types.

First, there is the basic or fundamental research such as the kind required in the breeding and selection of new or improved varieties of plants. Also in this category would come development work on disease and insect control.

A second type of research is the applied or adaptive type which is necessary to determine crop response under regional or localized conditions of soil and climate and at various levels of fertility. Limiting requirements as well as control measures for weeds, insects and disease should also be tested. In order to obtain reliable, comparable data, such research must be carried out continuously in the form of carefully planned controlled experimental plots which are usually rather limited in size. They are also very specific as regards the enviromental conditions existing at the precise location where they are established. Another aspect of this adaptive research consists of solving production problems as they occur in the field. This type of research will be the main thrust of the research programme carried on within the region.

The third category may best be described as field trials which approximate as closely as possible conditions prevailing at the commercial production level. Depending on the crop, available resources of land, money and manpower, and numerous other factors, such field trials may occupy, and should preferably occupy, areas of sufficient acreage to obtain the necessary experience on which to base recommendations for extensive plantings in the region. In some cases, such trials may be carried out in conjunction with commercial scale production. Recommendations have been made as to where and when such trials would be appropriate.

12.3.1 Agency Responsible, Establishment of Facilities and Site Selection

It is recommended that Malaysian Agricultural Research and Development Institute (MARDI)

be responsible for launching the required programme of agricultural research in Pahang Tenggara.

A 2,500 acre site has been selected on which to locate the main research station. It is situated approximately fourteen miles from Bukit Ibam on the alignment of the former Rompin mine railway. It is therefore immediately accessible, which will allow an early start to be made. Soils and terrain are satisfactory for development of a well-balanced, in-depth research programme. Soil types on the site are representative of the major soil types found in the region and considered most suitable for crop diversification. The site is adjacent to a proposed new town which could later serve as a headquarters for staff and facilities. In the near future the area will be accessible by means of an improved regional road network.

Bukit Ibam will serve as interim headquarters for staff since adequate living accommodation, facilities and essential services are available to permit a start being made.

Additional laboratory and other facilities will be required as soon as possible at the proper location, to support and ensure the success of the research effort.

It is recommended that a more detailed soil survey of the site be conducted as soon as possible to facilitate proper planning and implementation of the research programme. It will be extremely important to provide the necessary permanent fencing and otherwise arrange for adequate protection of the experimental crop areas in order to prevent damage by wild animals. No effort or funds should be spared in this regard. It is further recommended that priority be given to logging and clearing of the area so that the research programme can commence without delay.

12.3.2 Specific Research Needs of the Region

Within the broad framework of applied or adaptive research the following specific research objectives for the regional have been identified:

(1) to determine the effect on soils of clearing and burning of forests as is currently being practised in the region.

(2) to determine optimum soil management techniques for the soils of the region.

(3) to determine response to and optimum timing of fertilization for potential crops.

(4) to determine requirements for and responses to liming for potential crops.

(5) to determine the response of various crops to the climate of the region.

(6) to determine the best varieties and planting materials.

(7) to determine the optimum crop protection techniques.

(8) to determine the optimum cropping system and rotations.

(9) to determine accurate production costs of various crops when produced on a commercial scale.

(10) to determine the most suitable engineering systems with respect mechanized production, marketing and conservation measures.

12.3.3 Crop Research Needs

Certain specific crops have been identified which require varying degree and kinds of research in order to determine the extent to which they can be grown successfully in the region. These crops are considered below in groups. Group A crops are defined as these which require additional research before more than limited commercial production can be recommended. Group B crops are defined as those for which it is believed there is some potential for production on a commercial scale but which should not be proceeded with until more research and field trials have been carried out under local conditions.

Group A Crops—

(*a*) *Tapioca—*

Attention should be focussed on varietal selection, cultural trails and fertilizer and liming experiments in order to determine whether a system of continuous cultivation, in rotation with a green manure crop, is feasible in Pahang Tenggara and will result in sustained levels of production and profitability. Recommendations are outlined in greater detail in Study Paper No. 17. "Potential for Tapioca Production and Processing in Pahang Tenggara."

(*b*) *Sago*—

Thorough research on this crop has never been done and consequently available knowledge is very limited. Additional investigations are required in order to improve on existing information. Commercial trials are recommended to determine the development of sago palms on the heavy, badly drained soils of Pahang Tenggara, and also to determine influence of fertilizer application. The method and rate of starch formation requires further study. Market research should include assessment of the acceptability of sago pellets as an animal feed. Further details are provided in Study Paper No. 16. "Sago Production in Pahang Tenggara."

(*c*) *Fruits*—

Past research on fruits and other horticultural crops has been very limited. Concentrated effort is required in order to solve present and future problems if a successful fruit industry is to develop. Research should be geared to raising the currently low levels of production through a combined introduction and selection of promising high yielding planting material and the determination of the proper levels of fertilizer and limestone applications. Response to different soils and climatic conditions must be determined.

Horticulture research should be based on a broad, long term programme and should be geared to the development of fruit cultivation for the market.

Market research and development should receive priority since a suitable marketing system and available markets are prerequisites to a prosperous fruit industry. The control of pests and diseases is essential for intensive horticulture. Experiments with insecticides, herbicides, fungicides and nematocides are required. Priority should be given to research on non-seasonal fruit species since they are more conducive to the development of a successful processing industry. Detailed comments and recommendations are provided in Study Papar No. 21. "Potential for Fruit Production and Processing in Pahang Tenggara."

(*d*) *Livestock*—

To establish a sound basis for development of a beef cattle industry in the region, much additional research is required on production of grass under an intensive system of management on the most suitable soils and terrain. Selection of species, varieties and strains of the most suitable forage grasses and legumes is required. Fertilizers and lime requirements, establishment practices and management techniques in general need to be determined for the appropriate forage species. The economics of all grazing versus a cut-and-haul system need to be worked out as do the various engineering aspects of a partially or wholly mechanized system. Methods of preserving excess production for use in periods of low productivity deserve attention as do various feeding trials associated with the use of other fodder crops and the by-products of other agricultural industries. Livestock selection and improvement is also of prime importance. Study Paper No. 20 relative to livestock production may be referred to for additional information.

Group B Crops

(*a*) *Cocoa*—

Some serious problems still exist in the cultivation of cocoa in the region and therefore field trials to determine the response to the best available planting material to the environmental conditions in the region are required. Various soil types must be tested for suitability and fertilizer and lime requirements worked out. In particular, attention should be given to the influence of the diurnal temperature range which may well be too wide in some parts of Pahang Tenggara for successful cocoa cultivation. Investigations should be conducted with respect to the problems of vegetative propogation and related matters as well as husbandary and management of the crop in general.

The effect of the extent and distribution of rainfall on cocoa yields should also be investigated. Die-back may prove to be a problem which will require attention as well as various pests and diseases. Continuing market research on cocoa is recommended.

(*b*) *Maize*—

In view of the large importation of maize into Malaysia, and the general interest throughout the country in attempting to grow it on a commercial or semi-commercial scale, it appears justified to

conduct research on this crop in the region. Field trials would be required to identify the varieties best adapted to the humid climate and to the irregular rainfall pattern which is likely to exist. The most appropriate rotations with other crops will have to be determined as will the best soils, fertility requirements, cultural practices, diseases, insect and weed control measures, and marketing arrangements if the crop can be successfully grown.

(*c*) *Sorghum*—

Varieties of sorghum which show promise of high yields under conditions expected to prevail in the region have been developed. These should be tested in field trials. Since sorghum is a ratoon crop and is somewhat resistent to dry spells it appears that the chances for successful production in Pahang Tenggara are reasonably good. Bird control measures will require attention as will basic investigations involving soil suitability, cultural practices and fertility requirements.

(*d*) *Groundnuts and Soyabeans*—

The main factor with respect to these two crops involves their suitability to the climatic conditions in Pahang Tenggara. If suitable varieties can be found which prove successful from this aspect, additional work will be necessary to determine soil suitability, establish the proper rotation, ascertain response to lime and fertilizers and develop effective weed, insect and disease control programmes as well as appropriate methods for mechanized production. A lower priority is attached to the need for research on these crops than for others recommended.

(*e*) *Cashews*—

Attempts at cashew production on the east coast of West Malaysia have so far proved largely ineffective. The reasons appear to be related to an unsatisfactory climate, in particular the high humidity and irregular rainfall pattern, and to the lack of selected high-yielding planting material. There may be merit in conducting varietal trials, using selected planting materials believed to be currently available in Malaysia, in the interior of the region where a more suitable rainfall pattern may be found and where response on inland soils can be determined.

(*f*) *Ramie*—

Field trials are recommended to investigate the production of ramie on various soil types, including peat, if areas of suitable peat can be found. A full range of management studies on this crop is required as a basis for any future expansion. As a fibre, it has potential for blending with synthetics and there seems to be renewed interest in it for this purpose. Developments in solving the technological problems associated with processing the fibre should be followed closely.

12.3.4 Use or Results and Support Requirements

The research programme as outlined is considered necessary as a basis for successful agricultural diversification in Pahang Tenggara. It should enable various production agencies, including smallholders, to grow various crops with some assurance that their efforts will meet with success. At the same time, investment in inputs such as fertilizers, planting material, machinery and other items can more readily be justified.

Detailed descriptions of boundaries, acreages, suggested crops, and suggested development agencies are given in the Agricultural Appendix to the supporting report. Section 5.

12.4 THE AGRICULTURAL DEVELOPMENT PLAN

The preparation of the agricultural development plan involved basically the bringing together of all the work described above into a coherent, consistent plan for the development of the region. Essential to this was the correlation of soils and climatic information with the agronomic characteristics of the selected crop list. In this manner areas were identified that potentially could support the crops that are recommended. Total acreage requirements for development over the Second Malaysia Plan (SMP) period were derived from existing commitments in the region, the Second Malaysia Plan and discussions with the Economic Planning Unit.

The acreage recommended for each of the diversification crop and livestock opportunities were determined on the grounds of research and production experience relative to the crop elsewhere in Malaysia as well as what would be necessary to achieve economies of scale both on the farm and in processing facilities.

The acreage recommended for the traditional crops of oil palm and rubber were determined, first of all, on the extent to which land was already alienated to each of the crops in the region. In this regard, the intended cropping pattern in each of the areas concerned was evaluated on the basis of available information and in general was found to be a satisfactory use of the land. Secondly, the recommendations are based on the belief that the regional economy should avoid risk as much as possible through a "judicious mix" of oil palm and rubber. The judicious mix was considered appropriate especially in the light of the cost benefit analysis which did not reveal a significant difference either in the returns to capital and labour to the two crops or in their employment effects. Of necessity, the agricultural development plan is consistent with the overall masterplanning objectives and the phasing of development and was designed in that context.

The 250,000 acre objective was met by land within the semi-detailed soil survey area for the period up to 1975 and to a large extent for the period 1976 to 1980. However, in order to sustain the development during the latter time period at the same rate as during the former, as suggested by the EPU, it was necessary to select two areas totalling 69,000 acres outside the semi-detailed soil survey area. It is recommended that before development commences in these two areas, a semi-detailed soil survey be carried out.

Detailed descriptions of boundaries, acreages, suggested crops, and suggested development agencies are given in the Agricultural Appendix to the supporting report Section 5.

To arrive at the recommended land use pattern, oil palm was allocated to Class 1 and 2 soil suitability areas and rubber to Class 3 and 4 for the large scale development units. Land for diversified crops and livestock was selected separately based on the estimated special requirements for these enterprises and labelled as such in the Agricultural Development Unit Map.

12.4.1 The Initial Phase

12.4.1.1 The Second Malaysian Plan Period 1971-1975

A development target of 250,000 acres was established for the Second Malaysia Plan period. Of this total, an estimated 189,920 acres or 75%, is accounted for by prior commitments through alienation in the region. It is assumed that these commitments will be honoured and the areas developed during this time period. At the same time, it should be noted that areas already alienated and planted prior to 1971 are not included in the target total.

In terms of production agencies this 189,920 acres is comprised as follows:

(*a*) F.L.D.A.	98,700	Acres
(*b*) Nucleus Estates ...	72,420	„
(*c*) Ladang Pegawai ...	18,800	„

It is estimated that of the total 180,700 wil be planted to oil palm and the remaining 8,300 to rubber.

A further 17,500 acres of the target has been identified as folows:

(*a*) Re-settlement along the Pahang river	6,800 acres
(*b*) State Agricultural Industries Board scheme	3,700 acres
(*c*) Smallholder settlement of the fringe alienation type near Triang to relieve pressure for land in that area	7,000 acres

For crop allocation purposes it is assumed that most of this 17,500 acres will be planted to rubber, although a number of miscellaneous crops may be grown on small amounts of acreages.

An additional 43,100 acres comprising the balance of the target total, has been identified in the form of agricultural development units which have been allocated for various purposes in order to accommodate new activities as well as to meet the target. These units have been grouped together where feasible to form the most suitable project areas possible, in order to maximize management and processing efficiency and to facilitate development generally.

Table 12.4a—Cropping Pattern—1971 to 1975 (Net Crop Acres)

Crop	1971/72	1972	1973	1974	1975	Total
Oil Palm	20,100	40,600	38,300	53,700	45,600	198,300
Rubber	6,700	2,300	8,500	6,600	3,800	27,900
Beef	—	500	1,000	1,000	3,100	5,600
Tapioca	—	—	800	300	200	1,300
Sago	—	500	—	—	—	500
Tea	—	—	300	200	200	700
Fruit (Commercial)	—	—	—	600	700	1,300
Mixed Cropping	—	1,000	2,000	3,000	6,500	12,500
Research Station	—	500	500	500	700	2,200
	26,800	45,400	51,400	65,900	60,800	250,300

12.4.1.2 The Third Malaysian Plan Period 1976-1980

For the period of the Third Malaysia Plan, 1976 to 1980 a further total of approximately 319,000 acres has been identified as being suitable for clearing for agriculture. This should result in 271,100 net crop acres being available for planting.

The recommended cropping pattern is summarized in Table 12.4b. The recommended expansion of acreages planted to various diversified crops during the Third Malaysian Plan period is based on the level of success the Consultants expect to be achieved from the early research and field trials. If results are more favourable, additional acreages should be planted to these crops.

Table 12.4b—Cropping Pattern—1976 to 1980 (Net Crop Acres)

Crop	1976	1977	1978	1979	1980	Total
Oil Palm	32,800	26,500	27,800	14,900	12,500	114,500
Rubber	10,100	20,600	18,400	26,700	31,200	107,000
Beef	2,000	2,000	2,800	1,900	—	8,700
Tapioca	1,600	3,000	3,600	4,700	2,800	15,700
Sago	—	—	1,300	2,300	800	4,300
Tea	300	—	—	—	—	300
Fruit and other Diversified Crops..	3,500	1,000	2,900	9,200	4,000	20,600
	50,300	53,100	56,700	57,700	51,300	271,000

The desirability of having a higher proportion of diversified agriculture in the region is recognized and has been discussed in Sections 5 and 6. Table 6.2 provided an overall summary by crop for the period 1971 to 1980. Production agencies such as F.L.D.A. and nucleus estates could alter their planting programmes to include significant acreages of promising crops other than rubber and oil palm, if the research programme is successful. While it is considered that up to 20% of the area developed for agriculture by 1990, could realistically be used for diversified crops, it must be recognized that substantial restraints are imposed by such factors as climate, terrain and lack of proven research, production experience and adequate markets and marketing channels.

12.4.1.3 Commercial Feasibility Studies

As part of the initial phase programme 5 feasibility studies have been prepared to a level of detail suitable for submission to lending institutions. These reports are each separately bound and constitute appendices to the supporting report "Agricultural Development in Pahang Tenggara."

Oil Palm and Rubber

Detailed commercial feasibility studies have been prepared for a typical 10,000 acre oil palm project, for the Kertong F.L.D.A. oil palm scheme and for one rubber-tapioca scheme. No specific recommendations or special research requirements are made with respect to these crops since the production techniques are well known and information is readily available. It is recommended, that all new technology will be applied by the agencies which plant these crops.

Beef

A joint venture is recommended as being suitable agency for the initial beef scheme but either public or private estate organizations could be considered if suitable management and capital arrangements are made. Details of the joint venture system recommended are contained in the feasibility study report.

It is considered that the appropriate size for the initial unit is 3,500 acres which should be developed on commercial lines while at the same time serving as a multiplication unit for improved beef type breeding stock and as an applied research unit which could provide answers to many questions concerned with commercial beef production for Malaysia.

Importation of improved beef-type male and female breeding stock suited to the environmental conditions in the region is recommended as part of the cattle selection programme. These could be supplemented by crossbred females becoming available from dairy multiplication unit being established during the Second Malaysia Plan in other areas of West Malaysia. These animals could then be crossbred with beef type bulls to produce productive animals of good quality.

It is proposed that an intensively managed rotational grazing system will form the basis of the feeding programme for the cattle. Proper management and supervision of this initial beef enterprise will be a crucial factor in ensuring its success. Therefore, great care should be taken in choosing qualified, experienced management personnel.

Sago

A detailed feasibility study of a unit of about 600 acres has been prepared. Such a unit will provide economically valid results as well as ample opportunity and justification for a thorough research programme.

12.4.2 The Period of the Fourth and Fifth Malaysia Plans—1981 to 1990

Assuming that agricultural development proceeds at the rate projected during the Second and Third Malaysia Plan periods, there would still remain approximately 300,000 acres of land which, on the basis of a generalized assessment, would be suitable for agricultural development after 1980.

For purposes of estimating population, labour requirements, capital investment, tonnages of products, and settlement pattern for the overall masterplan it was considered necessary to assume certain tentative land use allocations for this decade of development. It should be stressed that these assumptions are based on very limited knowledge of the various areas and are therefore subject to amendment in the light of new and more complete information. Of the estimated 300,000 available acres, it has been assumed that 150,000 acres or 50% will be planted to rubber, 75,000 acres or 25% to oil palm and 75,000 acres or 25% to various diversified crops.[1]

The basic question as to whether these areas should be developed for agriculture or left under forest cover has been discussed in Section 7.1. Part of the 300,000 acres consists of flood-prone areas in the portion of the region covered by the semi-detailed soil survey, and a drainage and

[1] For the purposes of town population projections, any portion of an individual towns hinterland that was projected to be developed in the period 1981-90 was assumed to have this percentage crop breakdown. *See* supporting report "Settlement and Infrastructure in Pahang Tenggara."

flood control feasibility study of these areas has been recommended in 9.3.2, in order to assess their agricultural potential. Together with certain smaller areas of soils of the alluvial complex, these areas comprise about 25,000 acres.

12.5 PARTICIPATION BY PRODUCTION AGENCIES

The means by which the development plan is translated into reality is through the production agencies to which land is alienated and which develop projects. In order to achieve and maintain a balanced pattern, which provides diversity of opportunity, while at the same time assures steady and acceptable progress towards the plan targets, it is considered desirable to have a variety of production agencies involved from the beginning.

The two primary production agencies which are capable of developing the recommended crops and achieving Government objectives are large estates and FLDA, and their related roles have been discussed in Section 5.2.

12.5.1 F.L.D.A. Participation

This agency has a heavy initial participation amounting to 38% of the crop acres planted before 1976[1]. Two large schemes are already in progress and a third is scheduled to commence in 1972. Based on the assumption that these schemes will be developed and settled on schedule it is proposed that two additional new areas plus an extension to one of the existing schemes be made available for development by F.L.D.A. during the 1976-80 period. One of the new schemes involves about 34,000 crop acres and the other about 45,400 crop acres. The extension involves about 14,300 crop acres. Oil palm is the major crop being planted in these schemes during the 1971-75 period but during the 1976-80 period about 65% of the land will be more suitable for planting to rubber.

12.5.2 Public Estate Participation

This type of an agency provides an opportunity for private sector management to be employed under contract on a medium or long term basis on government owned and developed land. This arrangement could facilitate that work of the Research Station by providing land to try out a crop on a commercial trial basis as well undertaking full scale commercial production.

It is recommended that public estates be created to launch the trial commercial production units of fruits, sago and some of the rubber estates to be developed during the Second Malaysian Plan period and if the trial units are successful, several more should be established for diversified crops in later years.

12.5.3 Joint Venture Estates

Joint ventures provide a further opportunity to take advantage of the experience and technical expertise of the private sector, while at the same time retaining an element of public sector participation. The form of joint venture organization may vary but in general it is recommended that the private firm provide one half or more of the equity capital and have management responsibility.

It is recommended that joint venture estates be the means of establishing one of the initial beef cattle schemes and the tapioca-rubber combination scheme. In addition, several oil palm and rubber estates are recommended for joint ventures developed during the 1976-80 period.

12.5.4 Private Estates

Private sector estate involvement in the region is already substantial in the form of nucleus estates and the Ladang Pegawai estate. It is recommended that two additional areas suitable for oil palm be allocated for private estate development before 1975 and that other areas recommended for development during the 1976-80 period be made available to this type of organization in order to maintain a reasonable balance of opportunities between public and private sector development.

12.5.5 Private Smallholdings

Some smallholder activity already exists in the region, located mainly on the periphery. More has been recommended as part of a trial programme of mixed cropping. Allowance has also been made for limited expansion of existing smallholdings on the western boundary of the region to alleviate pressure for land in that area.

[1] Table 5.2 this volume.

The areas recommended for mixed cropping during the Second and Third Malaysia Plan periods and some of the areas recommended for smallholder rubber and diversified crops could be developed by smallholders. FELCRA could be the appropriate agency to assist the development of these areas by smallholders.

12.6 CROPPING SYSTEMS

The traditional cropping systems followed by the present agriculture industry in Malaysia tends to be a monocrop system on estates and a mixed system on smallholdings. Estates may operate a mixed system under one management when different soil types and planting decisions have dictated two crops within the estate. Also, estates operate an intercropping system when two crops such as coconut and cocoa are the best use of the land, but the general situation which prevails is for a single crop under one management on each estate.

Smallholdings tend to have a mixed system with one crop providing a cash crop combined with other crops which provide food for the family.

The study considered that the development of diversified crops in the area would have a greater chance of being successful if systems other than the traditional dependency on monocrops by estate were adopted. Accordingly, several analyses were made of mixed and intercrop systems on both estates and smallholdings. These analysis used linear programming models of estates and smallholdings to maximize profits to fixed land and labour resources involving several enterprises.

On estates, poultry enterprises combined well with rubber and oil palm to improve labour returns. A combination of about two-thirds oil palm and one-third rubber gave the best labour and capital return. If capital was very limited for estates a rotation of tapioca, other annual crops such as maize, sorghum and groundnuts with rubber gave the best labour and capital return but reduced the return to land compared to the rubber, oil palm, poultry combination. The analysis also indicated that rubber with grasses for beef intercropped could be a successful combination which increased land and capital return.

On smallholdings rubber combined well with short-term crops to increase labour efficiency and to minimize capital investment. The most profitable combinations involved about one half the land in rubber with the remainder planted to bananas, chillies, groundnuts and tapioca.

Thus, it is recommended that both estates and smallholders be encouraged to consider mixed crops and intercrops where possible. Of course market, soils and management constraints will limit the applicability of the above analysis but the areas suggested for rubber smallholdings and for diversified crop should be considered for agencies which would develop mixed cropping or intercropping. In addition recommendations have been made for small private estates of 100 to 1,000 acres to develop some of these areas and crops.

Finally if the short term annual crops prove successful for the region a system which combines elements of intercropping and mixed cropping to obtain maximum production and returns from a unit of land may be used. Recent and current research at the International Rice Research Institute in the Philipines is concerned with intensive multiple cropping. Depending on the sequence and combination of crops in the rotation, from three to five crops can be obtained from the same piece of land in one year. Results have been encouraging to date. Further investigation of this system, as part of the research programme of MARDI is recommended. The appropriate agencies to develop this system if it proves successful in Malaysia would be small private estates or smallholders supported by effective extension service involving a multi-disciplinary team of extension workers.

12.7 SUPPORTING SERVICES AND INPUTS, EXTENSION AND CREDIT

The most important supporting services required are in the fields of agricultural extension, agricultural credit, and assistance in processing and marketing. The organization of these services will have to be geared to the requirements of the various production agencies which will operate in the region.

It is assumed that large scale operations such as estates and F.L.D.A. will have adequate contact with the proposed Research Station and other sources of information through normal existing channels of communication. Therefore no services additional to those already in existence in

Malaysia for these types of organizations are proposed. It should be noted however, that F.L.D.A. developments eventually become smallholdings and as such will need agricultural extension, agricultural credit, and some assistance in processing and marketing. Appropriate measures will need to be evolved but the requirement is not immediate in the region.

Suitable extension facilities will be required from the very beginning of the region's development for the 1,640 settler families that are expected to be in the region by 1975 in four different smallholder settlement areas. It is recommended that an extension officer for each of the areas and one coordination officer be provided to offer extension advice and assistance to these four areas. Where rubber is planted in these areas, the smallholder advisory service of the Rubber Research Institute will have a role to play. The need for extension services in total will increase in proportion to the rate and extent of smallholders development.

Credit facilities will be required if the smallholder agricultural programme is to be successful. The establishment of a branch of the Bank Pertanian in one of the major urban centre of the region is recommended. The bank should be equipped with mobile units which would provide in the home banking services throughout the region as required. Credit should be provided at market rates of interest and if subsidization is found to be required, it should be effected through farmer's organizations by discounts on farm inputs. It is estimated that annual loans in the amount of $500 to $1,000 per ten acre plot will be required.

12.7.1 Lime

Because of the high acidity of the soils in Pahang Tenggara, diversification on a large scale will require significant amounts of agricultural lime. Other beneficial properties of liming are widely recognized and are discussed in detail in section 7.2 of the supporting report. Theoretical requirements to correct the acidity level of the various soils in the region have been calculated. On the assumption that up to 100,000 acres could be planted to diversified crops during the period 1976 to 1990, it is estimated that a total amount of 150,000 tons would be required over this period, the annual requirement being about 10,000 tons. The maintenance requirement would gradually increase from 3,300 tons per annum to 33,000 tons per year in 1990. The limestone deposits located outside, but relatively close to the region have been identified and should be developed to meet these requirements.

12.8 LAND ADMINISTRATION, LAND USE REGULATIONS AND LAND TAXATION

In order to facilitate the development and use of land in Pahang Tenggara for agricultural purposes, certain measures concerning land administration are considered desirable and are put forward as recommendations.

Apart from the obvious need to expedite boundary surveys as quickly as possible, it is essential that applications to obtain land be processed within a very short time period (*See* "Organisation and Implementation of Pahang Tenggara Development." This is particularly important in the case of foreign private sector investors who could easily choose to go elsewhere if undue delays are encountered.

Changes in the land premium and quit rent system are also considered desirable. The proposals put forward by the South East Johore Regional Masterplanning Study in regard to this matter have been considered as well as the existing situation.

The resultant recommendations for Pahang Tenggara are as follows:

12.8.1 Land Premium

(*a*) Instead of charging a standard land premium of $50 per acre, as at present, a variable minimum rate based on the soil capability classification for the region should be applied.

This is considered preferable to a system of charges related to the crops recommended or approved for specific blocks of land, since it makes possible and encourages greater flexibility in choice of crop and is based more directly on the potential productivity of the soil.

(*b*) A suggested minimum premium schedule based on this system is:

Class I Soils	...	$80 per acre
Class II Soils	...	$60 per acre
Class III Soils	...	$40 per acre
Class IV Soils	...	$20 per acre

In the event that administration of this system should prove too difficult,

simplification could be achieved by re-grouping the soil classes for premium purposes into two or three groups instead of four.

(*c*) It is assumed that the premium would be payable as the land is developed. However, if it were considered necessary or desirable to provide an incentive for the private sector to participate, payment of the premium could be delayed for a period of perhaps five years after signing of the agreement to allow time for the crop to come into production.

(*d*) Application of this system would leave the operator free to grow whatever crop he wished, subject only to the requirement that proper soil conservation measures be observed in accordance with criteria to be established by legislation.

Responsibility for reporting violations and prosecuting offenders would rest with the Ministry of Agriculture and Lands, in co-operation with the State Government.

(*e*) The system as outlined would apply to all potential users of land with the exception of smallholders, for whom the premium would either be waived entirely or special grants or loans made available to them to acquire land.

(*f*) In as much as it may be more efficient for government to plant and develop smallholder settlements than for the private sector to do so, it is proposed that funds to finance such developments could be raised by tendering for the premium on all land to be made available to the private sector for agricultural purposes. This would be similar to the logging licence system now used.

(*g*) The tender system could be controlled by the State Executive Council. The minimum tender accepted could be the level suggested in item (*b*) above, unless it was considered that other development conditions warranted acceptance of a lower amount.

(*h*) This system would encourage the economic use of the land, and if tenders were accepted which were higher than the proposed schedule, the money would be available for government to use in other aspects of land development.

12.8.2 Quit Rent

(*a*) With regard to quit rent charges, it seems appropriate that they be related to size of holding. Commercial sized holdings could fairly be taxed at a higher rate than single family smallholdings. This would assist smallholders to achieve a higher standard of living which is a major policy goal of the Second Malaysia Plan.

(*b*) The proposed quit rent schedule for various sized holdings would be:

Up to 20 acres	...	$ 6 per acre
20 to 100 acres	...	$ 8 per acre
100 to 500 acres	...	$10 per acre
Over 500 acres	...	$12 per acre

These rates would be payable only when the crop being grown comes into production.

12.8.3 General

Since the suggested changes in premium and quit rent charges would not necessarily encourage the development of livestock and diversified crop enterprises by the private sector, it is suggested that tax incentives could be made available.

These could be similar to those granted to pioneer industries and should apply to projects of this nature started during the first ten years of development of Pahang Tenggara.

13.0 FORESTRY

The analysis relating to the development of forest resources has been conducted within the framework of the exploitation potential of all natural resources in Pahang Tenggara. In this regard reference is made to the alternative strategies in section 4.2. The technical studies are fully documented in the supporting report "Forestry Development in Pahang Tenggara". This summary will deal with the inventory, management of resources and industrial utilization possible both under present conditions and those projected to occur in the future as a result of research or re-organisation.

13.1 INVENTORY

The trees in the entire area of Pahang Tenggara were inventoried. The forests of Pahang Tenggara are classed as rain-equatorial and are composed of many species forming one or two storeys. More than 200 different species or species groups have been identified in the region. A high proportion of these trees belong to the Dipterocarp family. The forest was found to differ in both species composition and volume from area to area within the region. The differences reflect a correlation with physiographic features of the terrain and with the pattern and quality of drainage. Poor drainage conditions constitute the major element adversely affecting the forest stand, while the type of soil has only a secondary influence.

Trees have been tallied by species and by diameter classes on 8,200 sample plots for the compilation of stand tables. Two thousand eight hundred trees have been felled, measured and analysed for volume and defect study. The results of the survey are presented in Forest Cover Maps and in Stand and Stock Tables in Appendix I to this report. Forest cover mapping was carried out on the topographic maps of a scale 1: 25,000, and final maps were reduced to the scale of one inch to one mile, with a grid corresponding to that of the Government topographic series.

13.2 FOREST RESOURCE DEVELOPMENT

The most significant factor governing the development of the forests in the Pahang Tenggara region is the scale of agricultural development until 1980. 660,000 acres are scheduled to be cleared for agricultural purposes with the result that forest management cannot be practised on a great part of the forest area. This period until 1980, will be mainly one of liquidation of the forest resource and if current standards are continued, only 20 to 30% of net volumes will be utilized. However, the orderly liquidation of the forest can be planned within the limits of the agricultural clearing schedule and existing transportation facilities. The importance of better utilization of the wood volumes contained within the remaining forests is a much more difficult problem.

The timber supply in Malaysia is not unlimited, but the high priority attached to the agricultural clearing operations place such large volumes of wood on the market, that the actual situation of a limited remaining forest resource is obscured.

The improvement in species and tree size utilization requires industrial plants capable of handling a wide range of species and tree sizes. Unfortunately plants with these capabilities do not exist within or adjacent to the Pahang Tenggara region. The necessary utilization facilities could be provided by the upgrading and modernization of existing plants but this would require a complete change in plant management attitudes.

At present, within the forest industries there is little relation between the forest resource and plant design. Few plants have an assured timber supply. Current practice is to purchase log supply on the open market from logging operators at negotiated prices.

For the detailed forestry programme to be defined it is necessary to consider three aspects of development in greater detail. In areas where the analysis has indicated that forestry operations could be efficiently carried out indefinately, it is proposed to evolve an intensive management system which can maximise the sustained yield of timber in the areas in question. When the produce of an area is committed to a single company a Tree Farm License (T.F.L.) is proposed. Where the sustained yield is assigned on a long term basis to more than one conversion plant as an assured timber supply quota the area will be regarded as a Forest Management Unit (FMU).

Table 13.1—Forest Type: Area Summary (Acres)

PRODUCTIVE—VIRGIN—		
Hill Dipterocarp Forest—		
Seraya Ridge	74,000	
Seraya Slope	74,000	
Seraya Dissected	95,000	
Non Seraya	118,000	
Sub-total Hill Dipterocarp Forest	—	361,000
Lowland Dipterocarp Forest—		
Balau—Undulating	351,000	
Kapur—Undulating	2,000	
Meranti—Flat	162,000	
Keladan—Riverine	16,000	
Sub-total Lowland Dipterocarp Forest	—	531,000
Sub-total Virgin Productive Forest	—	892,000
PRODUCTIVE—LOGGED	—	461,000
PEAT SWAMP POTENTIALLY PRODUCTIVE	—	272,000
Sub-total Productive Forest	—	1,625,000
Edaphic Hill	36,000	
Marginal Flat	49,000	
Seasonal Swamp	115,000	
Permanent Swamp	270,000	
Sub-total Non Productive	—	470,000
Non Forest (including clearings, Plantations, Water)	—	390,000
GRAND TOTAL	—	2,485,000

In area where the masterplan analysis has indicated conservation or park areas, forest exploitation is prohibited but the management of the areas will place first priority on maintenance of the aesthetic values and protection of the environment. Additional environmental forests will occur throughout the study region as residual areas following agricultural development of forest in scattered blocks, often with value as protective forests. These areas are generally too small to be developed on a sustained yield basis as individual blocks, but together have considerable sustained capacity. The areas will be managed as permanent forests with environmental considerations being given priority.

On land scheduled for agricultural development the forests will be liquidated. The liquidation will be mainly on a short term basis before 1980, and longer term afterwards to permit better utilization of the forest being cleared.

13.2.1 Tree Farm Licenses and Forest Management Units

Without almost complete species utilization, proper forest management will be difficult if not impossible. To justify expenditures on plants and machinery capable of utilizing and producing saleable products from the majority of the tree species contained within the forest stand an assured timber supply is an essential precondition.

An intensive forest management system based on selective cutting of 20 percent of all species, every five years in the same area in perpetuity is proposed for the permanent forest within the Pahang Tenggara area. The system will be initiated in the Lesong T.F.L. area (*see* Fig. 13.2) and will be applied to other permanently managed forest areas when operating procedures have been proven and standarized. The details of the proposed systems are enumerated in Section 8.0 Appendix C of the supporting report "Forest Development in Pahang Tenggara".

The FMU is similar to the TFL except that the management and planning on a sustained yield basis is a function of the Pahang Tenggara Development Authority who specify the timber rights that are to be issued by Long Term Timber Sales as quota allocations to selected forest utilization complexes. The Long Term Timber Sale Agreement is to be processed and royalties collected through the normal state forest administrative channels.

13.3 NEW INDUSTRIES

13.3.1 Lesong Integrated Forest Complex—116,000 Acres

A Forest Complex Feasibility Study has been prepared for the Lesong area. The complex would be based on modern perpetual yield forest management which would support an integrated sawmill and plywood plant as described in detail in the Appendix II to the supporting report. The study shows that conditions of access, weather, terrain and timber quality, timber ingrowth and distribution are favourable to the establishment of a forest management operation capable of producing 125,000 forest tons per annum in perpetuity. Both the intensive management proposed for the forest area, and the construction of the manufacturing complex will require the expenditure of an estimated M$40 million. In order to justify this level of investment an assured supply of raw materials must be provided. It is proposed, therefore, that a company be assigned the sole cutting rights to 116,000 acres of the Lesong Forest, referred to as the Lesong Tree Farm License (T.F.L.) area. The Lesong T.F.L. area contains an inventoried net merchantable volume of some 160 million cubic feet or over 3 million timber tons. This is sufficient to sustain the proposed operation for 25 years on a once over basis, a period more than adequate for the return of investment. A forest inventory carried out by the Study indicates sufficient ingrowth to permit, under a sustained-yield management system, an annual cut of 6,250,000 cu. ft. in perpetuity.

13.3.2 Bukit Ibam Tree Farm License—120,000 Acres

This second Tree Farm License area has been established to protect this contiguous resource until such time as the intensive management system to be applied in the Lesong T.F.L. has been proven. A draft proposal[1] was prepared in 1971 for the development of the Bukit Ibam Timber Complex. It is recommended that a similar agreement to that proposed for the Lesong Forest Complex cover the management and development of the proposed Bukit Ibam T.F.L. area. The construction and continuous operation of an integrated forest manufacturing complex must be a condition of the agreement.

This project, already incorporated has potential for a sustained yield operation of Sawmill and

[1] Study Paper No. 9 "Proposed Bukit Ibam Industrial Forest Complex".

Remanufacturing facilities in conjunction with a plywood operation utilizing 5,000,000 cu. ft. of round wood annually. A potential for expansion into particle board and fully finished component parts exists after proper product and market research is completed. The complex will require 100,000 forest tons annually, with the plant coming into production in 1975. The proposed conversion plant will be supplied from areas scheduled for agricultural clearing for the initial operating period 1972 to 1980 with an extension of 3 years available.

13.3.3 FMU 1 Bebar—177,000 acres

The area contains some 271,000 acres of *potentially* productive forest at which 177,000 acres at this time is considered to be manageable. An estimated 265 million cubic feet (5,310,000 forest tons) is contained within the manageable forest areas.

The species composition is ideal for a furniture component part plant[1], however, the area is presently undeveloped due to the lack of economic logging methods. The substantial size of this forest reserve and the utilization plants which the area could support warrants the establishment of experimental logging operations.

[1] *See* Appendix F of the supporting report.

Assuming that development of logging techniques will allow the production of the resources in the swamp area by 1980 or sooner, at economic costs per ton, a potential utilization system producing fully finished component parts could be established on the coastal highway.

13.4 FORESTS TO BE LIQUIDATED—1972-1980

There are over 660,000 acres of forests, both virgin and disturbed scheduled for agricultural clearing during the years 1972 to 1980.

The areas scheduled for clearing shown in Table 13.4 are equal to a conservative volume of round wood based on a 12 tons[1] per acre (average 15 tons from virgin forest—5 tons from logged over forests) to be disposed of during this clearing programme, amounting to 5,710,000 tons on an eight year schedule. The possible markets for the round wood resources available from these areas can be considered in the following groups:

A. Singapore.

B. Existing operations on periphery of Pahang Tenggara Area.

C. Complexes within Pahang Tenggara.

[1] ton (T) equivalent to 50 cubic feet of timber.

Table 13.4—Areas Scheduled for Agricultural Development 1972-1980 (Acres)

Block	*Virgin*	*Disturbed*	*Non-Forest*	*Total*
I—LOGGING COMMITTED:				
Mentiga	39,200	25,700	3,100	68,000
Teriang and Bera	7,300	62,800	35,400	105,500
Keratong	100,900	76,700 19,200[1]	19,400	216,200
Lesong West	4,400	62,800	51,100	118,300
Logging Committed Sub-Total	151,800	247,200	109,000	508,000
II—LOGGING NOT-COMMITTED:				
Lesong South	11,800	—	—	11,800
East	6,100	24,500	—	30,600
Rompin-Aur	71,500	8,300	—	84,000
		4,200[2]	—	—
Bebar	6,000	24,000	—	30,000
Logging Not-Committed Sub-Total	95,400	61,000	—	156,400
GRAND TOTAL	247,200	308,000	109,000	664,400

[1] Marginal virgin forest calculated at 5 forest tons/acre.

[2] Riverine type, virgin, calculated at 5 forest tons/acre like disturbed forest.

Fig. 13.2

PAHANG TENGGARA
REGIONAL MASTERPLANNING STUDY

FORESTRY INDUSTRIAL COMPLEXES

●----- MILL SITES

600000 Yds. E. 103° 00'E.

400 Yds. N.

3°00' N.

300 Yds. N.

10 5 0 MILES 10 20

Mentiga
Mentekab
Temerloh
Teriang
Bahau
Segamat
Kg. Melayu
Pekan
Nenasi
Merchong
Kg. Aur
Fort Iskandar
Tasek Bera
Bt. Ibam
K. Rompin
Pdg. Endau

S. PAHANG
S. Teriang
S. Bera
S. Serting
S. Mentiga
S. Jeram
S. Aur
S. Bebar
S. Merchong
S. Rompin
S. Kerotong
S. Jekatih
S. Pukin
S. Pontian
S. Endau

MENTIGA FOREST CONCESSION

BUKIT IBAM TREE FARM LICENCE AREA

LADANG PEGAWAI

PEAT SWAMP FOREST RESOURCE I

F.M.U. I BEBAR

PEAT SWAMP FOREST RESOURCE II

SPECIAL COMPLEX LOGGING AREA 1973-1980

LESONG TREE FARM LICENCE AREA

GENERAL LANJUT AREA
SITE OF I II III SPECIAL COMPLEXES

I II III SPECIAL PLANTS LOGGING AREA 1973-1980

SOUTH CHINA SEA

13.4.1 Singapore

The Singapore timber industry has been a steady and influential customer for disposal of unprocessed resources of the Pahang Tenggara area and could still be considered as a market to be supplied up to 1980. However, the Singapore market will be influenced by the higher grade and less expensive logs of Indonesia that could enter the market in volume from 1974 onward.

13.4.2 Existing Operations

Approximately 68 round wood conversion operations exist in Pahang and northern Johore, around the periphery of the Pahang Tenggara area. It is estimated that these operations, based on existing conditions, will require approximately 748,000 T (@ 50 cu. ft. per ton) annually of round wood.

Included in the 68 operations are 8 plywood plants that consume approximately 184,000 tons annually of round wood comprising only high grade logs of fairly large diameter, and limited species. Thus it is estimated that only 4-5 tons per acre are suitable for this operation. If the high grade logs are taken from the overall saleable volume of the resources, the marketing of the balance becomes quite difficult and usually involves reducing both the number of species and their price.

None of the sixty existing sawmill operations have production facilities to dry and further remanufacture the resources into finish products. It is estimated that only 13 existing operations in Pahang have the production and capabilities to expand. Only 2 and possibly 3 operations are known to draw their present resource requirements from the Pahang Tenggara area. In addition to the two complexes and peripheral existing operations, a future resource utilization system is planned by Mentiga forest Products whose plant would be located outside the region but whose resource consists of 102,000 acres within Pahang Tenggara. Although agreements with the State involve firm commitments by this company, no detail planning or implementation of the manufacturing facilities has been made public. However, the operation is understood to be based upon production for 20 years, taking 60,000 forest tons @ 50 cu. ft. per ton per year. The logging programme is designed to work the first 14 years in virgin timber and the last 6 years in disturbed forest areas of the concession. All lowland forest areas after logging will be released for agricultural development.

13.4.3 Special Complexes within Pahang Tenggara

In the event that existing industries do not utilize the wood supply coming from clearing operations through the lack of suitable conversion facilities, it is proposed that integrated wood utilization plants or special plants be established within Pahang Tenggara. Based on the total agricultural clearing programme for the region these plants would have a 15 year capital write-off period. The estimated balance of 935,000 tons of such "excess" resources would support three "special" complexes that could possibly come into production in late 1974, 1975 and 1976.

A technical feasibility study of such a complex is provided in Section 10 of the supporting report. Each operation would include a sawmill, pre-dry-kiln drying facilities and a planer moulding operation. Total investment in each operation would be approximately $5,500,000 to $6,000,000 depending on site requirements. Increased marketing ability in Malaysia of fully finished wood products will enable new manufacturing systems to profitably utilize smaller and lower grade commercial species and a larger varity of so called secondary and under utilized species.

It should be understood that 3 such complexes are *possible* with this volume of resource, but the degree to which other "claims" will be made on these sources of supply by industries outside the region is not known. Thus the siting of one, two or all three of these new plants should be finalised after this situation is clarified. Any or all of these complexes could be established in central locations in the Lanjut area within a reasonable trucking distance from the resource. This location has the advantage that the economic life of the plants can be extended beyond 1980 by ongoing agricultural clearing required in that area. The volume of resources available would then be sufficient for a maximum of 17 years operation assuming the first unit becomes operational in the middle of 1974.

13.5 FOREST DEVELOPMENT OPTIONS

The masterplan has established that 1980 is a critical point for reappraising the overall plan. In addition to the routine monitoring of progress which has been going on as described in the supporting report "Organization and Implementation of Pahang Tenggara Development" there

will be an examination of the basic assumptions and forecasts which were used in the original cost benefit analysis to determine the relative positions of forestry and agriculture in the masterplan.

This section discusses the options which could result from *changes* in basic assumptions or forecasts since the plan would otherwise remain as previously described. There is only one real option open in the pre-1980 and that relates to the committed areas destined for agricultural development.

The Ladang Pegawai Concession warrants special consideration because of its unique status.

13.5.1 Ladang Pegawai Concession

The concession contains an estimated 50,000 acres of virgin forest which is scheduled for agricultural clearing. Assuming that a conservative 12 tons (600 cu. ft.) per acre is removed, a total of 600,000 tons will be produced from the area between 1972 and 1980. This will average 75,000 tons per year, more than ample volume to supply a sizeable conversion plant.

A special complex utilizing 36,000 tons per year is described in Section 13.4.3. If the contract covering the Ladang Pegawai concession area can be re-negotiated to recognize this industry potential then 36,000 tons per year could be committed to such a plant.

Assuming that a special complex is established to utilize the resources generated from the Ladang Pegawai area by the clearing programme up to 1980, resources for a minimum operation of 10 more years will be required since one of the prerequisites of Ladang Pegawai establishing an "industry" would be a guarantee of round wood resources for a minimum period of 17 years.

In theory the clearing schedule could be extended beyond 1980 to provide 36,000 tons per year for at least 15 years from the Ladang Pegawai concession area alone. This option however should be preserved as part of the overall masterplan review scheduled for 1980.

It is adso possible that the 1971-1990 resources could be available from delayed agriculture clearing or FMU No. 3 which is located adjacent to this area.

13.5.2 New Possibilities

In the event that the cost benefit analysis review to be performed in 1980 favours forestry land use over the balance of the agricultural development programme. then two Forest Management Units could be established as shown on Figure 7.1.

The two following FMU's summarized in Table 13.5, contain areas with marginal potential for agricultural development. These lowland forest areas when combined with surrounding hill forests produce units with potential sustained yield management as permanent forests. Without the addition of the lowland forests, the potential for developing the hill forests alone will be seriously restricted.

13.5.2.1 FMU 2 Chini—114,700 acres

This area is adjacent to the Mentiga concession and has the potential for a sustained yield capacity to maintain a forest complex. It is logical that this area can be allocated to the Mentiga operations for development after the present Mentiga concession expires some time after 1980.

13.5.2.2 FMU 3—111,400 acres

This area is located east from the Tasek Bera Park and is accessible mainly from north west. The southern part is also accessible from Ladang Pegawai area. This area could be allocated as follows:

(*a*) To be turned into a Tree Farm Licence with potential similar to that of Lesong T.F.L.

(*b*) The southern part (say 30,000 acres) be allocated to the special complex in Ladang Pegawai if such a complex existed at 1980 and if the clearing schedule in Ladang Pegawai were not extended to provide timber supply for the necessary 15 years write-off period.

Table 13.5—Proposed Forest Area Development After 1980

	Hill Forest	*Lowl. Forest*	*Marginal Forest*	*Riverine*	*Seas, Swp.*	*NF*	*Total*
FOREST DEVELOPMENT							
FMU 2. Chini:							
Mentiga Block	18,000	—	—	—	—	—	18,000
Teriang-Bera Block	26,700	33,300	2,300	—	17,400	—	79,700
Rompin-Aur Block	17,000	—	—	—	—	—	17,000
Total ..	61,700	33,300	2,300	—	17,400	—	114,700
FMU 3. Godam:							
Teriang-Bera Block (includes Edaphic Hill, non-productive, 2,393 acres)	46,700	64,700	—	—	—	—	111,400
FMU 4. Kelantong:							
Teriang-Bera Block	—	37,000	—	—	—	—	37,000
Sub-total Forest Employment	108,400	135,000	2,300	—	17,400	—	263,100
AGRICULTURAL DEVELOPMENT							
1. Teriang-Bera Fringes in 3 parcels	—	25,900	—	—	—	13,500	39,400
2. Lesong-East, 11 parcels ..	—	91,100	—	5,300	—	—	96,400
3. Rompin-Aur Jeram Valley (including H. H. Concession)	—	42,000	—	—	—	—	42,000
4. South of Bukit Ibam, 2 parcels	—	4,000	—	—	3,000	2,800	9,800
Sub-Total Agricultural Development	—	163,000	—	5,300	3,000	16,300	187,600
TOTAL ..	108,400	298,000	2,300	5,300	20,400	16,300	450,700

13.5.2.3 FMU 4—Kelantong—36,900 acres

This area is situated west of Tasek Bera Park. It consists of disturbed forest on a rather swampy terrain. The area is not scheduled for agricultural development. Before any specific plans for this area could be proposed, the forest stand will have to be rehabilitated and its productive capacity assessed.

13.5.3 Agricultural Clearing Areas—After 1980

13.5.3.1 Teriang-Bera—3 parcels (39,400 acres)

These parcels are located on the western fringes of the Pahang Tenggara area. Because of the location and existing clearing they will be converted to agriculture and the remaining forest stand will be liquidated on a cutting permit basis.

13.5.3.2 Lesong—East of Endau-Rompin Park—11 parcels (96,400 acres)

This area is under heavy pressure for agricultural development and the forest areas are so disturbed that they do not lend themselves to management as a unit. It is assumed that the areas will be cleared after 1980.

This area should be almost totally allocated to the three "special" complexes (or however many are operating in 1981) and will provide sufficient additional timber after 1980 to provide each complex with a total minimum right-off period of 17 years. After 1990 there might be additional forest areas available from FMU 1—Bebar which would extend the life of these complexes well beyond 1990 if required.

13.5.3.3 Jeram Valley—42,000 acres

This area which has good potential for agricultural development includes the concession to D.Y.M.M. Sultan of Pahang. There could be an area of forest in the Jeram valley which, if the agricultural development programme were to be cut back after 1980, would be available for more flexible logging. At the present time it is assumed that the soils in that location would be most productive in agriculture, but if this is not the case then the area could be added to either the Bukit Ibam complex or the Mentiga complex because the area is too small to support an independant new industry.

13.5.3.4 South of Bukit Ibam—2 parcels (9,800 acres)

This area is not suitable for forest development and will be liquidated after 1980.

13.5.4 **Environment Forests**

The scattered environmental forest areas remaining after agricultural development total 146,000 acres of forest considered at present productive. This area may in future be augmented by forests with lower timber values, by virtue of the expected better future utilization. The forest will be accessible through the agricultural road network. These areas should be flown in 1980/81 for new aerial photo coverage. The forested areas then should be mapped and inventoried. Suitable blocks should be grouped into manageable units, the productive, protective and recreational forests identified and development plans formulated.

13.6 FOREST ADMINISTRATION

Within the limits of the State forest administration the following organizational changes are suggested for the management of the forests within the study area.

It is considered to be of prime importance that the Pahang Tenggara study area be organized into one forest district under the administration of one District Forest Officer, (with one or more assistants) directly responsible to the State Forest Officer. The uniformed staff required to perform the normal administrative functions would be organized in the usual manner.

As the planning of the management and development of the forests is of prime importance in the overall development of the Pahang Tenggara region, it is considered that a function of Planning Forester on the staff of Pahang Tenggara Authority must have high priority. It is recommended that the Planning Forester should be directly responsible to the Pahang Tenggara Authority and liaise with the State Forest Officer on policy matters and with the District Forest Officer on administration. The duties in brief of the Planning Forester would be as follows:

1. To represent the Pahang Tenggara Authority in all matters concerning forest management and development planning in the Tree Farm Licence areas by the Licensees.
2. To plan and implement the management and development of the Forest Management Units.
3. To approve the scheduling and implementation of the logging for the agricultural clearing.
4. To plan the development of the environmental forests.
5. To propose, recommend or request forest research and development studies as required for the overall forest management of the Pahang Tenggara area.

It is recommended that the Planning Forester be supported by two or more assistants and an adequate number of field crew and office staff.

13.7 RESEARCH AND DEVELOPMENT

Research and development in the forest products industry of Malaysia covers three separate fields of activity each relying on the other for success i.e.

— Forest research and development

— Product research and development

— Market research and development

All of these fields should be joint ventures by Federal and State Governments and the forest industry as a whole. The basis for a successful research and development programme is the Forest Research Institute at Kepong. The Pahang Tenggara study has undertaken initial work in both product and market research and development. The product research is documented in Appendices G, H and I while the market analysis is presented in Appendix J to the supporting report.

13.7.1 Forest Research and Development

13.7.1.1 Plantations

Preliminary studies have been carried out in co-operation with the staff of the Pilot Plantations for Quick Growing Industrial Tree Species Project, Forest Research Institute at Kepong regarding the establishing of pilot plantations. Areas in both the proposed Lesong T.F.L. area and adjacent to the proposed Bukit Ibam T.F.L area were selected for the establishment of pilot plantations and a suggested development programme with a list of recommended species to be planted was included.

13.7.1.2 Swamp forest experimental logging operations

The determination of economic logging methods for the successful exploitation of the Bebar swamp forests should be concentrated on the following phases:

(*a*) access, which is presumed to be the building of the necessary road system within the swamp forest area;

(*b*) yarding and skidding, which is the assembly of the logs at the road access system ready for transport; and

(*c*) cable system.

Details of the specific system to be tested are provided in the supporting report "Forestry Development in Pahang Tenggara".

13.7.2 Product Research and Development

It was decided to include a programme within the Pahang Tenggara Masterplanning Study of applied research at Forest Research Institute on three production areas of the wood products industry of Malaysia. The basic objective of this applied research was to simulate industrial operating practices in the field of plywood, component parts and particleboard furnish. The applied research was carried on over a period of 14 months by three specialists in the above areas of operation.

The Forest Utilization Section was concerned with all species found in the Pahang Tenggara area, but their experimental programme was attuned to species of lesser or no current commercial value. This was necessary in order to conduct a suitable analysis within the allotted study period.

13.7.2.1 Product research and development needs

Although the forest industry has made appreciable progress in its technology in recent years, the industry will need major technological advances in the coming decades if it expects to meet the increase in competition from synthetic materials, to continue to market a reasonably priced product, and to continue to operate in an environment which is increasingly conscious of the problems resulting from pollution.

While recognizing that pure research is important, the co-operation of marketing and technology is crucial if results are to contribute to the technology of the industry. It is important that industry learn in which areas research and development can play its most useful role. An industrial research programme should thus include

the industry and both Federal and State Governments. The Forest Research Institute at Kepong provides a basis on which a successful programme can be built.

The vehicle for such a well organised and active research and development programme could be the establishment of a Research Programme Committee consisting of members of industry and government.

The objects of the committee would be to review the research programmes and make recommendations to the Forest Research Institute and to submit new technical problems requiring research.

In this manner the committee provides a direct channel of communication between research staff and industry and Government. All members of the Research Programme Committee should be technically and managerially competent due to the diversity of interests, knowledge and experience required.

13.7.3 Market Research and Development

The wood products industry in Malaysia will, over the next decade, be required to change not only its manufacturing policies, but also its marketing policies. Marketing in the future will not be an entity by itself but will be part of a wholly integrated industry beginning at the standing timber through the manufacturing systems, on to the means of transportation, up to the door of the customer.

This will require market research and development to a degree never before practised in Malaysia. The Malaysian Timber Export Industry Board (Incorporating Act 1966) is considered as a start in regulating and improving the sawn timber export industry. Changing marketing conditions could possibly decrease the need for industry regulating and would allow the board to become the focal point of market research and development for the industry. Although sales of sawn timber products must be the responsibility of the producer, guidance and assistance in product acceptance by overseas markets, through technical programmes, advertising and publicity are all vital ways the board could assist the industry.

The various activities required of an organization to achieve these objectives are described in the supporting report, using the "plywood industry" as an example. There must be *industry-wide* recognition of the basic requirements for establishing and maintaining a position in world markets-quality-price and continuity of delivery. A vigorous and unceasing marketing effort, by knowledgeable personnel is necessary to acquire and maintain a market position.

14.0 OCCUPATIONAL STRUCTURE AND TOWN SIZE

Section 2.2 of this report has established the targets for structural change which result from the New Economic Policy and the Second Malaysia Plan objectives when applied to the present composition of employment in West Malaysia. Section 4.4 interprets these targets in terms of the resource based and non-resource based employment goals within Pahang Tenggara.

To arrive at a means of ensuring that the non-resource based employment target could be achieved in the region, the study performed an extensive analysis of existing relationships for both primary and non-primary occupations to types of settlement.

14.1 PRIMARY AND NON-PRIMARY EMPLOYMENT

Socio-Economic Survey (1967-68) was supplemented by further tabulations for metropolitan towns, State capitals, other urban areas and rural areas. The occupational structure (per cent of employment in each industry group) is shown in Table 14.1a.

This data for West Malaysia illustrates vividly the influence of urbanisation on occupational structure. Moreover, although the data relate to a single point in time they can be taken as indicative of the change in occupational structure that occurs over time as the degree of urbanisation and the size of centres increases.

Viewed on this basis, it can be concluded that there is no possibility of obtaining the modernization and re-structuring of society objectives outlined in the Second Malaysia Plan as an immediate and longer term goal, if land settlement patterns continue to be similar to those of the past.

Malaysian experience indicates that rural and small urban settlements result in a high proportion of primary activities (agriculture, forestry, hunting and fishing, mining and quarrying, and the primary processing of major agricultural products both on and off estates) and a low level of involvement in manufacturing, construction, utilities, commerce, transport and services. Only in town sizes around 15,000 or more does the opportunity begin to occur for people to move to a significant extent from primary into secondary and tertiary activities. At larger town sizes, a steady decrease in primary involvement is accompanied by a gradual increase in all other sectors of activity .

The data in Fig 14.1a can be taken to indicate the changing structure of employment at different degrees of urbanization in Malaysia. But it is necessary to make some adjustments to the basic data so that the definitions of the major industry groups are consistent with those in other data and are in their most useful form for the Pahang Tenggara Study.

By including resource-based manufacturing in resource-based activities there is an upward revision in employment in resource-based activities and a drop for non-resource based

manufacturing; all other activities continue unchanged. The adjusted data are given in Table 14.1b attached and are shown in Fig. 14.1b.

Use of Fig. 14.1b should, of course, be accompanied by caution and judgement. It appears likely that the "normal" occupational structure shown will not be reached for some time, perhaps becoming fully relevant only after 1980. The pattern during the 1970's will be heavily influenced by imbalances caused by concentration initially on physical infrastructure and on major resource projects, with manufacturing and services activities lagging. Thus the composite development pattern for the 1970's will differ from that shown. However, it is vital for achievement in the 1980's of modernization and restructuring objectives that the settlement and urbanisation patterns adopted in the 1970's be such as to permit realization of the longer term objectives later.

Judgement will also be necessary as to whether the occupational structures in towns of different sizes within the settlement pattern that has prevailed in the past will be fully applicable to similar-sized centres within new settlement patterns. For instance, the characteristics of a town of 25,000 housing both urban and rural workers may well be somewhat different to those of a town of 25,000 housing urban workers only and supplying goods and services to workers living in adjacent rural areas.

Increases in town size alone will not automatically transform occupational structures in the manner indicated in Fig. 14.1b. The type of resource-based activities carried on and their potential for generating linkage effects and for upgrading labour skills and incomes are most important determinants also. Urbanisation is a necessary, but not a sufficient, condition for changes in occupation structure to occur.

Table 14.1a—West Malaysia Occupational Structure by Major Industry Group

PERCENT OF EMPLOYED BY STRATA

	Rural	*Urban*	*Metropolitan*	*Total*
Primary				
Agriculture, Forestry, Hunting, Fishing ..	28.0%	10.6%	2.6%	21.2%
Agricultural products requiring substantial processing	41.3	12.1	1.3	30.4
Mining and Quarrying	3.5	2.5	1.8	3.0
Sub-Total, Primary ..	72.8	25.2	5.7	54.6
Non-Primary:				
Manufacturing	5.7	13.3	18.8	9.1
Construction	2.3	4.8	6.3	3.3
Utilities (electricity, gas, water, sanitary) ..	0.4	1.8	2.3	0.9
Commerce	6.5	18.8	21.7	10.8
Transport, Storage and Communication ..	2.1	4.8	8.6	3.6
Services	10.0	31.3	36.4	17.5
Unspecified	0.2	—	0.2	0.2
Sub-Total, Non-Primary ..	27.2	74.8	94.3	45.4
TOTAL ..	100.0%	100.0%	100.0%	100.0%

Source: Socio-Economic Survey, 1967—1968.

NOTES—

1. The strata are defined as follows:
   Rural: less than 5,000 population;
   Urban: 5-75,000 (excluding State capitals);
   Metropolitan: All State capitals and cities over 75,000.
2. Agricultural products requiring substantial processing include rubber, oil palm, tea, coconut and copra.

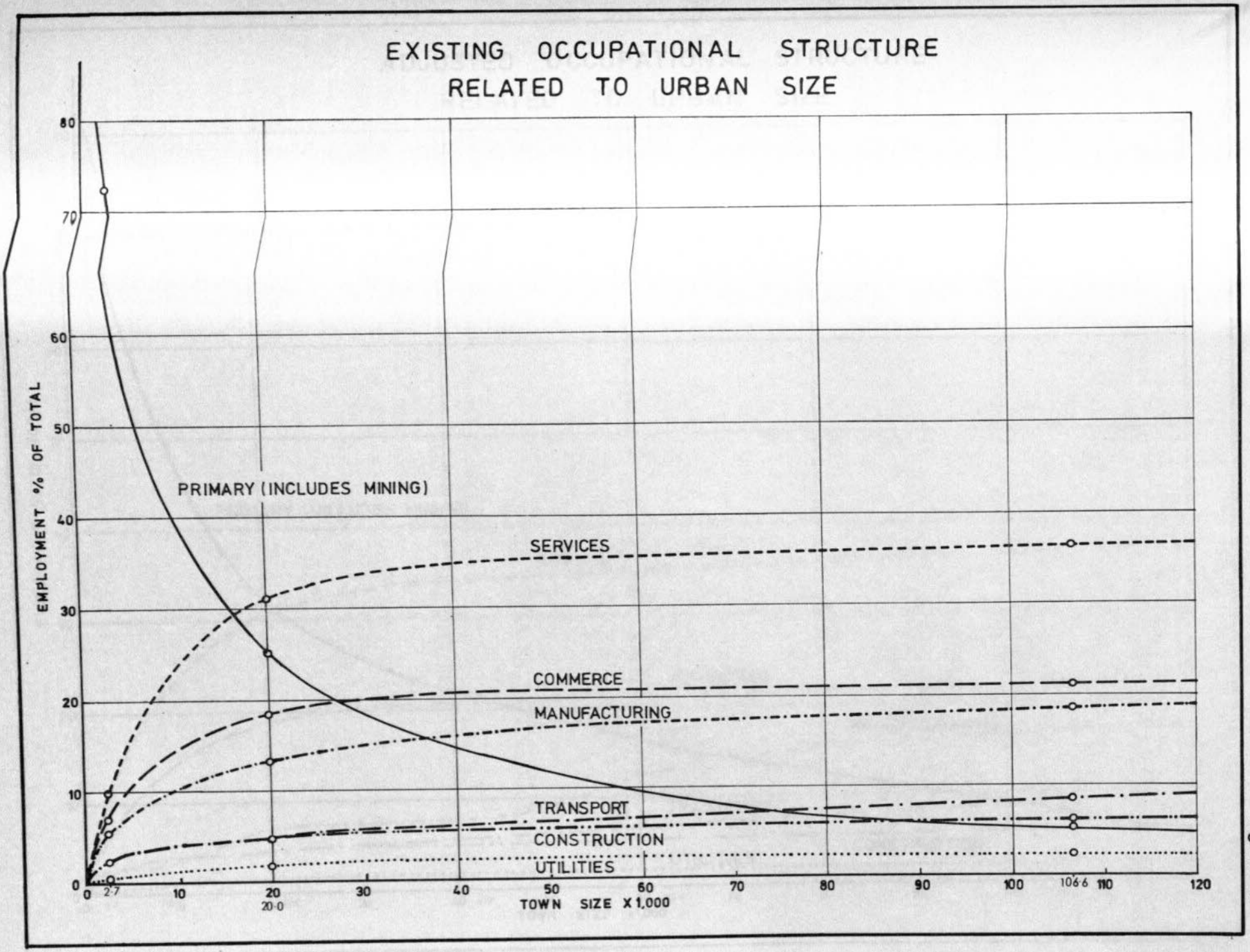

EXISTING OCCUPATIONAL STRUCTURE
RELATED TO URBAN SIZE
EMPLOYMENT % OF TOTAL
TOWN SIZE X 1,000
PRIMARY (INCLUDES MINING)
SERVICES
COMMERCE
MANUFACTURING
TRANSPORT
CONSTRUCTION
UTILITIES
2·7
20·0
106·6

Fig. 14.1a

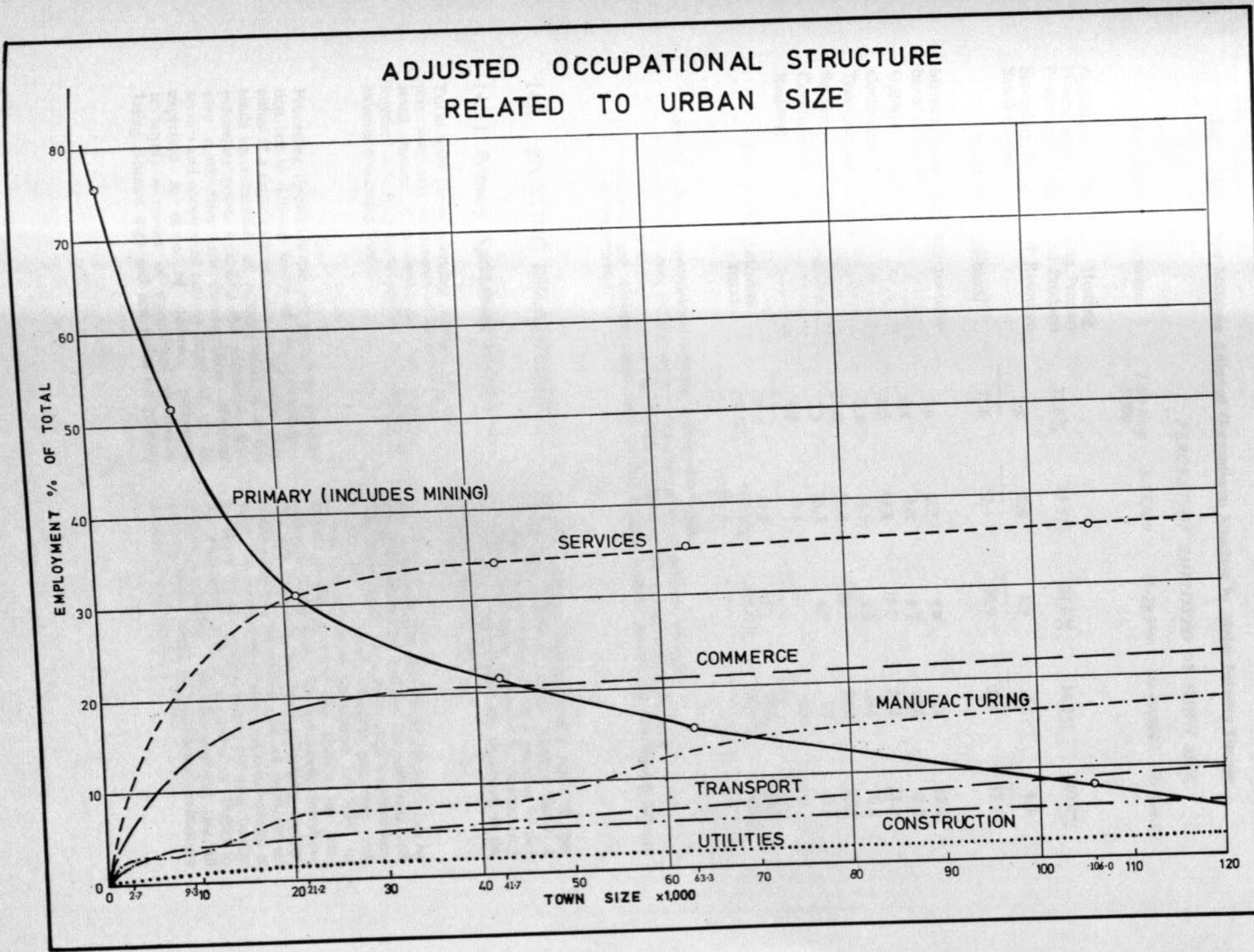

ADJUSTED OCCUPATIONAL STRUCTURE
RELATED TO URBAN SIZE
EMPLOYMENT % OF TOTAL
80
70
60
50
40
30
20
10
0
PRIMARY (INCLUDES MINING)
SERVICES
COMMERCE
MANUFACTURING
TRANSPORT
CONSTRUCTION
UTILITIES
0
2·7
9·3
10
20
21·2
30
40
41·7
50
60
63·3
70
80
90
100
106·0
110
120
TOWN SIZE x1,000

Fig. 14.1b

Fig. 14·1b

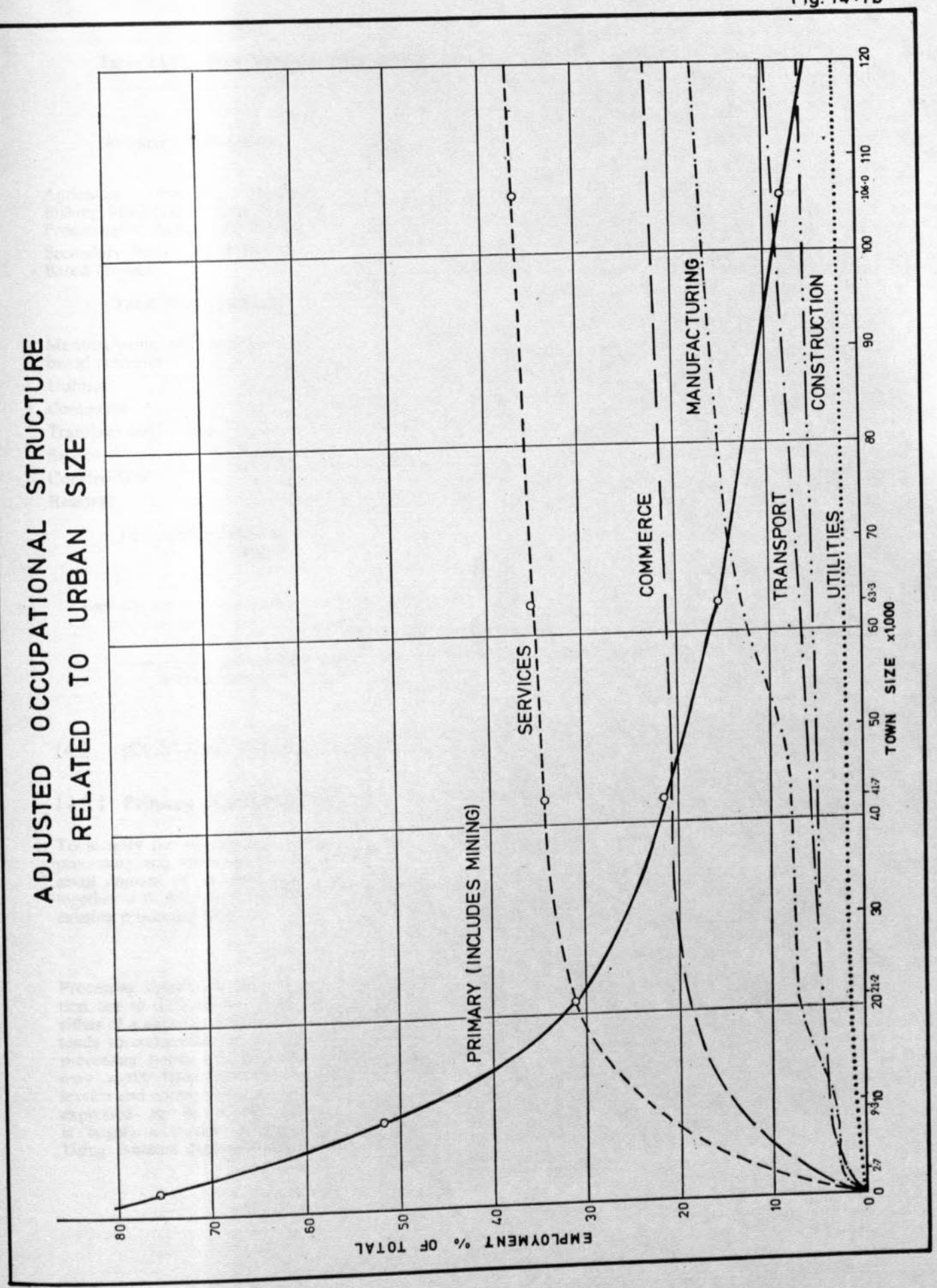

ADJUSTED OCCUPATIONAL STRUCTURE
RELATED TO URBAN SIZE
EMPLOYMENT % OF TOTAL
TOWN SIZE ×1,000
PRIMARY (INCLUDES MINING)
SERVICES
COMMERCE
MANUFACTURING
TRANSPORT
CONSTRUCTION
UTILITIES
80
70
60
50
40
30
20
10
0
2·7
9·3
10
21·2
30
41·7
40
50
63·3
60
70
80
90
100
104·0
110
120

Table 14.1b—West Malaysia Adjusted Occupational Structure by Major Industry Groups

Resource-based Activities	*PERCENT OF EMPLOYED BY TOWN SIZE*				
	Less than 5,000	*5–14,999*	*15–29,999*	*30–49,999*	*50–899,99*
Agriculture, Forestry, Hunting, Fishing, Mining, Quarrying, Primary Processing of Agricultural Products	72.8%	45.5%	24.6%	14.2%	10.9%
Secondary Processing of Resource-Based Products	2.8	6.6	6.3	8.2	4.4
Total, Resource-based ..	75.6	52.1	30.9	22.4	15.3
Manufacturing excluding resource-based activities	2.9	3.2	7.9	7.9	13.4
Utilities	0.4	1.0	1.7	2.0	2.2
Commerce	6.5	13.8	19.0	21.4	21.2
Transport and Storage	2.1	4.1	4.9	6.1	6.4
Services	10.0	22.2	31.3	34.6	35.7
Construction	2.3	33.5	4.7	5.5	5.8
Residual	0.2	0.1	—	0.1	—
Total, Other Activities ..	24.4	47.9	69.1	77.6	84.7
TOTAL ..	100.0%	100.0%	100.0%	100.0%	100.0%

NOTE:-The category "resource-based Activities" is designed to include:
—traditional crops and their primary processing (rubber, oil palm, tea, coconut).
—new, diversification crops and their secondary processing (beef, sago and tapioca, fruit etc.).
—primary and secondary forest-based activities (logging, sawmills, plywood and particleboard, furniture components etc.).

14.2 EXISTING RELATIONSHIPS

14.2.1 Primary Agriculture Processing

To identify the relationship between agricultural processing and settlements of different sizes the small amount of published data was examined together with field knowledge of the capacity of existing processing plants.

Processing thresholds are not geared to production but to different scales of crop processing—either of a single crop or a number of crops. This tends to concentrate all primary workers at the processing point, including the population that may result from this concentration. Whereas service and commercial activity thresholds can be expressed in terms of demand, processing is largely a matter of operational thresholds. Using assumed high and low ratios for primary and non-primary workers, and a scale of operation for individual crops ranging from a minimum to maximum size it is possible to plot the size of population generated by various crop options. These "thresholds" are illustrated in the accompanying Fig. 14.2a.

If it is assumed that operational efficiency can be achieved somewhere between the minimum and maximum range, then most crop combinations having one processing facility per crop will generate a settlement population of 6,000 to 10,000 people, provided the workers are concentrated at one point. Any settlement size above this will require a duplicate processing facility. With a mixture of rubber and oil palm, or oil palm and annual crops, where the area covered is governed by an average size processing facility for each crop, then a settlement of 15,000 to 20,000 is possible. This also assumes that all primary field workers and processing workers are located in one centre.

14.2.2 Manufacturing Activity

The detailed analysis of industrial activity in individual towns in West Malaysia[1] was done to learn the frequency of occurrence of particular activities, the threshold in terms of town size for individual activities, and typical profiles of activity and employment for centres of different sizes. This analysis is based on data for 1968 as published in the Census of Manufacturing Industries, supplemented by additional information specially prepared by the Department of Statistics. While the results, therefore, record the past patterns of industrial development in West Malaysia as a whole, they are useful as an aid in assessing what might be future patterns for centres in Pahang Tenggara.

1 Working paper No. 39 "Town Sizes and Thresholds for Manufacturing Activities in West Malaysia".

Table 14.2—Average Number of Activities, Importance of Resource-Based Employment, and Total Full-Time Employment in Towns of Different Sizes

Town Size	*Average Number of Activities*	*Major Resource-Based Manufacturing Employment As Per-Cent of Total Manufacturing Employment*	*Average Number of Full Time Employees*
Under 5,000	10	63%	304
5— 9,999	17	54	405
10—14,999	13	76	152
15—29,999	25	39	430
30—49,999	46	30	1,157
50—89,999	61	39	2,098
Over 90,000	98	12	10,430

The main conslusions from the analysis are listed below:

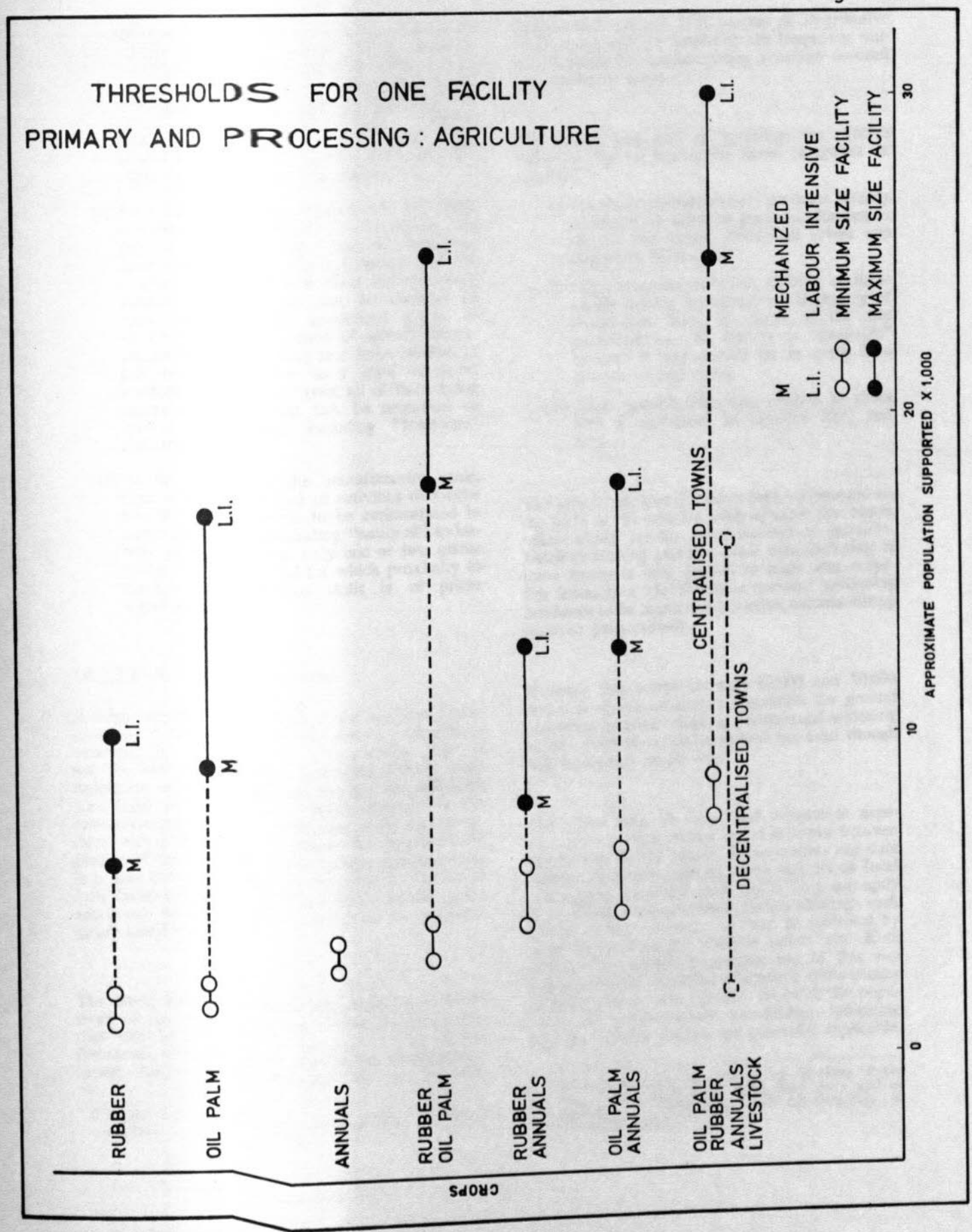
(*a*) The number of activities carried on is comparatively small in towns of less than 15,000 (Table (14.2). Above this size of town the number and range of activities increases steadily with increase in town size.

(*b*) Activity in major resource-based manufacturing is of great significance, particularly in smaller towns. Major resource-based employment was 25% of total full time manufacturing employment in West Malaysia and 24% in the 64 towns being examined. As shown in Table 14.2, it ranged between 50% and 75% of the total in towns below 15,000, between 30% and 40% in centres of 15-89,000, and was 12% in towns over 90,000.

(*c*) Major resourse-based activities are widespread and often provide the basis for a town's existence. However, they do not themselves stimulate the development of other manufacturing activity although they likely contribute something to its growth once it is established.

(*d*) A number of activities that are related to people's direct consumption are also widespread but many of them are carried on in a traditional small-scale, local way. There is a tendency as towns grow for there to be a greater number of such operations rather than large-sized operations: and output often consists of custom work made to order rather than prior production of standard and commonly bought lines of products. For there to be a change to larger-sized units supplying wider markets and providing greater employment, there would need to be a number of associated

Fig. 14·2a


THRESHOLDS FOR ONE FACILITY
PRIMARY AND PROCESSING : AGRICULTURE
CROPS
RUBBER
OIL PALM
ANNUALS
RUBBER OIL PALM
RUBBER ANNUALS
OIL PALM ANNUALS
OIL PALM RUBBER ANNUALS LIVESTOCK
CENTRALISED TOWNS
DECENTRALISED TOWNS
L.I.
M
M MECHANIZED
L.I. LABOUR INTENSIVE
MINIMUM SIZE FACILITY
MAXIMUM SIZE FACILITY
0
10
20
30
APPROXIMATE POPULATION SUPPORTED X 1,000

changes including a greater distribution radius and new forms of distribution; good transport and delivery systems; production of high quality and possibly brand name goods that would be promoted and advertised; and new financing arrangements that would allow carrying of stocks at the factory and in the shops and that might provide credit to buyers.

(e) Somewhat less widespread, but still fairly common, are a number of activities that provide a broader basis for industrial development and for acquisition and use of greater skills by workers and managers. Additionally, there can be location of larger and more specialized plants in smaller centres because of special circumstances like nearness to a large market, to raw materials, or to a good transport arrangement like a port, all of these being characteristics that can be attractive to certain activities, including "footloose" industries.

(f) At the end of the manufacturing scale, there are a number of activities that have tended in the past to be concentrated in larger centres, including "national" industries in which are only one or two plants in the country and for which proximity to markets or labour skills is of prime significance.

14.2.2.1 Activity profiles

It might appear then that if the required settlement size is attained that the desired occupational structure is automatic. Unfortunately this is not the case since the settlement size is itself dependant on the induced employment activities. The focal point of the urban strategy is the manufacturing sector. Whereas other infrastructural thresholds are within the implementing control of the agencies concerned, manufacturing in a free enterprise economy tends to control its own locational distinctions within certain limits and towns compete with each other for manufacturing activities.[1]

The study has therefore performed an in-depth study of the specific manufacturing *opportunities* that can be normally associated with various thresholds. Data from the Census of Manufacturing, further disaggregated by the Statistics Department and the 1966 Census of Distributive Trades was used to determine the frequency with which particular manufacturing activities occured in existing settlements.[1]

For clarity and easy of handling, the profiles were set up to distinguish three categories of activity:

(i) the major resource-based products already identified as being of great significance in all but the largest Malaysian towns and important there also.

(ii) other common activities, defined as those which have a prevalence or frequency of more than 50% in towns of the size examined, i.e. the activity is "probable" because it was carried on in more than one out of two towns.

(iii) other possible activities, defined as those with a prevalence of between 20% and 50%.

The activity profiles that have been constructed on the basis of the detailed analysis show that towns below 15,000 are heavily dependant on resource-based processing and that other manufacturing in these towns is very limited in scale and scope. For towns over 15,000 people resource processing continues to be important but other manufacturing increase progressively.

It seems that towns between 30,000 and 50,000 are at a significant size as thresholds for general industrial activity; there is pronounced widening in the range of activities carried on, even though still in a fairly small way.

The effect both of range and volume is experienced to a much greater extent in towns between 50,000 and 89,000 people. These centres are state capitals or major regional towns and act as focal and supply points for their region.They are aptly described as regional growth centres although such growth is not automatic and can be inhibited by other factors, as the analysis points out. Kota Baharu and Kuala Trengganu are in this size group and their industrial structure is quite similar to that of other urban centres in which the population is predominantly non-Malay, indicating that the activity profiles are generally applicable.

1 "Footloose" industries are treated as a special category.

1 This analysis is the subject of Working Paper No. 39 and is discussed more fully there and in Section 7.0; "Settlements and Infrastructure in Pahang Tenggara".

The very largest towns, over 90,000 experience all the foregoing influence to a greater extent and have a national impact as well. They are the thresholds for many of the activities earlier referred to as national. The range of industry in them and the full time employment they provide are illustrated in the supporting report along with similar data for the other smaller centres.

14.2.3 Commercial Activities

The significant changes in the percentage employed in commerce shown earlier in Table 14.1b indicated the need for a closer examination of this activity.

An analysis of the data on commercial establishments for towns in Malaysia shows that there are proportional changes in the ratio of commercial activities to population size. The survey of Distributive Trades 1966-67 contains a profile of retail, wholesale and catering establishments for a number of towns above 8,000 population. The population for each of the towns has been projected based on 1957 and 1970 data and the total turnover and the number of shops and their population plotted. Figures 14.2b and 14.2c summarize the pattern for retail and wholesale establishments.

Two points emerged from the analysis of retail establishments:

(*a*) The number of shops per 1,000 population varies little over the full range of towns—from 8,000 upward. Although the average of 16 shops per 1,000 population is fairly constant for all towns, there are undoubtedly differences in scale, e.g. the larger the town the larger the average size of shops.

(*b*) A break in the graph occurs in total retail turnover for towns between 15,000-25,000 people. This would appear to be a threshold for volume of turnover for a particular size of town and suggests that a fairly complete range of retail establishments occur once towns reach a population of 15,000.

It should be noted that the thresholds are related to town population only and do not take into account differences in hinterland population. Changes in regional densities for example would probably affect the commercial retail activity within the town. Nevertheless a strong relationship remains between the retail trade and the town threshold perse. This can be illustrated by the double curves which appear for towns below 20,000 to 25,000. The lower curve indicates the probable differential in regional importance either because of small hinterland population or relative isolation. The pattern for catering establishments is similar to that shown for retail establishment although these have not been plotted. No such pattern seems to exist on the wholesale level. Locational characteristics appear to be the main criteria for volume of turnover in wholesale establishments, however two obsrevations can be made.

(*a*) Volume of turnover in wholesale is not necessarily dependant on town size but a high wholesale normally reflects a high retail turnover.

(*b*) There is a difinite "stratification" of wholesale establishments in the 10,000 to 20,000 range and similarly but less defined in the 20,000 to 40,000 range, as shown by hatched areas in the accompanying Fig. 14.2d.

14.2.4 Social Service Thresholds

Fig. 14.2d summarizes some of the essential social services for which threshold data has been collected. The "blocks" in this Figure indicate the population size at which a *single* facility of its type would likely occur. Each of the activities (e.g. Education, Health and Community Services) has been defined according to the broad functional levels in current use in the planning of institutions in Malaysia. The population required to justify each facility has been estimated. The thresholds are based on existing national averages except for education for which projections are made to 1990. More detailed estimates of both health and education facilities are contained in Working Paper No. 51 "Cost Evaluation of Settlement Patterns."

By taking the average or medium condition for *all* social services shown in the Figure it is possible to identify a series of four population thresholds.

(*a*) Lower range ...	2,000	—	3,500 population
(*b*) Medium range ...	8,000	—	12,000 population
(*c*) High range ...	20,000	—	30,000 population
(*d*) Upper range ...	50,000+		

Fig. 14.2b

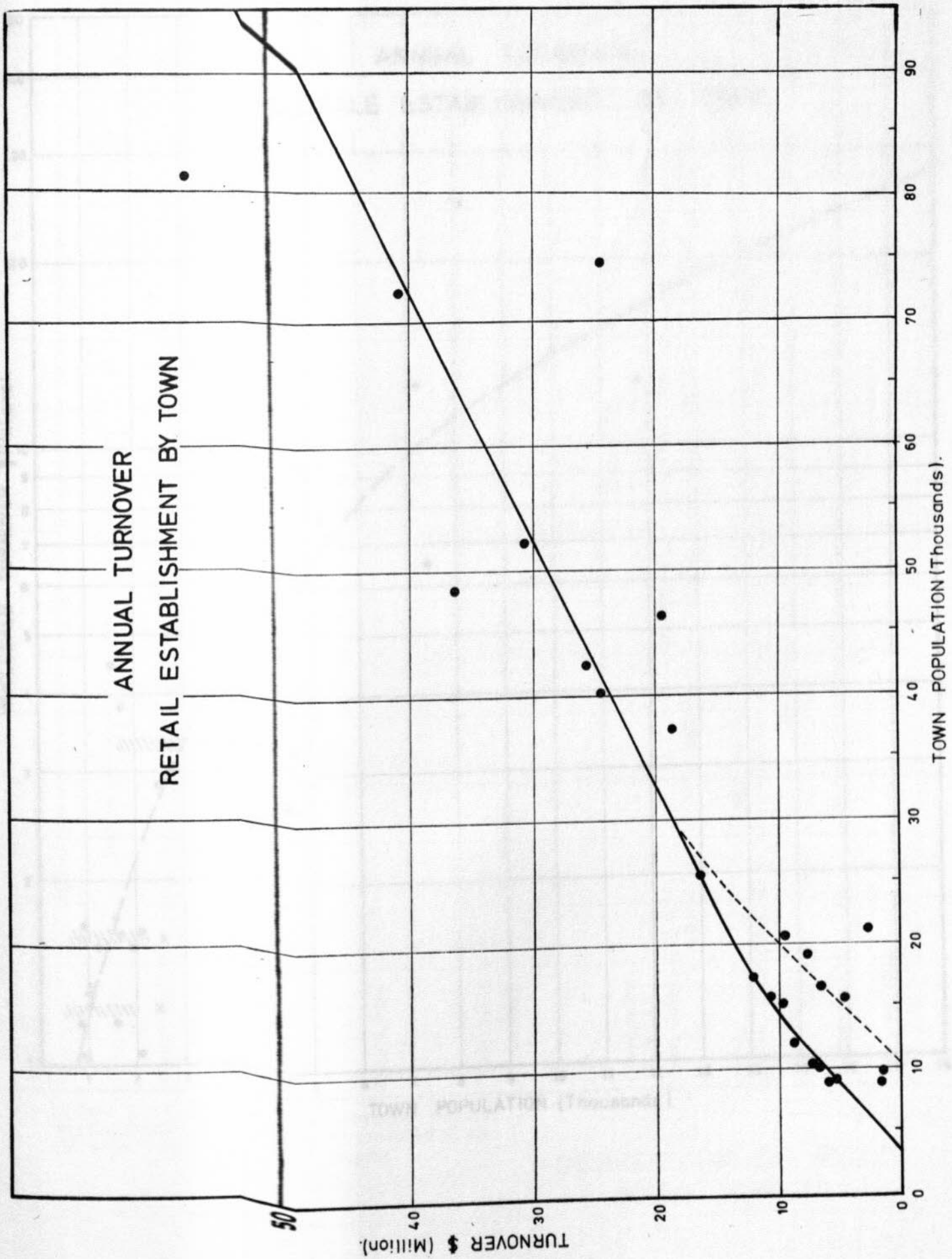

ANNUAL TURNOVER
RETAIL ESTABLISHMENT BY TOWN
TURNOVER $ (Million)
0
10
20
30
40
50
TOWN POPULATION (Thousands)
0
10
20
30
40
50
60
70
80
90

Fig. 14.2c

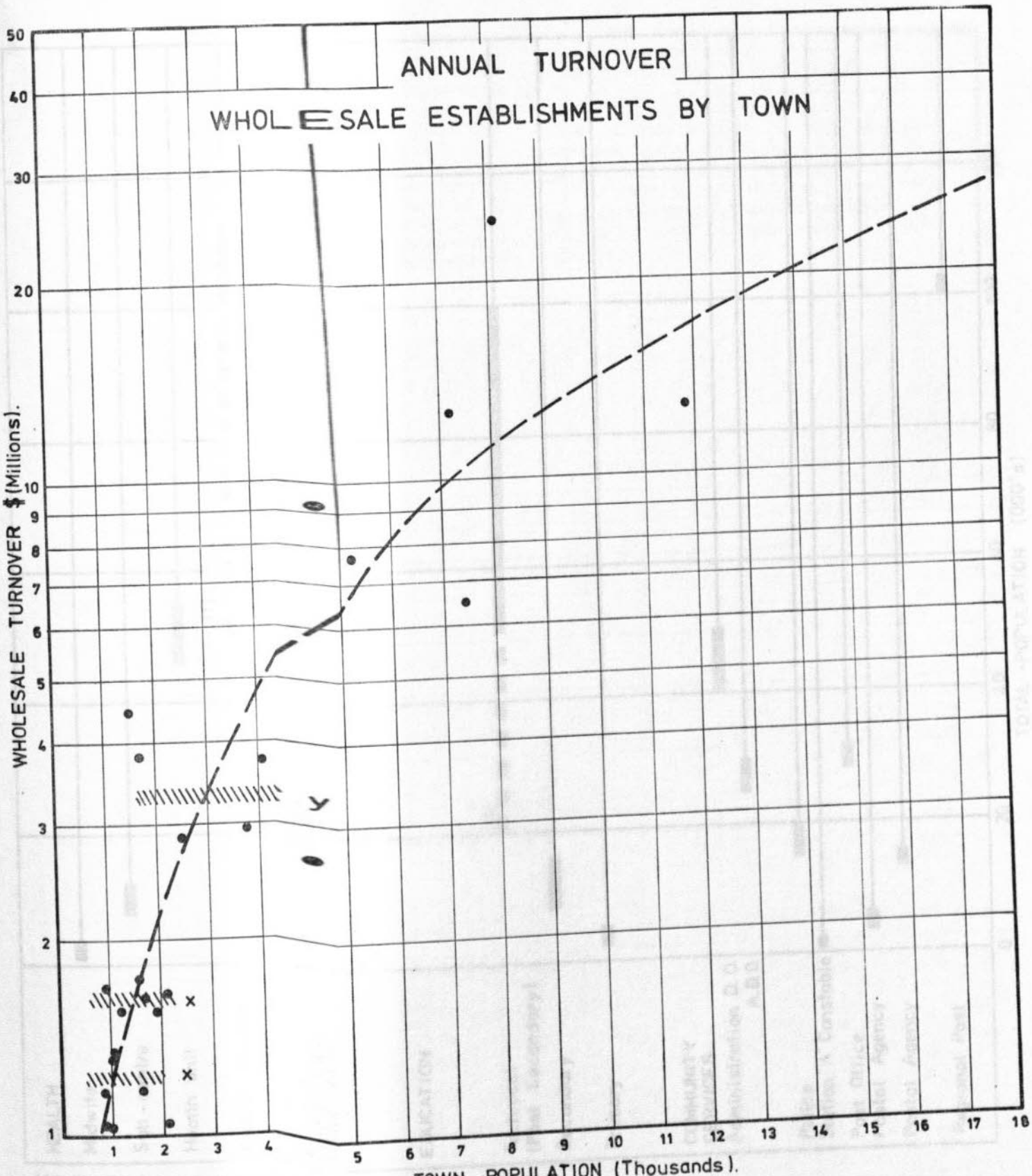

ANNUAL TURNOVER
WHOLESALE ESTABLISHMENTS BY TOWN
WHOLESALE TURNOVER $ (Millions).
50
40
30
20
10
9
8
7
6
5
4
3
2
1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
TOWN POPULATION (Thousands).
x
x
y

Fig. 14.2d

(1) Dashed lines indicate the possible minimum threshold when the area is isolated from the other parts of the region.

THRESHOLDS FOR ONE FACILITY
SOCIAL SERVICES

15.0 SETTLEMENT IN PAHANG TENGGARA

Both the settlements and the settlement pattern are designed to achieve the masterplan objectives. In the light of the foregoing analysis these objectives can be expressed as follows:

(*a*) To meet the socio-economic goals of the New Economic Policy, it is necessary to obtain as high a proportion as possible of population in settlements larger than 10,000 persons and preferably above 20,000.

(*b*) To focus the development of the region toward the East Coast it is necessary that at least one settlement in Pahang Tenggara should become a growth centre of sufficient size to take a significant position in the national urban hierarchy.

(*c*) To minimise the implementation difficulties within the region and provide a basis for urban growth a prototype design is needed for individual settlements which permits structural change in their economy.

15.1 CONCENTRATION OF RESOURCE BASED WORKERS

To achieve settlements of sufficient size for social and economic objectives, it is suggested to group the resource-based workers in larger settlements than is presently the case. This gives an early impetus to the generation of non-primary activity and provides a large enough population base for the economical provisions of social and physical services. A cost analysis shows that the concentration of settlements is financially superior to dispersed pattern.

15.1.1 Cost Appraisal of Concentrated Settlements

The details of the cost evaluation are presented in Section 11.0 Appendix C of the supporting report "Settlements And Infrastructure In Pahang Tenggara". Briefly, the agricultural workers for 66,000 acres of rubber and oil palm respectively were distributed in a number of spatial alternatives. These ranged from a dispersion of 12 settlements to the concentration of all the workers at one location. A cost comparison was made of these alternatives and the following general trends were identified.

The costs for nearly all infrastructure components decline only slightly as the level of dispersion decreases from 12 to 7. After this however, the savings begin to increase substantially and curves decline markedly through to the level of dispersion of 3 where they begin to level off. It would appear therefore that in order to insure that economies of scale in infrastructure could be realized both now and in the future in Pahang Tenggara it will be necessary to aim for minimum size major settlements of the 10-25,000 range in total population. The summary curves for capital and operating costs are illustrated in Figs. 15.1a and 15.1b respectively. Inclusion of transportation costs and requirements for the non-primary induced population results in further savings of considerable magnitude for both the rubber and oil palm models.

Even on the extreme assumption that all workers in the concentrated settlements are provided with their own transport, (as separate from farm vehicles) the general conclusion that concentrated settlements are cheaper in terms of infrastructure

costs does not change, neither does the analysis on thresholds change as the shape of the curves remains virtually the same when these items are added: nor does the provision of facilities for a greater induced population affect the conclusions of the analysis substantially as the net reduction in the cost of infrastructure for a town of 45,000 is in the order of 30% for the oil palm model. Similar savings would be experienced for the rubber model.

It should be noted that in addition to the cost savings additional benefits accrue to the concentrated settlement pattern in that the people in the community concerned would have access to a level of services that would not be possible under the more traditional settlement pattern. That is to say that the simplifying assumption that the benefits remain the same no mater how the services are provided is unrealistic. Without going into detail here, it is suggested that the intangible benefits to be derived from larger scale settlements are considerable and of great importance to the economic development of Malaysia.

The potential savings in capital and operating costs in an agricultural development with a more concentrated settlement pattern as compared to the more traditional approach is a significant factor in the planning of Pahang Tenggara. The estimated cost differences between Models 1 and 6 indicate that potential savings to the development of Pahang Tenggara could be in the order of $61,000,000 in capital costs over 10 years and $12,000,000 annual operating costs at year 10.

Of course it is impossible to directly apply a concentrated settlement pattern without due consideration to other development constraints such as the land ownership pattern, the configuration of suitable agricultural land, location of urban sites, the alignment of major roads and so forth. Furthermore, while the analysis shows that on the whole concentrated settlements are cheaper, these savings may not be distributed equally between all government agencies and the private sector. Nevertheless this analysis is a useful planning guide which emphasizes the importance of settlement concentration as a means of achieving both net cost savings and a form of settlement which contributes to the broader goals of the New Economic Policy.

15.2 PROTOTYPE SETTLEMENT

The prototype layout suggested is shown in Figs. 15.2a and 15.2b. To achieve the size of centre identified in the socio-economic analysis it is apparent that the populations of several estates must be combined. Separate estates should have specific areas of the settlement allocated to them and they should be responsible for the provision of housing and ancillary services for their designated area. The town authority would have general coordinating responsibility for the entire settlement and specific responsibility for these portions of the town not taken up by the major resource developers. Transportation could be organised by the estates either separately or cooperatively. The workers could be picked up at mustering points and transported to and from work sites. With time, the boundaries and jurisdictions could be phased out so that the urban processes would become more normal.

It should be kept in view that the prototype suggests an administrative and physical solution only and should not be applied literally to any specific settlements. It will be found that settlements of different sizes and situations will, to varying degrees, require several modifications to the proposal. Before describing these modifications, several organizational aspects of the prototype should be discussed.

15.2.1 Separate Estate Areas within the Settlement

Traditionally, both the majority of private estates and FLDA have provided housing and ancillary services for their employees. Retaining this traditional role in the implementation of housing may avoid needless confusion and disenchantment on the part of the settlers. Furthermore, the initial identification of residential area with work place will ease the change to a new job and new acquaintances and ease the transition from a rural to an urban environment. In addition to private and public agricultural estates, other resource based employment will originate in forestry and mining. Not all of these employers will have made such provisions for their employees. In these cases specific solutions in the plan of the town should be determined to the satisfaction of all concerned.

15.2.2 Transportation

The Pahang Tenggara worker will face a situation for the first few years in early settlements in which public transportation will frequently not be

Fig.15.1a

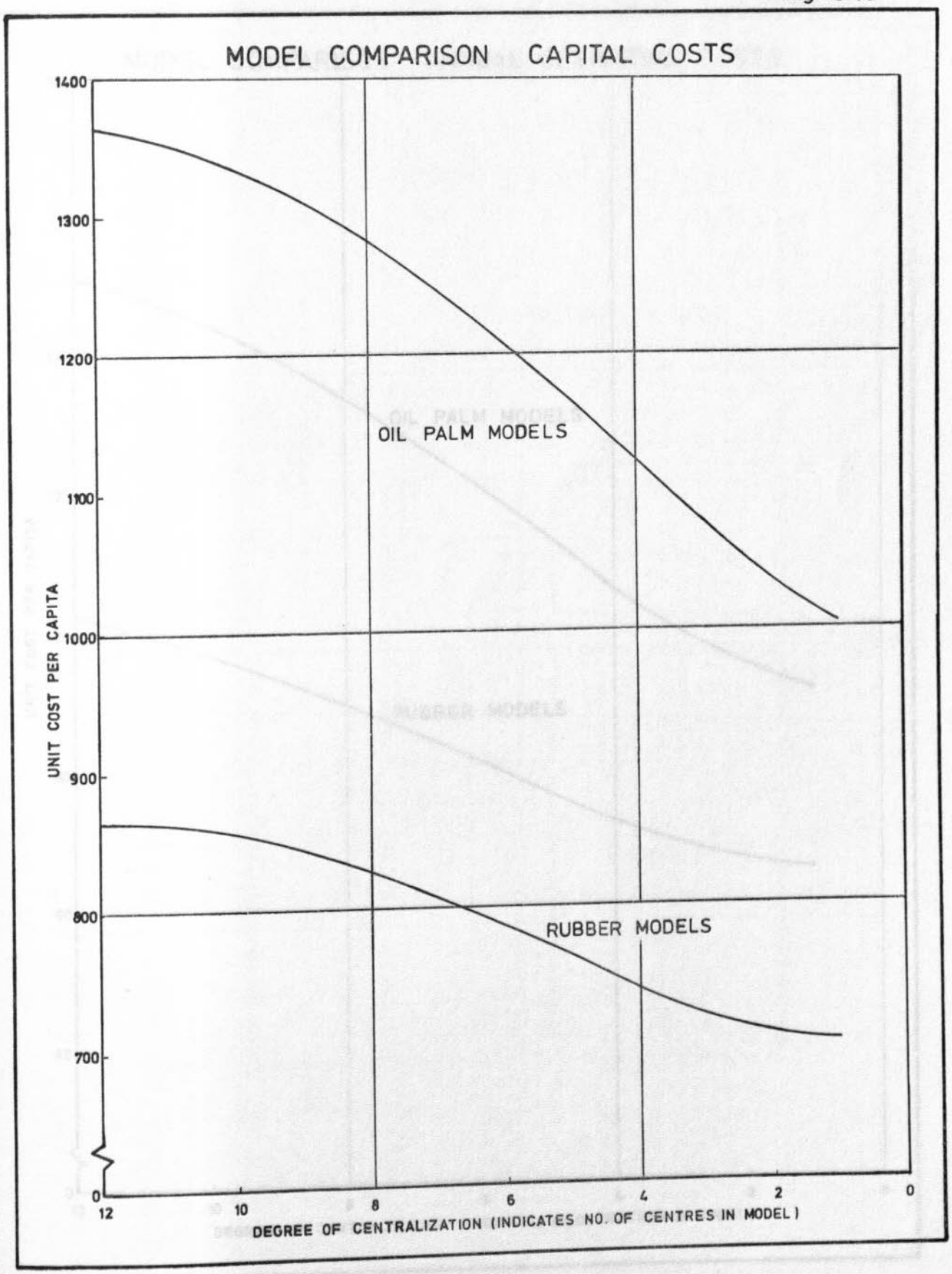

MODEL COMPARISON CAPITAL COSTS
1400
1300
1200
1100
1000
900
800
700
0
UNIT COST PER CAPITA
OIL PALM MODELS
RUBBER MODELS
12
10
8
6
4
2
0
DEGREE OF CENTRALIZATION (INDICATES NO. OF CENTRES IN MODEL)

Fig. 15·1b

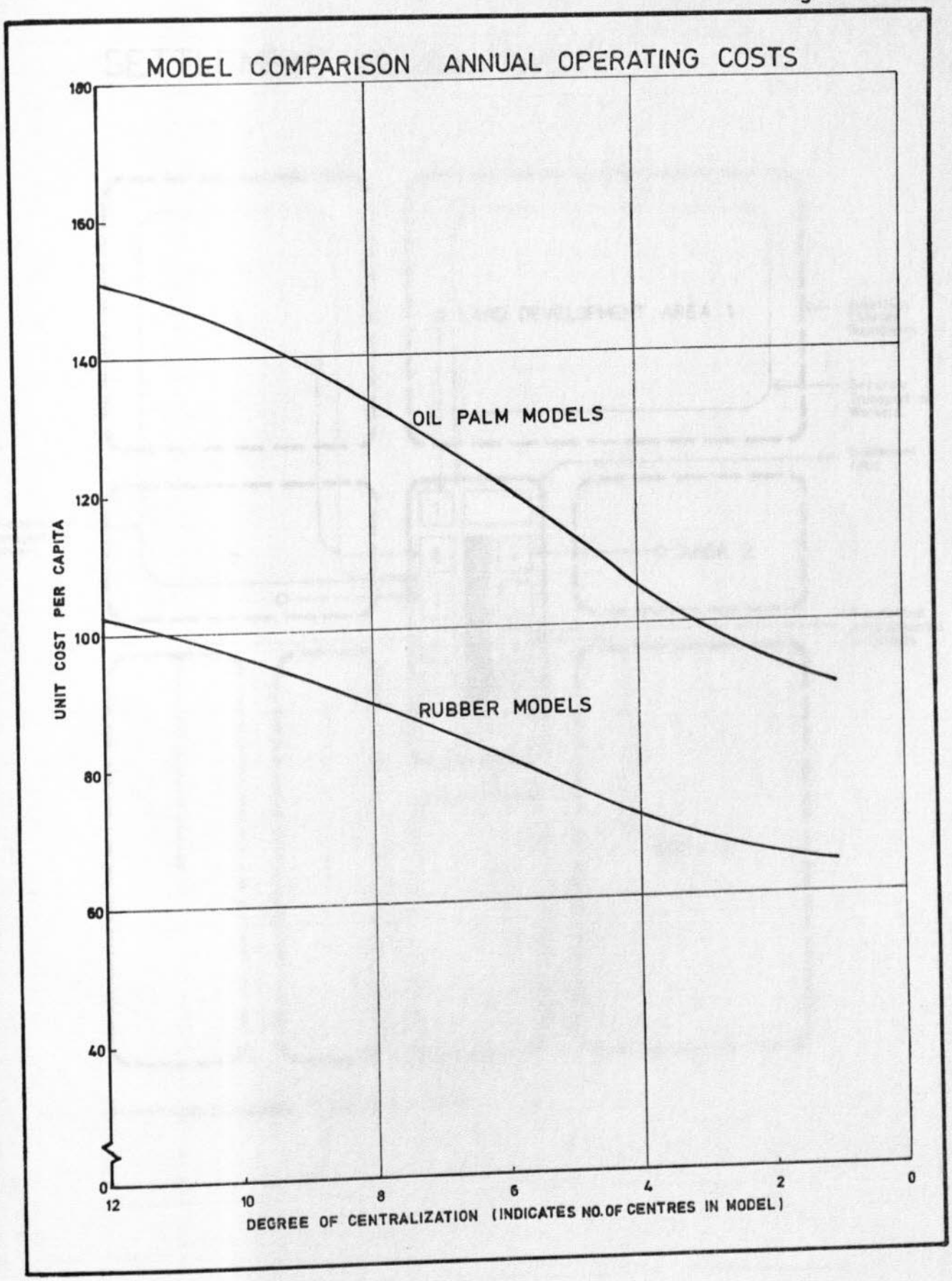
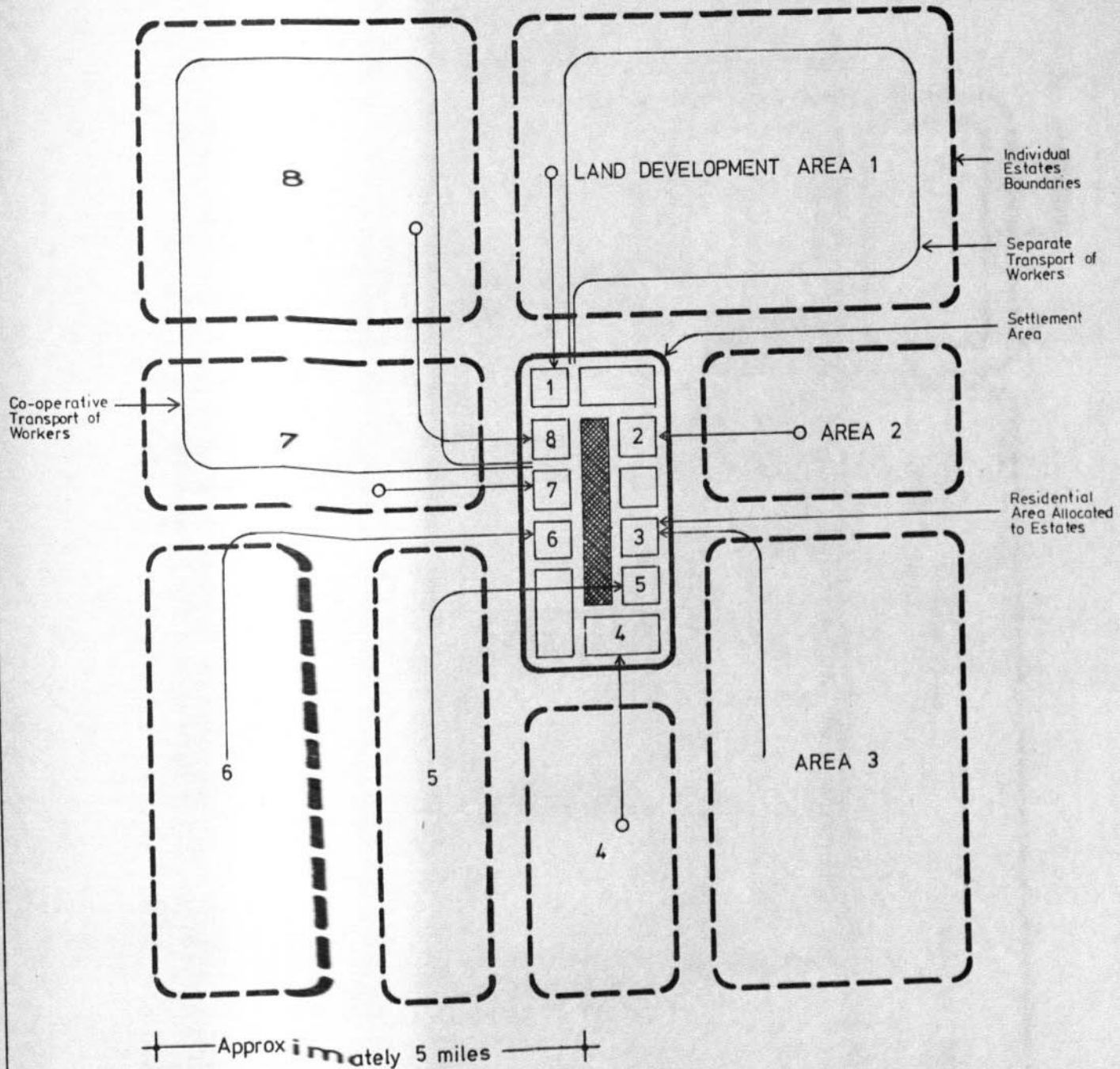

MODEL COMPARISON ANNUAL OPERATING COSTS
UNIT COST PER CAPITA
180
160
140
120
100
80
60
40
0
OIL PALM MODELS
RUBBER MODELS
12
10
8
6
4
2
0
DEGREE OF CENTRALIZATION (INDICATES NO. OF CENTRES IN MODEL)

Fig. 15.2a

SETTLEMENT MODEL TWO



HYPOTHETICAL INITIAL LAYOUT OF SETTLEMENT 22

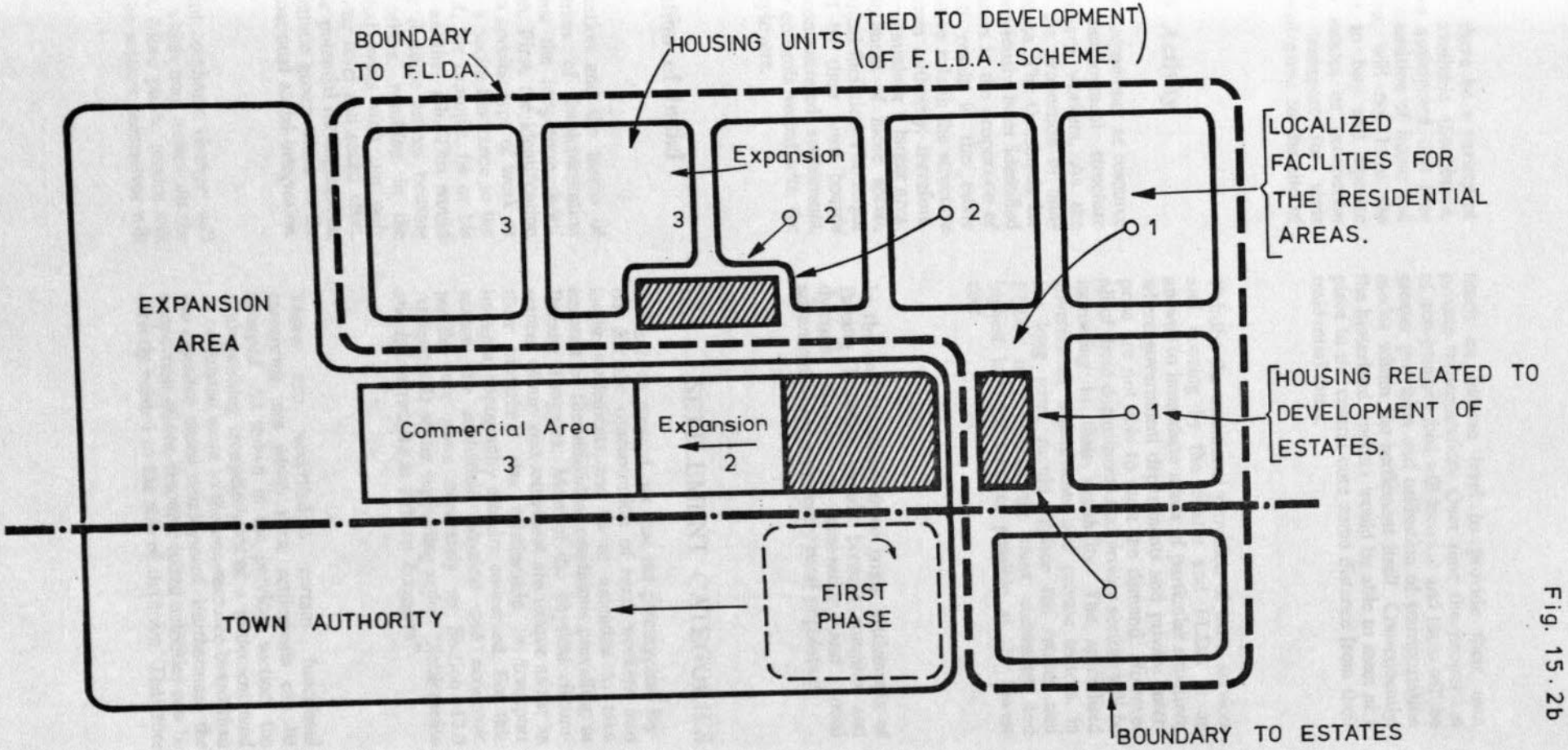


Fig. 15.2b

readily available. Nor will there be a variety of alternative public modes available (i.e. buses, taxis, pedicaps). It is also anticipated that new settlers, having made the transition of home and family to a new location, will not have the financial means available to buy and operate their own vehicles. The estates or production agencies should provide transport for their workers from the residential areas to the site of work.

15.2.3 Non-Primary Activity

Functionally all settlements commence as resource based centres with an employment structure consisting mostly of primary workers. As the settlements grow in size the proportion of non-primary activity will increase. The thresholds for various activities have previously been identified in Section 14.0, but increases in the proportion of non-primary activity will result in the estate performing a smaller relative role in the structure of the settlement. The town authority, therefore, will assume a larger role, administer a larger area, and stimulate the development of more social, residential and other physical facilities. The larger settlements are operated by their town boards while smaller, though concentrated settlements, retain many of the early controls vested with the major resource based employers.

15.2.4 Transformation of Initial Structure

The ease of implementation and the merits of extending present systems of implementation should be viewed against the long term shortcomings of this approach. First, the identification of residential area with a specific type of work or estate over time may be a social hindrance to the mobility of the settler, if, for example, he or his children choose to find another job. This would particularly be the case if some estates become more profitable than others, resulting in the identification of residential areas with not only work type but also income level and social class. Furthermore, there is the potential for segregation of residential areas by ethnic group which in the long term may impede national social integration

Secondly, as development continues, changes will occur in transportation which may loosen up the early physical structure. More public modes will become available and the settlers themselves will reach an income level to provide their own private transportation. Over time the proportion of non-primary jobs will increase and there will be greater provision and utilisation of transportation modes within the settlement itself. Consequently, the hinterland workers would be able to meet at a place in the central core some distance from their residential areas.

Thirdly, the traditional provision of extra services and housing by the estates and FLDA is an answer to immediate needs of particular situations where government departments and private enterprise are not able to meet the demand. However all of these departments and private sectors will be increasing in their capability. The specialised government departments and private sectors, in the long term, should replace the estates and FLDA in providing the most consistent and highest level of services possible at the lowest cost.

In the end therefore, these larger settlements of Pahang Tenggara should become complex and dynamic stations of innovation and social advancement for a presently rural population.

15.3 SETTLEMENT CATEGORIES

It has been pointed out that the prototypical layout for the concentration of rural workers into larger settlements has to be amended to take account of the individual conditions prevailing in Pahang Tenggara. Most of the physical circumstances of any one settlement are unique as far as their hinterland size relationship to transport linkages, topography etc. are concerned. For this reason the individual physical and economic profiles are given separately as Section 12.0 Appendix D of the supporting report "Settlements and Infrastructure in Pahang Tenggara".

There are nevertheless certain functional categories into which these settlements can be grouped. As shown in the previous section, the distinguishing characteristics of a settlement tend to be related more to the non-resource based than the resource based employment. Furthermore the proportion of non-resource based activities can be directly related to the size of the town. Therefore

in applying the preceeding analysis to the relationships which will prevail within the study region the settlements will be discussed in the following categories.

(i) less than 5,000 persons	Resource based settlements.
(ii) between 5 and 15,000 persons	Processing and basic social services communities.
(iii) between 15 and 30,000 persons	Service and supply towns.
(iv) between 30 and 50,000 persons	District centres of administration, services and supply.
(v) above 50,000 persons	Regional growth centre and focus of administration. Distribution of specialised services and supplies.

The actual numbers of towns of each size are shown in Table 5.4 presented earlier.

15.3.1 Resource Based Settlements

By 1980 less than 10% of the population will be living in settlements below 5,000 population, by 1990 the proportion will be even less. These settlements are a consequence of remote hinterlands, pockets of existing population, already proceeding development, or awkward access due to physical barriers.

Where existing population and facilities are also present, special solutions should be derived to suit that particular situation. Otherwise new development of this scale will require very little modification to the prototype. Due to the small size, decentralization of schools or other facilities is not anticipated and the central functions area need not be very large. It will nevertheless be important to prevent ribbon development along major highways, since this increases settlement costs, limits the highway capacity and would result in a weak rung on the urban ladder.

15.3.2 Processing and Basic Service Communities

It is projected that by 1980 17 settlements will be in this category comprising 50% of the regional population. By 1990, although 19 settlements would be of that size, they will include only 35% of the total population. The prototypical layout is well suited to this category of settlement since it would not yet be of a scale where, of necessity it would subdivide into smaller units. The focus can, and should remain on the "centre" of the town with its business and service function.

However, at about 10,000 population the first significant threshold in public services occurs, and an increase in commercial activity may begin. At this level therefore it may be necessary to review the organisation of the plan from the point of view of internal transportation, possible future growth patterns and optimum siting of service, cultural and recreation facilities. It is also possible that the addition of processing facilities may require environmental considerations to enter the planning process more seriously.

15.3.3 Service and Supply Towns

Projections show that by 1990 two settlements will be in this category comprising 15% of the total population. This increases to one third of the total population located in seven settlements by 1990.

The most significant feature in this category is that in time the majority of workers will be engaged in non-primary activity, indicating that a larger proportion of land shown in the prototype layout should be allocated for these uses. It also means that the transportation within the settlement will be of significant volume and therefore public transport modes should become feasible. Schools and other facilities may be decentralised allowing the settlement to become less unitary.

Because of the size and occupational diversity of the settlements, entrepreneurial activity may occur. This activity is quite likely to manifest itself in the private construction of commercial and residential areas. This would necessitate larger and more active local administration than for smaller towns. Furthermore it underscores the necessity of delineating specific settlement plans in advance of the development to safeguard this activity.

Nevertheless it is judged essential to initially preserve the existing methods of creating a settlement along the lines of the recommended model.

15.3.4 District Centres

By 1980 two settlements are projected to reach this category comprising over a quarter of the total population. By 1990 a regional centre will have emerged having grown still further, leaving only one settlement in this category at 38,000 which would be 8.5% of the total population of the region.

Town No. 22 presents a special situation with regard to its physical structure which requires that its conceptual layout be amended.

Because of the role which this settlement has to play as a sub-regional centre it is essential that its character be established at the outset *not* as an exclusively FLDA town (since that is how it must start) but as a community which will grow from the "consumer" volume afforded by the FLDA population and its siting at the intersection of the north-south highway and the east-west road through Bahau to Kuala Lumpur.

It should be recognised that the FLDA should be given relative freedom within their allocated area to provide housing to their normal standards and densities (with provision for upgrading of public utilities to the standards recommended in the masterplan for water supply, power, sewage treatment etc.). No other means of achieving such a rapid build up of population (to almost 30,000 by the end of the Second Malaysia Plan) is feasible at so early a stage in the regional development.

Care should be taken in the detailing of the plan and its organisation to prevent excessive segregation of the FLDA activities from other aspects of the town. It will be a difficult task to phase in and intersperse non resource based employment, facilities and housing into an established FLDA pattern and environment. A major task will be the design and construction of central amenities and other special community buildings, with the provision of adequate facilities. Also the stimulation of enterpreneurial development to ensure that sufficient business and commercial enterprises occur for a settlement of this size—the delineation of an adequate administration system to accommodate this unique blend of circumstances is an immediate task of the highest priority.

In view of the rapid build up of population and the obvious need for innovation it is suggested that these tasks be undertaken by one federal agency, quasi-government agency, or private company responsible to the Development Authority.

15.3.5 Bukit Ridan—Regional Centre

Bukit Ridan is the only settlement projected to pass the 50,000 population level. It grows at a more gradual pace than settlement 22. By 1975, the population should reach about 15,000 being the location of about 10% of the regional population. By 1980 15% of the regional population should be located there, increasing the size of the town to over 40,000. From 1980 onwards the size of the regional centre will remain consistently 15% of the total Pahang Tenggara population so that its growth parallels that of the region. By 1990 at this rate the size of Bukit Ridan will be approaching 70,000.

Of all the settlements, the layout of the regional centre will differ most from the conceptual prototype. Unlike the other settlements there are no land alienations nearby. Cosequently there are no implementing agencies with proven capability to ensure that houses and facilities are available for the early settlers.

This is compounded by the fact that 85% of its work force will not be directly involved with a resource agency in any event. Since Bukit Ridan is projected to be the only settlement with sufficient population to attract footloose industries it is important that adequate provisions be made for the specialised space requirements and residential programme accompanying it.

Furthermore, the success of Bukit Ridan is crucial to other significant objectives of the masterplan and will be the focus of the transport, administration, servicing, financial and commercial infrastructure of the region. In view of all of this the detailed planning and implementation has been initiated already as an extension to the masterplan study. Thus a sufficient and co-ordinated approach should contribute to the success of this settlement.

Even with a properly worked out town plan it will require an immense effort by the Development Authority to stimulate site work by 1973

and thereby offset the headstart of settlement 22 as the regional focus. Once again it is suggested that a specific projects be given to a federal agency, quasi-government body or private company to "develop" the central area of the town and other projects.

15.4 DISTRIBUTION OF SETTLEMENTS AND SERVICES

The size and location of specific settlements was determined by a process of successive approximations. The spatial distribution of population was sharply limited by the number of suitable sites due to:

(*a*) The steeply rolling terrain with many flood prone areas.

(*b*) The sizes and types of agricultural land use and their configurations and locations.

(*c*) The distribution of potentially permanent forest reserves.

(*d*) Conservation areas.

(*e*) Transport requirements both at a regional and a settlement scale.

Fig. 5.1a (in pocket) shows the location of the various towns of the region. Fig. 15.4 will provide an idea of the major physical restraints to the siting of settlements. The areas of comparatively flat land which were free from flood were a major factor in the "trade-off" between the various groupings of resource base projects which were possible as hinterlands for given towns and the transportation considerations. Particular care was also taken to provide an urban hierarchy in Pahang Tenggara within which a logical framework of infrastructural services could be provided. (*See* Table 15.4).

15.4.1 **Infrastructural Services**

The study has worked closely with government departments to design infrastructural services which contribute to the objectives of the masterplan. The intent of the masterplan relating to services in general was to "apply" the existing systems to the needs of the development of Pahang Tenggara. In this respect the "normal practice" in Malaysia was expected to be applicable to the masterplan. In some cases it was, and in other cases it was not. In general the study has recommended a "higher than normal" level of services in the masterplan as part of a "settler inducement" policy. It has been judged necessary to attract settlers by providing good quality facilities and amenities to compensate for difficulties of a "pioneer economy" and probably little or no initial increase in earning power.

15.4.1.1 Public utilities and services

Based on study demographic projections and surveys on household formation the following is the estimated number of houses requiring utilities.

	1975	1980	1985	1990
Total Houses ...	39,000	58,000	65,000	85,000

The housing and settlement pattern conceived for the Pahang Tenggara area will differ in two important ways from what is assumed to be the pattern among the population from which the settlers will be drawn. First, instead of the kampong style one room elevated houses, it is expected that about 65% of the settlers will live in permanent, concrete or brick dwellings and that the remaining 35% will live in detached wooden houses similar to those found in FLDA settlements. Since the number of rooms per dwelling will be two or more, it is expected that the ratio of persons per room will decrease from the present 6:1 to 4:1 by 1990.

The study has recommended that drinking water, power and sewage treatment be supplied to every household (*see* Section 9.0). This is a considerable raising of existing standards since only 15.7% of households presently have piped water in their living quarters, and only 7.5% have flush toilets.

However, in the case of police, postal and fire protection services to the households of the region the existing systems are directly applicable to Pahang Tenggara.

Fig. 15.4

SOUTH CHINA SEA

PAHANG TENGGARA

REGIONAL MASTERPLANNING STUDY

5 0 5 10 15

GENERALISED TERRAIN MAP

- SLOPING LAND over 12°
- FLOOD PRONE LAND based on 1971 Flood
- SWAMP AREA
- FLAT LAND suitable for urban development
- EXISTING ROAD
- PROPOSED PRIMARY ROAD
- PROPOSED SECONDARY ROAD
- RIVER
- FLOOD LEVEL-1971 in feet (approx.)

Table 15.4—Population of New Settlement by Size Rank (000's)

Town	*1975*	*Size Rank*	*1980*	*Size Rank*	*1985*	*Size Rank*	*1990*	*Size Rank*
1 ..	12.08	4	24.80	3	22.43	3	22.66	3
2 ..	0.58	23	6.27	18	6.34	23	6.94	21
3 ..	2.85	15	12.64	7	15.01	7	16.47	10
4 ..	—	—	2.13	28	2.27	30	3.89	32
5 ..	2.40	16	2.32	27	2.24	31	2.16	38
6 ..	1.07	21	2.91	23	5.74	24	5.18	29
7 ..	2.40	17	5.77	20	6.72	22	7.37	20
8 ..	1.75	20	7.80	12	6.83	18	9.21	18
9 ..	—	—	2.77	24	8.49	16	10.75	16
10 ..	14.26	3	42.93	1	55.60	1	68.69	1
11 ..	—	—	—	—	15.22	6	16.91	9
12 ..	—	—	0.06	30	1.58	33	2.51	35
13 ..	7.38	6	12.65	6	11.71	11	12.10	13
14 ..	4.79	8	5.92	19	4.90	26	4.67	31
15 ..	1.83	19	10.30	10	11.91	10	11.83	14
16 ..	1.87	18	8.41	11	7.08	17	6.26	26
17 ..	15.16	2	14.47	5	13.47	9	13.93	11
18 ..	3.20	14	2.47	26	2.32	29	2.43	36
19 ..	—	—	7.45	13	9.11	15	10.78	15
20 ..	—	—	1.65	29	4.76	28	6.62	22
21 ..	0.93	22	2.51	15	2.02	32	2.28	37
22 ..	28.22	1	37.93	2	35.53	2	38.57	2
23 ..	—	—	—	—	—	—	3.38	33
24 ..	—	—	—	—	10.53	12	16.94	8
25 ..	—	—	11.30	9	19.10	4	20.18	4
26 ..	—	—	18.80	4	19.04	5	18.55	6
27 ..	—	—	—	—	—	—	8.44	19
28 ..	—	—	—	—	13.48	8	17.98	7
29 ..	—	—	—	—	—	—	12.73	12
30[1] ..	5.19	7	4.85	22	4.8	27	4.75	30
31A, 31B, 31C[2] ..	4.73	10, 11, 12	6.35	15, 16, 17	6.76	19, 20, 21	6.50	23, 24, 25
32 ..	7.68	5	11.46	8	10.14	14	10.01	17
33[1] ..	4.65	13	5.47	21	5.29	25	5.28	28
34 ..	—	—	—	—	—	—	5.36	27
35 ..	—	—	—	—	—	—	3.34	34
36[1] ..	4.78	9	6.41	14	10.24	13	20.13	5
TOTAL ..	137.26		291.50		364.18		448.78	

[1] Includes some existing population, *see* section 10.0 "Settlements and Infrastructure in Pahang Tenggara".

[2] FLDA Settlements each having equal population, *see* section 10.0 in the supporting report.

15.4.1.2 Education and health services

The programmes of both Ministries have been discussed in Section 8.2 of this report. Both existing systems are being redesigned to meet the special needs of the masterplan. At this time the details of the new educational system are not available. The detail of the new health system is provided in Section 8.5 of the supporting report "Settlements and Infrastructure in Pahang Tenggara"

The principle features of the new health system are:

(*a*) There will be one General Hospital which will serve the entire population of the region.

(*b*) There will be three District Hospitals each serving populations from 80,000 to 120,000 representing an average of 1.76 beds per 1,000 people.

(*c*) In addition one District Hospital is proposed for the town of Triang, outside the boundaries of the study to serve the 80,000 residents of the northwest area of the region. This population falls under an existing health district (the Temerloh District).

(*d*) The present Rural Health Units consisting of 1 main health centre, 1 sub-health centre and 20 midwife's clinics per 50,000 population have been modified to meet the requirements of an urban population. The envisioned service will provide 21 main health centres for towns with populations above 10,000. Seventeen towns with populations less than 10,000 will receive sub-health centres. There will be no midwife clinics in Pahang Tenggara.

The proposed service will be attractive to the potential settlers on the following accounts:

(1) All levels of health services will be available to the settlers upon arrival.

(2) Every township will have a full range of promotive and preventive services, which will be readily accessible to the population.

(3) No centre will be more than 1 mile, and no hospital more than 10 miles, from the people it serves.

(4) Clinic schedules will be adjusted to suit the working pattern of the population.

(5) The diagnostic and curative capabilities have been increased to provide a higher standard of personal service.

(6) There will be extensive community health services in schools, homes and community centres.

(7) The new functions of the health team call for continuous updating of their training.

(8) The permanent residency of the health staff will enhance the rapport between the community and the service.

(9) The role of the newly established community nurse is consonant with the cultural background of the immigrant population.

(10) The service will enroll the support of the traditional system of health care.

16.0 TRANSPORTATION

The operational feasibility of the masterplan is closely linked to the efficiency of the interaction between the various elements of the development. A considerable body of technical and statistical data has been compiled to produce the design of the regional transportation network. The detail tables and supplementary text are included in Section 5.0 of the supporting report "Settlements and Infrastructure in Pahang Tenggara".

16.0.1 Existing Conditions

Transportation within the Pahang Tenggara region is at the present time almost exclusively by road. There also exists a small amount of river transport and coastal shipping. There are in the region three small airports for light air craft at Lanjut, Bukit Ibam and Fort Iskander. The only regular commercial air service available is at Kuantan airport to the north. The development programme envisages that roads will continue to be the chief means of servicing the area.

The roads now serving the Pahang Tenggara region which have an asphalt surface comprise 70 miles of coastal road connecting Pekan in the north to Endau in the south; and an additional 40 miles of road along the south bank of the Pahang River. A major deterrent to traffic along the coastal route are the three ferry crossings. Bridges are now being constructed and work on the three crossings is scheduled for completion by 1975. The other existing roads of the region are for the most part laterite surfaced timber tracks built and maintained by the loggers. The former Rompin railroad trackway had the rails and sleepers removed in 1971 and the route is presently employed as a single track road by the loggers.

16.1 PROJECTION OF TRANSPORT NEEDS

16.1.1 Freight Traffic

16.1.1.1 Goods leaving the region

Estimates were made of the volumes of output that could be expected at each five-year period.

The central and northern sub-regions are generally expected to send their produce via the Kuantan-Segamat Highway. The logs from Mentiga forest complex are expected to leave the region via the Pekan bridge, and the produce of the Jeram Valley and Ladang Pegawai are expected to initially exit via Bahau. Most of the produce of the south-west sub-region is projected to leave via the southern portal, but the three towns to the west of the Keratong River are expected to send their produce via the south-western portal to the Klang Valley. Produce from the western and south-western sub-regions is expected to leave via those portals.

16.1.1.2 Goods entering the region

Goods coming into the region have been divided into four groups:

(*a*) food

(*b*) other consumer goods

(*c*) miscellaneous other goods, including construction raw materials, other than fuel

(*d*) fuel

Food for the central sub-region is expected to come half from the north—from Kelantan, Trengganu and Kuantan—and half through the south-west portal. Food for the south-west sub-region is anticipated to enter half via Bahau and half via Segamat. Food for the western, and south-eastern sub-regions is expected to enter by those portals. For the central and south-western sub-regions, it is expected that 70% of other consumer goods and miscellaneous goods will come from the Klang Valley, and 30% from Johore Baharu. For other sub-regions, imports and expected to enter via the relevant portals. It is anticipated that all fuel for the central and south-western sub-regions will enter via the south-western portal, since this is the shortest way from the refineries at Port Dickson.

16.1.1.3 Internal freight transport

The bulk produce of the agricultural and forestry development will all have to be transported to processing plants within the region. In the case of sago and tapioca, the processing plants may be located within the respective estates. In the case of palm oil, rubber and logs, the raw materials will likely have to be transported to processing plants located elsewhere in the region. Moreover, most of these commodities will then have to be transported outside of the region for further processing or marketing.

Initially it is expected that a high proportion of logs will be transported directly outside of the region. However, following construction of the proposed forest complexes there will be a reduction in the log tonnage and an increase in lumber, plywood and other processed forest products leaving the region. In the case of two of the forest complexes raw materials will, for the most part be transported only for relatively short distances on the secondary and the primary roads connecting the resource with tertiary the processing facilities.

16.1.2 Other Traffic

16.1.2.1 Population and vehicle registrations

The present vehicle ownership of 4 vehicles per 1,000 population is expected to increase at a rate of 5% a year,[1] assuming that per capita vehicle ownership will keep pace with the rest of West Malaysia. Thus, by 1990 it is expected that there will be 10 vehicles per 1,000 population.

Only 15% of the non-lorry traffic is projected to use the southern portal, 30% is projected to use the south-western portal until 1985, making a movement through these two portals of 45% of the total traffic. On the other hand, traffic through the northern portal leading to Kuantan is projected to be 20% of the total non-lorry traffic in 1975, rising to 25% as the regional road network is improved. Non-lorry traffic through the remaining portals is proportional to the lorry traffic.

16.1.2.2 Tourist traffic

One further consideration in projecting overall requirements is the volume of tourist traffic which is expected to use the regional road system. There are two roads through the region which are likely to have traffic of this nature.

The first is the coastal road, and the second is the Kuantan-Segamat highway.

16.1.3 Total Projected Traffic Volumes

Combining the individual components produces a projected demand table shown below.

1 Registrar of Motor Vehicles in Pahang.

Table 16.1—Projected Traffic Volumes on Main Routes (ADT) (2-way)

Route	*1975*	*1980*	*1985*	*1990*
N	150	455	710	1,220
W	135	2,400	505	11,555
SW	150	640	1,050	810
S	215	700	880	1,280
SE	135	250	540	695
NE[1]	240	425	370	555

1 Across Pahang River Bridge at Pekan.

16.2 PREVIOUS STUDIES

16.2.1 Road Studies

The need for improved road links to Pahang Tenggara has long been recognized by the Government as a necessary prerequisite to development of the region. Construction of a "Southern Pahang Trunk Road" linking Segamat to the south with the Federal Highway Route II in the north at Gambang was recommended by consultants to Government in 1967.[1]

In 1969 Lyon Associates Inc. were commissioned to study the feasibility of building such a road. Several alternate routes were studied resulting in a recommended route having an overall length of 94.9 miles and estimated to cost M$54.3 million, excluding right of way costs.

The Pahang Tenggara Masterplanning Study fieldwork found the soils for the proposed northern half of the Segamat-Kuantan highway to be poor. Better soils were in areas already accessible, through having been logged, located east of the route proposed by the former highway consultants. It was consequently agreed with Government that the proposed new highway would be relocated further to the east in the section north of the Rompin river in order that it might give earlier and better access to the more fertile lands and the urban centre of the region. This realignment is presently being designed and the construction commenced in the southern portions of the highway.

16.2.2 Port Studies

The feasibility of constructing a port along the east coast has been the subject of at least three studies undertaken by foreign consultants since 1968. The consensus of opinion was that such a port would aid the development of Pahang and other East Coast states but that the high cost of building and maintaining a facility capable of handling present day ocean-going vessels cannot be justified solely on the grounds of the presently foreseeable freight tonnage likely to be handled. This matter, particularly the littoral drift problem common to the East Coast, is the subject of ongoing studies. The latest study is now being conducted considering a location 15 miles north of Kuantan. As such, it would be premature to comment on the outcome of that study.

1 "Transport Development in Malaysia" Volume 1 to 4 inclusive at 1967. Prepared by Frederic R. Harris, Inc. and Coverdale and Colpitts in co-operation with Robert R. Nathan Associates, Inc.

16.3 PROPOSED ROAD NETWORK

A study of alternative transport modes was undertaken and it was concluded that for the foreseeable future the roads should be designed to take all traffic in the region. Thus the implementation of the masterplan for development of Pahang Tenggara will necessitate construction of a network of primary and secondary highways as shown in Fig. 16.3.

The highway routes shown should be regarded as "transportation corridors" rather than specific alignments. They were selected on the basis of economic considerations as well as presently available physical data, including published topographic maps and reports, aerial photographs, soil survey data, rainfall, hydrologic and geologic data, and a reconnaissance along many of the existing timber tracks. Although much more information is required to select specific alignments and for final design, it is fairly certain that no insurmountable technical problems will be encountered along any of these routes and that acceptable base course materials will be found within economic haul distance.

16.3.1 Primary Highways

The construction and maintenance of primary highways, entails major expenditures of public funds. For this reason considerable attention has been given to satisfy the needs of the region to ensure their integration into the West Malaysian road network. To satisfy the requirements of a primary highway they would have to be built to a standard corresponding to J.K.R. 05 standard.

16.3.2 Secondary Highways

Secondary highways will be required to connect settlements and processing centres with the primary highways. Secondary highways should be constructed to J.K.R. 03 or 04 standards and carry an average daily traffic (ADT two ways) of between 250 and 750 vehicles per day.

16.3.3 Tertiary Roads and Trails

The lowest class of roads required to accommodate vehicles within the region are the tertiary roads and harvest trails. Although the unit cost of these roads is small in comparison with primary and secondary roads, they do nevertheless represent a very substantial total investment because of the many miles involved. Since forest clearing operations will precede agricultural developments in almost all areas it is considered expedient to plan the tertiary road grid to suit the intended agricultural use as well as the forest clearing operation.

16.4 ROAD CONSTRUCTION SCHEDULE

The major factors which determine the road construction schedules are the development sequences proposed for Pahang Tenggara during the Second Malaysia Plan for agriculture and forestry programmes. Part of the Pahang Tenggara agricultural development started well before the Pahang Tenggara study was initiated, but the permanent service roads for these developments were not begun. As a consequence the backlog of permanent road requirements has to be caught up at the same time that roads are constructed for the new agricultural and forestry development. As such, the road construction schedule for the Second Malaysia Plan represents a crash programme.

After the initial burst of construction in the Second Malaysia Plan, road building over the following ten year period can be carried out at a much more leisurely pace. Then again just before the Fifth Malaysia Plan there should be a speed up of construction, but only to a rate of half of the initial pace. A detailed breakdown of specific highway sections, their standard, and their phasing is shown in the supporting report "Settlement and Infrastructure in Pahang Tenggara".

The road construction schedule does not call for the primary highway crossing of the Pahang river and the road north to Gambang to be completed before 1978. In the interim period north-bound produce of the region will go to Kuantan by way of Pekan. This timing however, could be altered by current State and Federal planning for a Kuantan port to be operational in 1976. Providing that the cost of shipping out of Kuantan to world markets is competitive with costs through Port Klang, Johore Baharu or Singapore, freight traffic on the north, south highway could reverse. In this event the Pahang river crossing and the link to Gambang might have to be accelerated.

Table 16.4—Road Construction Schedule

	Graded Miles	*Paved Miles*
1972	59.5 ..	10.5
1973	90 ..	38
1974	39 ..	91
1975	22.5 ..	39
1976	0 ..	15.5
1977	7 ..	17
1978	24 ..	7
1979	5 ..	5
1980	5 ..	11
1981-1990 ..	102.5 ..	120.5
TOTAL ..	354.5	354.5

16.5 ROAD CONSTRUCTION COSTS

Cost estimates for constructing highways, roads and trails in Pahang Tenggara are based on soil and other field data obtained by the consultants, unit costs contained in various published reports, as well as unit costs provided by the Pahang J.K.R. relative to recently constructed secondary highways, logging roads and trails in Jengka Triangle. Typical road cross sections proposed for the region and unit costs of various road types are shown in the supporting report.

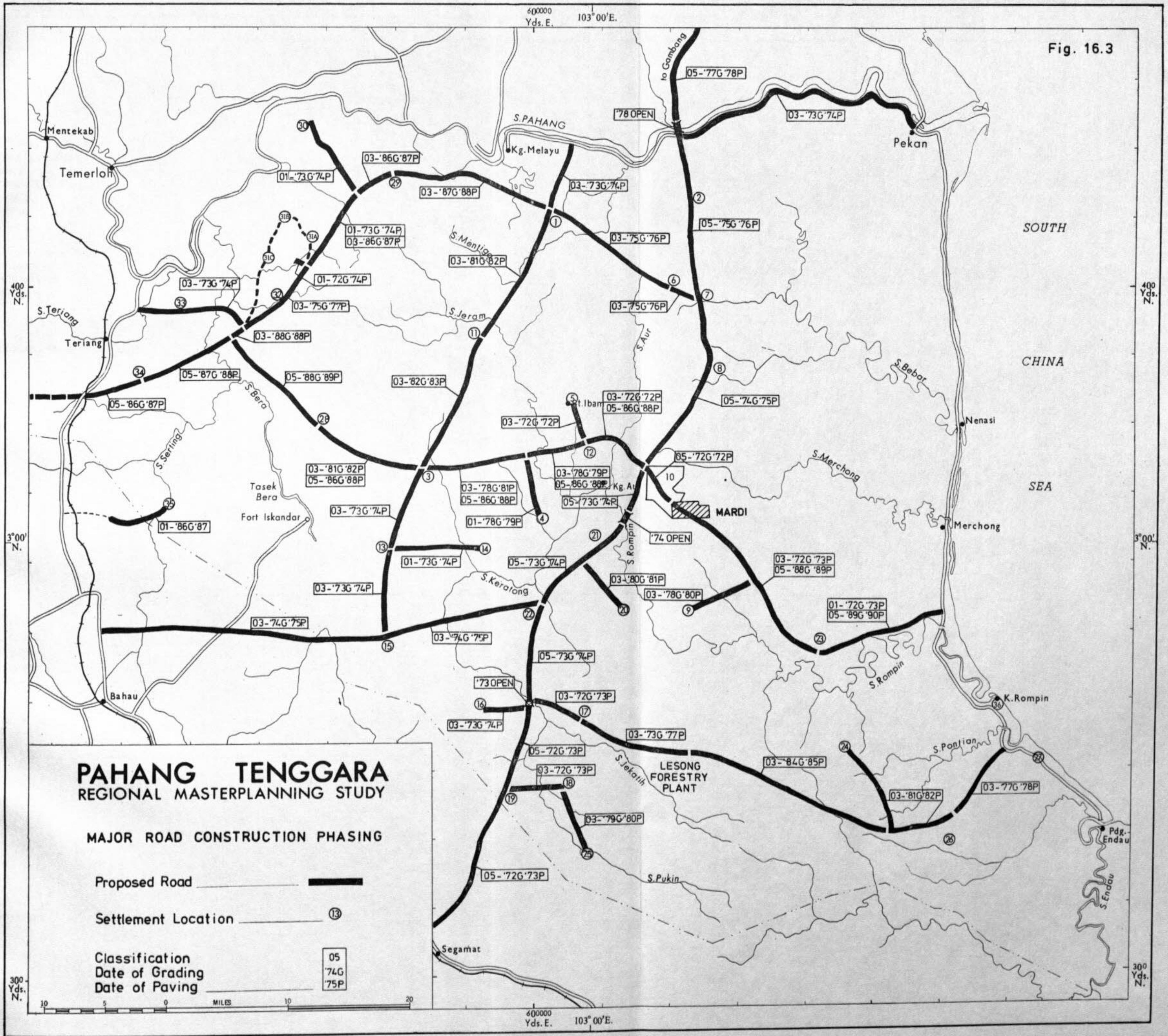


Fig. 16.3
PAHANG TENGGARA
REGIONAL MASTERPLANNING STUDY
MAJOR ROAD CONSTRUCTION PHASING
Proposed Road
Settlement Location
Classification
Date of Grading
Date of Paving
05
'74G
'75P
MILES
600000 Yds. E.
103° 00'E.
400 Yds. N.
300 Yds. N.
3°00' N.
SOUTH
CHINA
SEA
S. PAHANG
to Gambang
Mentekab
Temerloh
Kg. Melayu
Pekan
Teriang
S. Teriang
S. Mentiga
S. Jeram
S. Aur
S. Bera
S. Bebar
S. Serting
Tasek Bera
Fort Iskandar
Pt. Iban
Kg. Au
MARDI
Nenasi
S. Merchong
Merchong
S. Rompin
S. Keratong
Bahau
S. Jekatih
LESONG FORESTRY PLANT
S. Pontian
K. Rompin
S. Pukin
Pdg. Endau
S. Endau
Segamat
'78 OPEN
'74 OPEN
'73 OPEN
05-'77G'78P
03-'73G'74P
03-'86G'87P
01-'73G'74P
03-'87G'88P
01-'73G'74P
03-'86G'87P
03-'81G'82P
05-'75G'76P
03-'75G'76P
01-72G'74P
03-'75G'77P
03-'88G'88P
05-'87G'88P
05-'88G'89P
03-'82G'83P
05-'86G'87P
05-'74G'75P
03-'72G'72P
05-'86G'88P
05-'72G'72P
03-'81G'82P
03-'78G'79P
03-'78G'81P
01-'78G'79P
05-'73G'74P
01-'86G'87
03-'80G'81P
03-'78G'80P
03-'72G'73P
05-'88G'89P
01-'72G'73P
05-'89G'90P
03-'74G'75P
03-'73G'77P
05-'72G'73P
03-'84G'85P
03-'79G'80P
03-'77G'78P

16.6 ROAD CONSTRUCTION EQUIPMENT

A large volume of equipment for road work, grading and paving should be ordered in 1972 for delivery in 1973. This equipment is required to move the earth and rock for the Pahang Tenggara primary and secondary highways. The equipment for the primary highway work is specified as having larger unit capacities than those for the secondary highways. This is due to the fact that there is more room to manouver in building the primary road and there are greater volumes of earth moving at specific locations. The value of the equipment fleets are:

Primary Road Construction Equipment	M$ 9,282,000
Secondary Road Construction Equipment	M$ 9,118,000
Total ...	M$18,400,000

The detailed equipment costs are shown in the supporting report.

16.7 CONSTRUCTION PERSONNEL

For the period of construction during the Second Malaysia Plan large numbers of technical personnel and skilled equipment operators will be required. It is likely that there will be a shortage of available skills and that as a consequence, PWD may require expatriate assistance. They will also probably have to train operators, which process usually results in costs that are greater than would be the case when using skilled crew. Tables 5.10a & 5.10b in the supporting report show both the numbers and categories of personnel required and also the organization unit which would be necessary to implement the road construction programme on the assumption that a single agency was responsible.

Table 16.5—Road Construction Expenditure

	Grade M$1,000	*Pave M$1,000*	*Major Bridge and Overpasses M$1,000*	*Total[1] Road Costs M$1,000*	*Construction M$1,000,000*	*Sub-total 5yr. Plans*
1972 ..	17,743	983	1,500	220,226	5	
1973 ..	18,524	3,385	1,500	23,409	35	1972-1975
1974 ..	12,465	5,920	1,700	20,085	20	$79,043,000
1975 ..	9,788	3,735	1,800	15,323	20	
1976 ..	—	2,133	1,800	3,933	5	
1977 ..	44,320	1,105	2,000	7,425	4	
1978 ..	2,600	1,580	2,350	6,530	4	1976-1980
1979 ..	675	50	350	1,075	4	$20,353,000
1980 ..	675	715	—	1,390	3	
1981 ..	5,468	1,170	—	6,638	3	
1982 ..	1,350	2,633	—	3,983	3	
1983 ..	—	650	—	650	3	1981-1985
1984 ..	2,700	—	—	2,700	3	$15,271,000
1985 ..	—	1,300	—	1,300	10	
1986 ..	20,530	—	—	20,530	10	
1987 ..	1,890	1,173	—	3,063	10	
1988 ..	11,953	3,858	1,000	16,811	10	1986-1990
1989 ..	44,800	2,100	2,000	8,900	10	$52,204,000
1990 ..	—	900	2,000	2,900	5	
	115,481	33,390	18,000	166,871	167	$166,871,000

[1] Total road costs are based upon the requirements of development whereas construction expenditure is based on evening the work programme and providing M$18,000,000 of construction equipment in 1973, ordered in 1972.

17.0 CONSERVATION AND ENVIRONMENTAL CONTROLS

Major changes have already occurred in the natural eco-system of Pahang Tenggara. Such changes in the physical environment and indigenous biotic communities are the inevitable result of the exploitation of mineral and timber resources and, especially, of changes in land use which already have transformed areas of virgin jungle into productive agricultural lands and locations of human settlement.

Traditionally, the term "conservation" would seem to be synonomous with "preservation" in Malaysia, and is still the prevalent interpretation in many parts of the world. This definition implies the withholding of valuable natural resources from economically profitable exploitation for reasons of aesthetic or biotic significance. However, this is not the interpretation employed by the study as the conserved areas should serve multiple purposes including productive uses.

17.1 PRESERVATION OF NATURAL PHENOMENA

The conservation of natural phenomena implies that there is merit in preserving indigenous flora and fauna, jungle wilderness, and scenic landscape within the Pahang Tenggara. The proposals for Nature and Forest Reserves and a new National Park are shown on Fig. 17.1 and are intended to provide a living national heritage to be studied and enjoyed by future generations of Malaysians.

The sizes of the proposed Nature Reserves and the National Park are kept to a minimum in this plan, and it preserves from exploitation only those areas believed essential to meet the objectives proposed. It is anticipated that environmental manipulation will be a technique employed in all reserves either to improve the quality of fish and wildlife habitat, or to increase the educational and recreational potentials. The selective, or even clear-cutting, of timber and other flora, and the reforestation or cultivation of land are likely wildlife management techniques. The commercial harvest of timber, however, would be at the discretion and rigidly controlled by a professional biologist within the proposed Nature Reserves and National Park. The ecological concept requires the buffering of the reserves and park from civilization by forests under perpetual management. The presence of peripheral jungle roads will provide access to wilderness areas, complimenting the policy of optimum public use of the reserves and parks consistent with the preservation of special floral and faunal features.

Also, within the ecological concept is the recognition that isolated areas of jungle will remain within agricultural areas. These areas can be managed for the protection of birds and small animals. The concept recognizes that the control of nuisance animals may become necessary interfaces between jungle and civilization but such control should not endanger the persistence of native fauna within the sancturies provided by the conservation areas and forest reserves.

17.1.1 The Tasek Bera Nature Reserve Park

Tasek Bera is one of two major natural bodies of freshwater on the Malay Peninsula, the other being Tasek Chini. It supports a biological

17.0 CONSERVATION AND ENVIRONMENTAL CONTROLS

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17.1.1 The Tasek Bera Nature Reserve Park

Tasek Bera is one of two major natural bodies of freshwater on the Malay Peninsula, the other being Tasek Chini. It supports a biological

community which is unique within Malaysia and likely duplicated nowhere else in the world. Because of the scientific value of the Tasek Bera and the potentials which it offers for education and recreational activities, it is essential that this remarkable environment be preserved for the benefit of future generations.

17.1.2 Tasek Chini Nature Reserve Park

Tasek Chini is the other of the two natural bodies of freshwater in Malaysia which can be described as lake environments. Tasek Chini contains open water much clearer than Tasek Bera, except during flood period, and is suitable for motorless boating, fishing and swimming.

17.1.3 The Menchali Forest Reserve Park

The tract of approximately 1,500 acres is located along the coast of the South China Sea north of Sungei Rompin. It extends inland from the sand coastal beach to include raised beaches parallel to the coast with swampy depressions between podsolic soils profile. The boundaries of the present reserve are extended to the seashore although there is presently limited human settlement there.

17.1.4 Coastal Zone for Tourism

The coastal zone refers to the area between the road and the shore from Pekan town to Sungei Endau. Within this boundary, some 40,000 acres, lies all of the suitable beaches and the Menchali forest reserves. Most of this is Federally held land, except perhaps where existing settlements occur.

Tourist attractions along the coast are suggested at eight small parks distributed at approximately 10 mile intervals. Initially each of the park could have two or more small business enterprises (bumiputra) for a total of 16 ventures. At a later date when the tourist trade merits the increase, much more elaborate accommodations can be developed along the coast.

Lanjut is the most well sited point on the coast for initially intensive tourist and recreation development. It is already in the process of transformation through the acquisition of the recreational facilities of the Rompin Iron Mining Company by the State of Pahang.

17.1.5 Endau-Rompin National Park

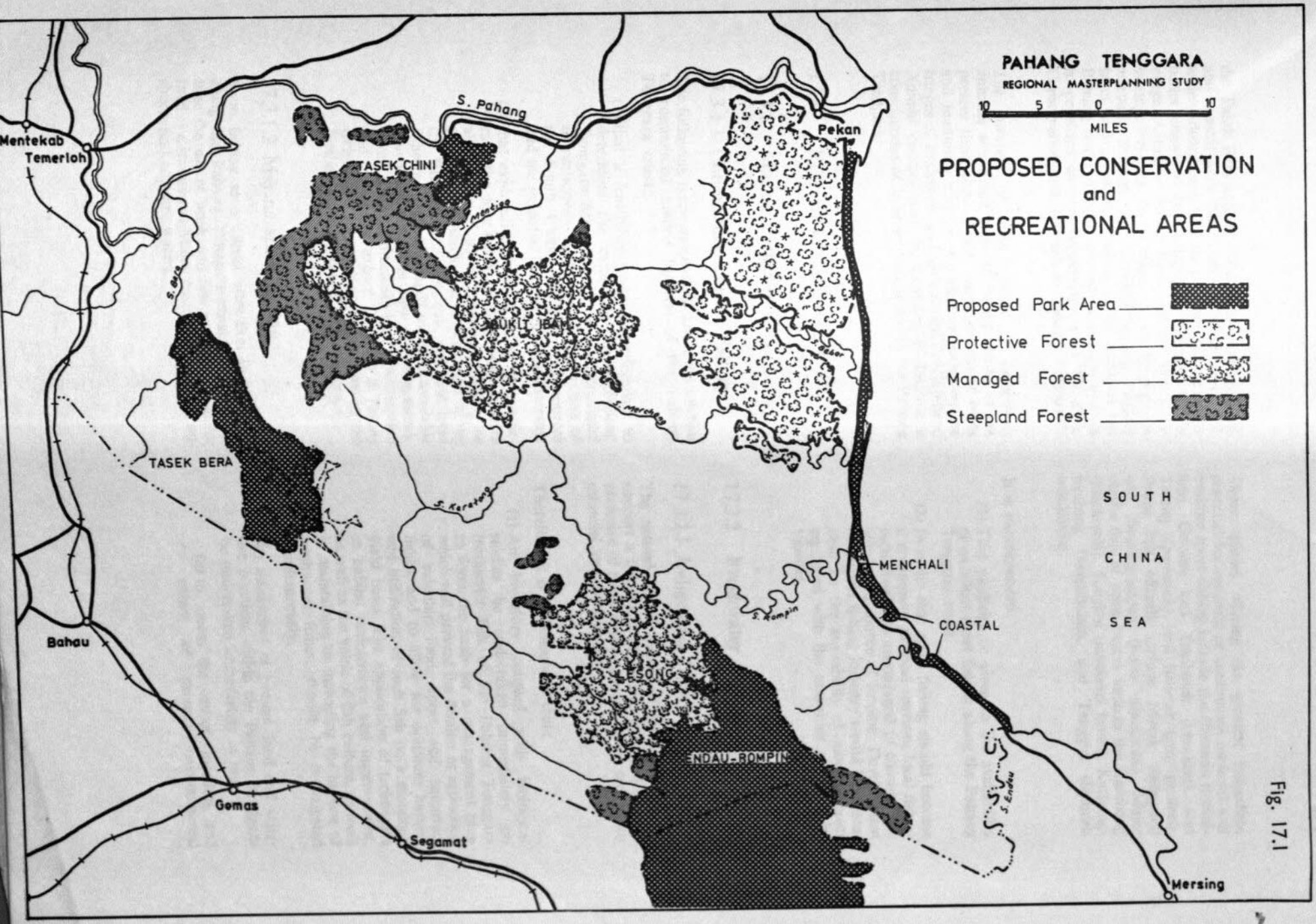
The proposed National Park is an area of approximately 85,000 acres in Pahang State to be adjoined by land of similar area in Johore State. This region consists of high hill country comprising the mountain range of G. Besar (3,398 ft. a.s.l.) to G. Ulu Kempayan (2,803 ft. a.s.l.) and the series of sandstone escarpments towards the north, stretching from Bt. Lawai to Bt. Peter.

The management concept proposed for this National Park is one of optimum public use, consistent of course, with the preservation of wilderness areas, the protection of endangered animals, and the demonstration of unique ecological communities. If this objective is to be realized, the development and ultimate management of the National Park will require the integrated efforts of foresters, biologists, naturalists, hydrologists, and other competent specialists in areas of renewable resources development.

Responsibility for the creation of the preliminary park plan must be placed in the hands of a specialist in that field, but working in close cooperation with scientists and others with pertinent expertise, including those with a knowledge of the local geography and natural history of the area. Because of the extent of the area, the diversity in topography and scenery and the variety of ecological communities, it is anticipated that virtually all types of outdoor activities can be accommodated within, or peripheral to, the park boundary. To suggest a mode for development would be unwarranted without an intensive field study of the location.

17.2 SURVIVAL OF INDIGENOUS ANIMALS

Actual numbers of the more spectacular large mammals (or in truth, any species of wildlife) are unknown in the Pahang Tenggara. Standing population of rhinoceros are estimated at as low as two or three individuals restricted to the south east area. Seladang are believed to be confined to the area around, and to the south of Tasek Bera where two known herds may total about 40 animals. Elephants are not an uncommon sighting within the Pahang Tenggara region, especially in


PAHANG TENGGARA
REGIONAL MASTERPLANNING STUDY
10 5 0 10
MILES
PROPOSED CONSERVATION
and
RECREATIONAL AREAS
Proposed Park Area
Protective Forest
Managed Forest
Steepland Forest
S. Pahang
Mentekab
Temerloh
TASEK CHINI
BUKIT IBAM
Pekan
TASEK BERA
MENCHALI
COASTAL
SOUTH
CHINA
SEA
Bahau
LESONG
ENDAU-ROMPIN
Gemas
Segamat
Mersing
Fig. 17.1

the Tasek Bera area and the south west highland and coastal area. No doubt the elephant is still widely distributed and its presence may become better known as land settlement impinges on it's range. A unique faunal feature of the east coast swamp forest is the bearded pig which migrates annually through the Pahang Tenggara, ranging from within Johore State to as far north as the Pahang river. A complete list of wildlife species is provided in the supporting report "Wildlife, Conservation and Tourism in Pahang Tenggara".

The survival of most species of indigenous animals would not seem to be threatened at the present time and, in fact, many species of birds and mammals may be expected to thrive on the fringes of settlement and agricultural development. Animal control may be expected to become a consequence of land settlement within the Pahang Tenggara.

17.3 FISHERIES RESOURCES

17.3.1 Marine Fisheries

17.3.1.1 Commercial marine fishing

The following recommendations are made relative to commercial marine fisheries of the Pahang Tenggara coast:

(1) that a feasibility study be undertaken to determine the extent to which Pahang Tenggara fishermen should be encouraged to participate in the future exploration of the South China Sea fisheries resources and the potential benefits to local economy.

(2) that exploration be undertaken to enumerate the speciation, ecology, and relative abundance of udang (prawns) presently or currently available for exploitation along the Pahang Tenggara coast, and that local fishermen be encouraged to utilize available prawn production in view of the economic potentials for immediate local consumption and, especially, export. Research in fishing technology should be a component in the further development of this country.

17.3.1.2 Marine sport fishing

Sport fishing as a tourist attraction is negligible along the Pahang Tenggara coast. At the same time the use of hook and line to capture fish for food is a traditional Malay custom in estuarial, onshore, and offshore waters.

Those species offering the greatest immediate potential for seasonal or continuous estuarial and onshore sport fishing include the Chermin (trevallies), Gelama and Tembereh (croakers), and Talang (Queenfish), and Belanak (grey mullets). Prime fish offreefs include Merah (snappers) and Gegong-gerong (horse mackerels). Major choice fish of open waters include the Kembong (mackerels), Tongkol (mackerel tunas), Kachang-kachang (barracudas), and Tenggiri (Spanish mackerels).

It is recommended:

(1) That publicity be given to the availability of excellent sport fishing along the Pahang Tenggara coast.

(2) In order that sport fishing should become a component of local tourism, local fishermen should be encouraged to consider the sport as a source of income. Development of a sport fishing industry would be dependent on the availability of modern boats equipped with the amenities expected by tourists.

17.3.2 Freshwater Fisheries

17.3.2.1 Indigenous freshwater fishes

The natural inland waters of Pahang Tenggara support a fish fauna of no less than 150 species, exclusive of those marine species which move into estuarial and tidal waters.

Therefore, it is recommended that:

(1) An inventory coupled with biological studies be undertaken immediately on freshwater fish of the Pahang Tenggara to form the basis for a management plan which will prevent the decline or extinction of valuable food, sport and aquarium fishes, and to allow for optimum harvest and utilization of such fish on a sustained yield basis. The application of techniques in habitat maintenance and improvement, as well as the value of fish culture, as tools in maintaining or increasing the harvest of freshwater fishes, should be investigated simultaneously.

(2) An assessment of present land and water use practices within the Pahang Tenggara be undertaken immediately in order:

(*a*) to assess the causes, location, and extent of present environmental

pollution relative to the future welfare and survival of important fish, and

(*b*) to establish environmental stands and the necessary regulatory controls over commercial interests profiting from the exploitation of timber and mineral resources and over those undertaking land development.

It is essential that these steps be taken before the aquatic environment and water quality deteriorates to the point of irreversibility not only for fisheries but for all human uses to which fresh water will be required in the future.

17.3.2.2 Potential for artificial pond fisheries in Pahang Tenggara

The potential for the pond culture of freshwater food fish within the Pahang Tenggara is limited only by the available market. Principal biological problems are the seasonal excess of water during the monsoons and the generally low pH (high acidity) of surface waters throughout much of the region. As both problems can be overcome by proper engineering and pond management and because techniques for tropical fish culture have become well-established for a number of native and exotic species, decisions on the future of pond fish production become an economic rather than a biological consideration. A commercial feasibility study of a half acre fish pond is provided in the supporting report "Wildlife, Conservation and Tourism in Pahang Tenggara".

While it is inevitable that most of the natural ecological systems will change with development there is no valid reason why those remaining components of the environment which are not directly utilized should be debased to such an extent as to be obnoxious to the aesthetical standards of people living in the region.

17.4 CONSERVATION CONTROLS

The masterplan has, within its design, the basis for the effective control of the environment. But the responsibility for administering actual controls during the implementation of development must rest with the Development Authority. In the absence of a national policy or control agency, some broad guidelines need to be difined in conservation control.

The ECAFE seminar on Development and Environment arrived at a number of considerations and recommendations for the assessment of environmental issues with respect to the countries in South-east Asia. Since these are comprehensive statements, they are reproduced in full (page 17-19).

In concrete terms, environmental concern, while pursuing development, should mean a number of things, e.g.:

(1) Study proposals submitted for approval of authorities should be required to include, as far as possible, an assessment of the environmental impact of the project. The licensing or approving authority should take an over-all view of the joint impact environment of a number of projects and activities. Costs of after thought ecological and environmental palliatives are often much higher than the additional cost of providing for environmental corrective action at the outset.

(2) So far as possible, alternative investment projects relating to the production of a product or a complex of products should not only specify the technological differences between the alternatives but also the differences, if any, in their effect on the environment.

(3) Efforts should be made to foresee the demand for products which were likely to give rise to environmental degradation by their use or by their production, if no intervention were made. In such cases, investment licensing, direct controls or fiscal measures (including subsidies and taxes, and effluent charges) should be used to prevent the demand arising and supply responding if the product were not considered essential, or favouring technologies which were less pollutive.

(4) By adequate physical planning, taking the spatial and locational aspects into account, much could be done and more economically by way of providing the minimum necessary infrastructure for urban development and avoiding serious deterioration of the quality of the environment.

(5) The ecological approach can help in designing a more satisfactory strategy for rational use of natural resources. Planning in such matters should clearly recognize the limits to exploitation as well as the opportunities for development. In particular, it should seek to identify ecologically fragile

areas and, in general, set out guidelines for intelligent use of land, marine and other resources.

(6) Regional and local planning should be strengthened and competence created to undertake overall planning and environmental management and control.

(7) In view of the general scarcity of resources, on every issue of choice involving resource allocation an answer would depend on careful weighing of costs and benefits. No satisfactory answer could be given unless both costs and benefits were analysed and compared. Hence, there was a need for greatly improving the data base and research for planning and analysis in the environmental field. A good deal of attention should therefore be given to quantification . . . .it was suggested that each country should take urgent steps to establish appropriate machinery for environmental planning, management and control, working in close association with the machinery of planning for economic and social development.

Such a machinery, with adequate resources at its command, could be entrusted with the task of

(*a*) conducting environmental surveys and appraisal of existing policies and legislation for environmental control,

(*b*) working out environmental standards by way of

(i) "goals" of development (e.g. nutrition) to be achieved and

(ii) limits (e.g. pollutants) not to be exceeded,

(*c*) developing indicators of environmental situation,

(*d*) making quantitative evaluation of the impact of the environment of different kinds of activities and evaluation of alternatives from the environmental angle,

(*e*) interpreting development policies in terms of environmental factors,

(*f*) undertaking studies directed to relating environmental concerns with planning methods, analyses and procedures,

(*g*) making recommendations for strengthening environmental work in terms of well-conceived priorities and in regard to the most appropriate authorities and institutions for environmental control,

(*h*) stimulating and assisting research into all aspects of environmental control,

(*i*) advising on the adequacy of training arrangements for personnel required for environmental work,

(*j*) publishing works on environmental problems,

(*k*) offering any other advice desired by the Government on environmental matters.

Few, if any, countries in the world have achieved such a standard of performance in the field of environmental assessment and control. Nevertheless, these are the kinds of steps which are required, are being recommended and are being adopted. It is desirable that Malaysia, in its own domestic and international interests and for both economic and social reasons, proceed similarly, after investigation of which actions are most appropriate for its circumstances.

The environmental considerations in the development of Pahang Tenggara can thus be a prototype for the formulation of national policy. The foregoing description of considerations and action recommended in the region are intended to assist in the formulation of policy and to provide a basis for action within the region.

18.0 APPENDIX A

18.0 APPENDIX A—INDEX OF ADDITIONAL STUDY WORKING DOCUMENTS[1]

18.1 STUDY REPORTS

No. 1 "The Malaysian Economy"
by Benjamin Higgins
August, 1970.

No. 2 "Pahang and its Neighbours"
by Benjamin Higgins
August, 1970.

No. 3 "Pahang Tenggara Climate and River Runoff"
December, 1970.

No. 7 "The Economics of Development of Pahang Tenggara"
by J. S. Baker, J. H. Clark, B. Higgins and T. F. Wise
January, 1972.

18.2 STUDY PAPERS

No. 4 "Lanjut-Rompin: A Preliminary Assessment of Recreational Potential"
by J. J. O'Callaghan and O. C. Simonsen
December 15, 1970.

No. 9 "Proposed Bukit Ibam Industrial Forest Complex"
July, 1971.

No. 10 "The Management of Development in the Pahang Tenggara Region"
by M. Chevalier and T. J. Cartwright
August, 1971.

No. 15 "Transport and Communications"
by P. F. Andersen, T. F. Wise and W. Hemerling
December, 1971.

No. 16 "Sago Production in Pahang Tenggara"
by M. Flach, R. A. Thompson, A. H. J. Kroon and J. S. Baker
December, 1971.

No. 17 "Potential for Tapioca Production and Processing in Pahang Tenggara"
by R. A. Thompson, A. H. J. Kroon and J. S. Baker
December, 1971.

No. 18 "Rubber Production in Pahang Tenggara"
by J. H. Clark
December, 1971.

No. 19 "Oil Palm Production in Pahang Tenggara"
by J. S. Baker
December, 1971.

No. 20 "Potential for Livestock and Poultry Production in Pahang Tenggara"
by J. H. Clark and R. A. Thompson
December, 1971.

No. 21 "Potential for Fruit Production and Processing in Pahang Tenggara"
by A. H. J. Kroon, J. J. O'Callaghan and R.A. Thompson
October, 1971.

[1] Excludes superceded work.

No. 22 "Analysis of Mixed Cropping Systems for Smallholders"
by J.H. Clark
January, 1972.

18.3 WORKING PAPERS

No. 4 "Integration of Regional Planning with National Development Planning"
by Benjamin Higgins
August, 1970.

No. 16 "Current Agricultural Land use in Pahang Tenggara"
by M. Flach
March, 1971.

No. 17 "Financial Institutions—Tokyo and Manila"
by Murray D. Bryce
February, 1971.

No. 19 "Employment and Income-Generating Potential of Land Settlement in West Malaysia"
by G. R. Rogalsky
March, 1971.

No. 27 "Higher Level Manpower Situation in West Malaysia"
by G. R. Rogalsky
April, 1971.

No. 28 "Reports on Meetings with Representatives of the World Bank and U.S. Department of Agriculture, Washington, March 29-31, 1971"
by Murray D. Bryce and H. G. von Cube
April, 1971.

No. 31 "Apparent Cost Differences in Manufacturing Activities in Different States in West Malaysia"
by J. J. O'Callaghan
June, 1971.

No. 33 "Model of Timber Utilization Complex: Phase II—Plywood"
by F. A. Wilfert and W. P. Crooks
June, 1971.

No. 34 "Model of Timber Utilization Complex: Phase III—Particleboard"
by F. A. Wilfert and W. P. Crooks
June, 1971.

No. 35 "Model of Timber Utilization Complex: Phase IV—Component Plant"
by F. A. Wilfert and W. P. Crooks
June, 1971.

No. 36 "Oil Palm—Price, Output and Demand Projections"
by J. S. Baker
July, 1971.

No. 38 "Regional Model—Cut 2"
by R. Hoffart, O. C. Simonsen and G. R. Rogalsky
July, 1971.

No. 39 "Town Sizes and Thresholds for Manufacturing Activities in West Malaysia"
by J. J. O'Callaghan
July, 1971.

No. 41 "Land Tenure in West Malaysia"
by W. Hemerling and R. A. Thompson
July, 1971.

No. 41 "Sociological Field Studies"

No. 45 "Towards More Complete Utilization of Forest Resources in Plywood"
by W. P. Crooks
September, 1971.

No. 46 "The Implications of Settlement Patterns and Urbanization for Changes in Occupational Structure and Economic Development"
by J. J. O'callaghan and O. C. Simonsen.
September, 1971

No. 47 "An Incentives Policy for Malaysia and Pahang Tenggara"
by Benjamin Higgins
October, 1971.

No. 48 "The Potential for Inland Fishing in Pahang Tenggara"
by J. J. O'Callaghan
October, 1971.

No. 50 "Welfare Economics, Planning Theory and Planning for Pahang Tenggara"
by Benjamin Higgins
November, 1971.

No. 51 "A Cost Evaluation of Settlement Pattern and its Implication for Urban Development in Pahang Tenggara"
by J. S. Baker and O. C. Simonsen
November, 1971.

No. 52 "Settlement Size—an Evaluation of Service-Thresholds"
by O. C. Simonsen
November, 1971.

No. 55 "The Potential for Industrial Development in Pahang Tenggara"
by J. J. O'Callaghan
December, 1971.

No. 56 "The Potential for Malay Participation in the Development of Pahang Tenggara"
by G. R. Rogalsky
December, 1971.

No. 58 "Construction Activity and the Potential for Building Materials Industries in Pahang Tenggara"
by J. J. O'Callaghan
December, 1971.

No. 59 "F.L.D.A. vs Estate Organization System"
by T. F. Wise
December, 1971.

No. 60 "Potential Areas in Pahang Tenggara for Recreation, Tourism and Conservation"
by J. J. O'Callaghan, O. C. Simonsen and R. Hoffart
January, 1972.

No. 61 "Estimates of the Size, Location and Demographic Characteristics of the Population and Work Force of Pahang Tenggara"
by R. Hoffart
April, 1972.

54117—2-10-72—J.C.K., K.L.

Figure 8.3

IMPLEMENTATION SCHEDULE - FLOW CHART OF MAJOR ACTIVITIES

		72	73	74	75	76	77	78	79	80
FORESTRY		Bukit Ibam Logging to Agricultural Program								Switch to Permant Reserve Based on I.M.S or Logging/Agriculture.
		Bukit Ibam Timber Co.: Sawmill		Phase in Plywood Plant	Possible Phase in Particle-Board Plant		Possible Phase in Component Plant	SLIPPAGE ANTICIPATED		
		Negotiate	Mobilise	Lesong Complex phase in	Sawmill	Plywood	Possible Pre-Fab housing	Possible Slicing & Pre-Finishing	Possible component part plant	
			Lesong Logging to Agricultural Programme					Field trial – Intensive Management System (I.M.S.)	Prove or Disprove system	Confirm Perpetual or switch to logging for agriculture.
		Mentiga Forest Company – logging in Agricultural sequence							Evaluate adjacent resources	Reschedule as Perpetual yield or leave agreement as is.
		Silvicultural planting – field trials							Preliminary results	
		Logging technique developments – elsewhere – on steepland harvesting								Review Future planting
AGRICULTURE		CATEGORY I	Rubber to date 17,500	additional 6,600	additional 3,800	additional 10,000	additional 20,600	additional 18,000	additional 26,700	additional 31,200
		Agricultural Diversification	CATEGORY III	MARDI testing	Cashews			Cashews – possible semi-commercial		
					Maize					
					Ramie			Possible semi-commercial — Maize, Ramie, Groundnuts & Soybean, Sorghum		Expansion possible – Maize, Ramie, Groundnuts & Soybeans, Sorghum.
					Groundnuts & Soybeans					
					Sorghum					
					Cocoa			Cocoa – possible semi-commercial	Cocoa – expansion possible	
			CATEGORY II	Beef pilot project				Beef expansion possible		Exp. possible
			Sago Test Planting	Tapioca				Tapioca expansion possible		
			Lowland Tea				Expansion related to international market			
						Pig & Poultry. Fruit for fresh consumption and Processing		Expansion related to local population growth		
ROADS		Oil Palm	planted to date 99,000	additional 53,700	additional 45,600	additional 32,800	additional 26,500	additional 27,800	additional 14,900	additional 12,500
			Export Starts	Build road from N/S to Bahau for import/export traffic				New Port Opening		
		North/South Road From Segamat to 16		Complete to Regional Centre	Complete to Pahang River	Complete Pahang Bridge	Connect to Kuantan	TRAFFIC REVERSES FROM NORTH TO SOUTH TO BECOME SOUTH TO NORTH		
		Existing access	SECONDARY ROADS: BUILD 130 Miles	additional 106 miles	additional 62 miles	additional 16 miles	additional 24 miles	additional 26 miles	additional 5 miles	additional 16 miles
TOWNS		STARTING NEW TOWNS	F.L.D.A. — towns 22 & 31 Nucleus Estates — town 17 & 18	F.L.D.A — towns 1, 30 & 32: PTDA-10 Joint Ventestate – towns 13,14,15,16 & 3,7,33	SLIPPAGE ALLOWED TO MAKE UP Start Towns 6 & 8	Start Towns 2 & 21	Start Town 26 (F.L.D.A.)	Start Town 4	Start Town 9,19 & 25 (F.L.D.A.)	Start Town 12 & 20
		SADA & Nucleus Est New Agreement	Ensure town plans are ready for 74 Formalise control in 2 urban 'regions'	CREATE TOWN BOARD 10 & 31	CREATE TOWN BOARD 22 & 32	CREATE TOWN BOARD 5 & 17	CREATE TOWN BOARD 1 & 13	CREATE TOWN BOARD 15	CREATE TOWN BOARD 3	CREATE TOWN BOARD 26	CREATE TOWN BOARD 8	CREATE TOWN BOARD 25
UTILITIES		Design Water Supply Systems	order equipment	Construct Pumping Station/Equipment Delivery	Batu, Rompin Kepasing & Cherong Supply System Operating	CONTINUE DISTRIBUTION NETWORK		Teroh supply system operating	CONTINUE DISTRIBUTION		Cherong supply system operating	
			Provide Temporary Wells & Pumps to 15 Towns									
		Design Power Supply Systems	order equipment	Construct Sub-station/Equipment Delivery	HOOK UP LOCAL GENERATORS AND EXEND DISTRIBUTION						CONNECT TO NATIONAL GRID	
			Provide Temporary Generators to 15 Towns									
		Design Network Telecommunications	order equipment / construct Relay stations		connect 2,500 sets	install 600 sets	install 600 sets	install 600 sets	install 600 sets		install 600 sets	
			Provide Radio communications essential services to 15 Towns									
PROTECTION		Police	3 police posts: 1 police station	10 police posts: 2 police stations	2 police stations	2 police posts: 1 police station	1 police station	1 police station	1 police station		2 police posts: 2 police stations	
		Fire	9 substations 4 main stations	→ overun	1 substation 1 main station	3 substations	1 main station	1 substation	2 substations 2 main stations		4 substations	
		Postal	9 postal agencies	→ overun	3 agencies	3 agencies 1 post office	2 agencies 1 post office	→ overun	2 agencies		NIL	
SERVICES		Design Education System	7 primary schools 2 secondary schools	14 primary schools 6 secondary schools	5 primary schools 3 secondary schools	7 primary schools 3 secondary schools	10 primary schools No secondary school	4 primary schools 4 secondary schools	4 primary schools 1 secondary school		13 primary schools 1 secondary school	
		Health Detail Project Team	4 sub-centres 6 main centres	2 District Hospital	4 sub-centres 2 main centres	1 General & 1 District Hospital	3 sub-centres	2 sub-centres	1 main centre 1 upgrade from SMC to MHC	1 sub-centre 1 upgrade from SMC to MHC	3 sub-centres 3 main centres	1 District Hospital
		IN-MIGRANTS	30,000 + 35,000	+ 25,000	+ 15,000	+ 15,000	+ 15,000	+ 15,000	+ 15,000	+ 15,000	+ 15,000	+ 10,000 + 10,000
		TOTAL POPULATION	100,000	150,000	200,000		250,000		300,000			