MIRI-BINTULU REGIONAL PLANNING STUDY

FOR

THE GOVERNMENT OF MALAYSIA

AND

THE STATE OF SARAWAK

THE ZONATION PLAN

OCTOBER 1972

HUNTING TECHNICAL SERVICES LTD.,
LONDON

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9th October, 1972

The Chief Secretary
to the Government of Malaysia,
Economic Planning Unit,
Kuala Lumpur.

Dear Sir,

Miri-Bintulu Regional Planning Study

In accordance with the Agreement effective from 15th April, 1972, between the Government of Malaysia and the Association of Hoff and Overgaard and Hunting Technical Services Limited, we are now presenting the Zonation Plan Map and Report. This was called for not later than six months from the date of notice to proceed with the overall study and is, therefore, due not later than the 15th October, 1972.

The Report has been written with the intention that the findings presented will become the basis for discussion between the Government and the Consultants and, subsequently, for some decision by Government, which will be incorporated into the ensuing work on the Perspective Plan and the final Master Plan.

Yours faithfully,
for the Consultants

M. Cooper
M. Cooper
Hunting Technical Services Limited

C. J. Mathiesen
C. J. Mathiesen
Hoff and Overgaard

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(2) Priority to development of Native Customary Land.
Keep forest land untouched as much as possible

(2) ii) Native Area land not encumbered according to Song.

CONCLUSIONS AND RECOMMENDATIONS

The Zonation Plan, in accordance with the Scope of Work, gives "proposals for broad zonation of the region in future land use terms". The results and recommendations of the Zonation Study are summarised below and in the accompanying generalised Figure which is derived from the Zonation Plan Map located in a pocket at the back of this report. It is recommended:-

(1) That land shall be allocated for urban settlements of all kinds, for industries, for transport lines and terminals in accordance with a final Regional Development Plan.

(2) That all land which is confirmed during further investigations as suitable for agriculture should be given priority consideration for agricultural development, respecting necessary allocations for purposes mentioned under (1). The agricultural land is divided into:

i) State Land; which would be available for new development schemes;

ii) Encumbered land; which includes Native Customary ~~Right~~ Land and/or Native Area Land and Land held under Title. On these areas, agricultural improvement schemes could be undertaken.

(3) That all land not allocated for the above purposes or for National Parks should be considered forest land, which would be divided into:

i) State Forest Reserves; these would include the areas not allocated to agricultural development in the present Forest Reserves, Protected Forests, Proposed Forest Reserves and most of the Interior Area Land. The areas would generally be Exploitable Permanent Forests run by the State for State revenue, but included in the category would be State Catchment Reserves. These would be areas where normal exploitation would jeopardise river catchment areas, and where there would be either no exploitation or only very strictly controlled exploitation;

ii) Non-State Forest Reserves; comprised of all areas assessed as unsuitable for agriculture in the Native Customary Right

Communal Forest is state land protected by Forest Dept. : moved to para (i)

(4) More could be identified.

(5) & (6) to be combined.

Land, Native Area Land, Mixed Zone Land, Communal Forests, Land held under Title and some Interior Area Land.

Some of these areas are at present used for agriculture, chiefly for shifting cultivation of hill padi. A change of use towards forestry of these areas should be actuated by forming economically viable forest units which could become the property of, and be worked by, the present users of the areas. These people could also carry out limited agricultural activity in small pockets of suitable land.

(4) That the proposals already submitted to Government for gazetting five National Parks within the Study Area should be accepted subject to minor adjustments of the boundaries. The suggested parks are located at: Sungai Dalam, Lambir, Niah, Loagan Bunut, and Tanjong Similajau.

(5) That a Task Force should be set up to study the problems associated with creating Non-State Forest Reserves and with forest re-development on land assessed as unsuitable for agriculture which at present is under Customary Right utilisation or is Licenced Exploitable and Remnant Hill Forest.

(6) That a Task Force should undertake to define criteria for the delineation of State Catchment Reserves.

(7) That soil surveys for the Semi-Detailed Master Plan should be started in the land assessed as possibly suitable for agriculture and situated south of the Lambir-Subis Scheme. The area is delineated on the Map (in pocket).

MIRI-BINTULU REGIONAL PLANNING STUDY
GENERALISED ZONING RECOMMENDATIONS

AREAS OF POSSIBLE AGRICULTURAL DEVELOPMENT POTENTIAL:

State Land

Encumbered Land

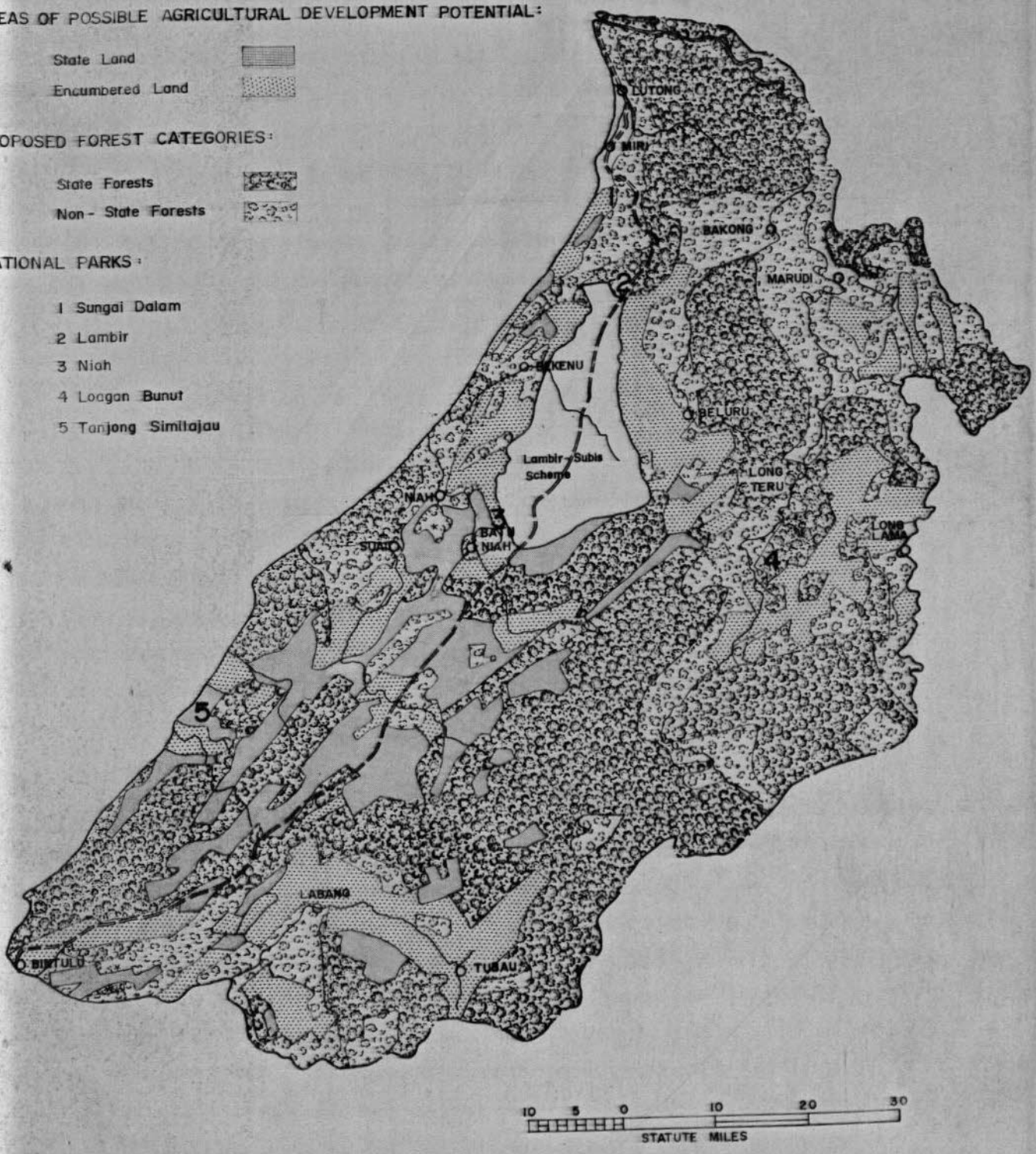
PROPOSED FOREST CATEGORIES:

State Forests

Non - State Forests

NATIONAL PARKS:

1 Sungai Dalam
2 Lambir
3 Niah
4 Loagan Bunut
5 Tanjong Simitajau



CHAPTER 1
INTRODUCTION

1.1 Scope of Work

The Scope of Work states that the Zonation Plan "will include proposals for broad zonation of the region in future land use terms", and be based on "all the available relevant physical and economic resource data... future land use needs and basic land resource capabilities". Accordingly the Zonation Plan and Map (in pocket) presented here indicate the location, and possible extent, of land considered to be suitable for development of some kind, especially for agriculture and forestry. Particular effort has been made to identify areas without any legal encumbrance as these offer the easiest opportunity for new development schemes. The assessment of potentially suitable land for agricultural development has been based mainly on photo-interpretation, together with some soil survey reconnaissance data supplemented by limited field work. The more extensive field work to be carried out for the Semi-Detailed Master Plan may well reveal that some of this land cannot in fact be developed for agriculture, and the present estimate of suitable land must be regarded as the maximum.

The Scope of Work also mentions that the following data and material will be available: reconnaissance soil data for the whole area, a forest inventory for part of the area, a recently completed 1:50,000 topographic map cover and a total aerial photographic cover. All these data have been used or considered during the present studies.

1.2 Land Suitability

In the background material accompanying the Terms of Reference it was estimated that the Study Area "... includes approximately 1,500,000 acres of land that is believed to be suitable for agriculture, of which approximately 1,000,000 acres is unencumbered State Land that is not under cultivation at present". During the studies for the Zonation Plan these estimates have been found to be optimistic. The total area now considered possibly suitable for agricultural development is around 863,000 acres or less than 60 per cent of that expected. The area of unencumbered possibly suitable land, that is without Native Customary Rights or reservations for Permanent Forest, is about 205,000 acres or 20 per cent of the original estimate. This

comprises areas within Interior Area Land, Native Area Land, Mixed Zone Land and Currently Licenced Exploitable and Remnant Hill Forest Land.

Because much less land than expected was assessed as suitable for agriculture, the extra erosion risk and conservation requirements associated with extending agriculture onto land with less favourable terrain than that at present accepted has received special examination. The decrease in the area of suitable agricultural land also highlights the conflict of interests for land between agricultural and forestry development. Of particular importance in this context is the previous forest land which has been commercially logged and released from forestry for agricultural development, but has now been assessed as unsuitable for that purpose.

1.3 Principles and Priorities

Certain given areas may be suitable for several different uses; agriculture, forestry or industry; which will necessitate a decision on allocation among the alternative uses. The smaller the total area available the sooner the conflicts will arise between different interests for use of the land. These problems are considered in subsequent chapters. The final choice, not only between different uses of the land but also of the time to commence development of areas located in different parts of the Study Area, will depend on considerations of a technical, physical, economic and social character. Further discussion on these matters also appears in subsequent chapters. However, a more thorough study of them will be undertaken in the Perspective Plan and their treatment in the present report must, therefore, be regarded as preliminary and aiming at indicating the type of considerations which form the basis for final decisions on priorities of use, location and timing.

The Zonation Plan and Map, therefore, in "broad land use terms", give the size and position of potential development areas and a first presentation of conflicts and priorities.

CHAPTER 2
LAND ASSESSMENT

2.1 Method of Assessment

The land development suitability has been assessed mainly by aerial photo-interpretation techniques. The Study Area has a complete aerial photographic coverage at a scale of 1:25,000 taken during the period 1963 to 1971. The areas covered with eight year old photography presented complications only at the compilation stage; the photographs were adequate for the delineation of aerial photo-interpretation units based on the differentiation of terrain, tone and photo texture. The work commenced with the selection of certain runs of photographs as samples covering some major terrain units which were recognisable on the 1:50,000 scale topographic maps. The sample runs were subjected to a detailed stereoscopic examination in order to draw up an interpretation legend describing how differing terrain can be recognised on the photographs. The legend, which is given in Appendix I, was used as the basis for assessment of the whole Study Area irrespective of present land use or land tenure.

The map prepared after completion of the systematic photo-interpretation provided an initial delineation of areas likely to be topographically suitable or unsuitable for agricultural development. Certain photo-interpretation units were modified on the basis of existing soil reconnaissance data and/or delineated on the basis of information derived from the 1:50,000 scale topographic maps. For instance, the differentiation between non-peaty and peaty alluvium was sometimes based on the reconnaissance soil maps. Field checks were carried out in some photo-interpretation units, especially those units where the terrain was marginal, (that is land coded as B2/B3 complex), to ascertain their true suitability for agricultural development.

2.2 Criteria Used For Assessment

Two major criteria have been used to exclude land from the category "land possibly suitable for agricultural development".

(a) The erosion hazard. In general, areas that have average slopes greater than 25 degrees have been considered unsuitable for agricultural development, as discussed in Appendix I.

Areas, with slopes of 25 degrees or more and currently in agricultural use, were examined to assess the practicability and advisability of extending future agricultural development to steeper areas. The conclusion emanating from these studies (Appendix II) is that the 25 degrees criterion should stand.

(b) Peat Swamps. Although agricultural research has shown that some crops can be grown successfully on certain peats, for example pineapples in West Malaysia, the peats in the Study Area are of a different nature. So far research in Sarawak has not shown a satisfactory, large scale method of developing these peat areas for agriculture.

Apart from the deep peat, soil fertility has not been considered as a criterion for discarding an area. On the contrary, areas known to have sandy soils of particularly low fertility have been delineated as suitable for agriculture though the range of possible crops will be limited. The only mapping units listed in the legend which are considered suitable for agricultural development are B3, B4, C, S3 and T.

2.3 Results of Assessment

The Zonation Plan Map shows that the area of possibly suitable agricultural land occurs generally in long tracts, running south-west north-east, bordered by areas with steep ridges. This is particularly evident south-west of the Lambir-Subis Scheme and is due to the geological structure of the country. Consequently the agriculturally suitable and unsuitable lands often occur in alternate blocks some of which are of considerable size. Along the levees of the larger rivers there are narrow strips of land which are suitable for only limited agricultural development because of intermittent flooding. These areas, which are too narrow to be shown on the Map are mostly already occupied.

The areas considered to have terrain too rough for agricultural purposes are extensive and occur in all parts of the Study Area but mainly in the eastern parts. Large areas of deep peat occur along the Batang Baram and along the coast and these areas have been classified as unsuitable.

The acreages of the various categories of land are shown in Table 2.1 in which all figures have been rounded to the nearest 500 acres. The acreages of land assessed as possibly suitable for agricultural development

TABLE 2.1 ACREAGES OF LAND CATEGORIES IN THE STUDY AREA
(Excluding the Lambir Subis Development Scheme)

	Acres	Percentage of total areas	Encumbered Land (acres)	State Land (acres)
1. Land Possibly Suitable For Agricultural Development				
a) Native Customary Right Land	451,000	52.3	451,000	
b) Titled Land	42,000	4.9	42,000	
c) Interior Area Land	28,000	3.2		28,000
d) Mixed Zone Land	36,000	4.2		36,000(1)
e) Native Area Land	16,000	1.9		16,000
f) Forest Land				
i) Forest Reserve	115,000	13.3		115,000
ii) Protected Forest	29,000	3.4		29,000
iii) Proposed Forest Reserve	21,000	2.4		21,000
iv) Communal Forest	NIL			
v) Currently Licenced Exploitable Hill Forest	60,000	6.9		60,000(2)
vi) Currently Licenced Remnant Hill Forest	65,000	7.5		65,000
TOTAL AREA	863,000	100.0	493,000	370,000
2. Land Unsuitable For Agricultural Development				
a) Native Customary Right Land	397,500	13.8	397,500	
b) Titled Land	67,500	2.3	67,500	
c) Interior Area Land	525,500	18.2		525,500
d) Mixed Zone Land	96,000	3.3		96,000
e) Native Area Land	224,000	7.8		224,000
f) Forest Land				
i) Swamp Forest Reserve	242,500	8.4		242,500
ii) Forest Reserve and Protected Forest	941,000	32.7		941,000
iii) Proposed Forest Reserve	123,500	4.3		123,500
iv) Communal Forest	500	0.1	500	
v) Currently Licenced Exploitable Hill Forest	122,500	4.3		122,500
vi) Currently Licenced Remnant Hill Forest	141,000	4.9		141,000
TOTAL AREA	2,881,500	100.0	465,500	2,416,000
Total acreage of Study Area	3,744,500			

Note (1) Some of this is thought to be Customary Right Land

(2) This will be available for agricultural development as soon as current exploitation is completed.

have been measured on the 1:250,000 scale Zonation Plan Map; these areas have been generalised from the aerial photo-interpretation maps originally drawn at 1:50,000 scale. They include small areas of land in which the average slope exceeds 25 degrees, but are too small to delineate at the 1:250,000 scale. Similarly, small areas of land with average slopes of less than 25 degrees have been excluded. The effects of these generalisations on the total areas shown in the Table are insignificant.

Land assessed as possibly suitable for agriculture in Mixed Zone Land areas has been shown as unencumbered on the Map unless the land is held under title, but some doubt exists as to the actual status of some of this land. For example, an area of Mixed Zone Land around Batu Niah is included in the unencumbered total yet it has considerable areas of static and shifting cultivation in it; some of it could be held under Customary Rights.

Acreage totals of the major categories of forests (Reserve, Protected Forest etc.) were obtained from Forest Department data, and the Forest Department Licence Maps for 1971-72. The acreages of Swamp Forest, other than that designated as Forest Reserve, are included in other categories of land. Other sources of information used for obtaining acreages were the 1:50,000 scale maps from the Land and Survey Department, Miri, showing Land held under Title, and the 1970, 1:1,500,000, Land Classification map of Sarawak produced by the Land and Survey Department, Sarawak.

Table 2.1 shows that of the approximate 3.7 million acres of land within the Study Area about 863,000 acres only or 23 per cent is assessed as being possibly suitable for agricultural development. Of this roughly 493,000 acres or 57 per cent is not State Land; it is either Native Customary Right Land or Land held under Title. Thus about 370,000 acres of the land possibly suitable for agricultural development is State Land. Of this approximately 165,000 acres is presently designated Forest Reserve, Protected Forest or Proposed Forest Reserve, leaving some 205,000 acres as unencumbered State Land. In the Table this is quoted under the categories Interior Area Land, Native Area Land, Mixed Zone Land, and Currently Licenced Exploitable and Remnant Hill Forest Land. However, some of the Mixed Zone Land and Remnant Hill Forest Land is known to be occupied by shifting cultivation some of which is probably illegal because it has occurred since the promulgation of the Land Code. Thus the area of truly unencumbered land which is possibly suitable for agricultural development will be somewhat less than 205,000

acres when the land tenure situation is fully understood. Further reduction of this acreage will probably occur when, during the next stage of the Study, the soil survey for the Semi-Detailed Master Plan Area, is undertaken.

CHAPTER 3

PRINCIPLES AND PRIORITIES FOR ALLOCATION OF LAND

3.1 Land Use Categories

The major land use categories considered are:-

- areas for urban settlement, including areas for housing, production, commerce, administration, communication and public services;
- areas for transport lines and terminals;
- areas for water catchment and river control;
- areas for agriculture;
- areas for forestry;
- areas for recreation, tourism and preservation of assets of particular beauty or interest.

Allocation of land for the various uses requires consideration of a number of factors. These factors must be weighed, one against another to obtain solutions which meet, in the best way, the various aims set for national and regional development. The factors to be considered are: the character and quality of terrain, location and accessibility of suitable areas and the possibility of assembling, within a reasonable internal distance, areas of a total size suitable for rational management.

3.2 Development Aims

The allocation of land should, of course, contribute to the general development aims of the country. The fundamental aims of development in Malaysia are to eradicate poverty and to eventually eliminate the identification of race with economic function. These aims are further identifiable in relation to the Study as:-

- promoting economic growth;
- settling people in modern agriculture;
- increasing the number of job opportunities in other industries;
- diminishing disparities between rural and urban populations and between different regions of the country;
- preserving the natural wealth of the country.

It is the object of development policy at any given time to combine these specific aims with the current political preferences into a number of concrete decisions. This implies combining the separate aims to obtain

what is considered, at that time, to be an optimal composition.

Although a high rate of growth of the National Product is considered an essential aim, it may be preferable for some time to allocate investment funds to development schemes which give a relatively high employment, but a moderate rate of return to the invested capital.

Economic considerations should be concerned not only with the average contribution of the various land uses but also with the marginal contribution; that is, the increased contribution resulting from the transfer of one more acre from one land use to another. For instance, in periods of low and decreasing rubber prices a stage could be reached when it would be more economic to keep an area under exploited permanent forest instead of using it for planting rubber trees. On the other hand; if for instance, the area is suitable for oil palm growing, which gives higher returns and employment, it should be transferred to this use as soon as funds and management inputs are available.

Areas with good or easily created accessibility, in both distance and time, would usually be given high priority for development. In this way the existing infrastructure and facilities will be optimally used.

The size of a tract of land is important in that there may be a desirable size, or at least a minimum size, for development schemes. This could give priority to contiguous areas of suitable size, or it may lead to a reallocation of land in certain areas from one use to another. For instance, small forest areas within an agricultural development scheme could be transferred to agriculture to obtain an optimum size for a development area.

However, important secondary or derived effects from development schemes could be a lever for developments in adjoining areas. If, for instance, an agricultural development scheme is located near a small town, it could increase the importance of the town. With improved service level the town could in turn attract new industries and thus contribute to a general improvement of economic and social conditions in the whole area. In the same way a development or improvement scheme located within an area of traditional agriculture could, by its direct and its instructive effects, contribute to a change of attitudes of the people and to development of a much wider area.

3.3 Conclusions

Thus the Zonation Plan can give certain important indications of where future development can be undertaken but the final decision on priority and allocation of the suitable areas will depend on comprehensive economic, social, technical and physical considerations and on political preferences.

CHAPTER 4
FORESTRY DEVELOPMENT POSSIBILITIES

4.1 Forestry Potential

The forestry potential of the Study Area is vast. The majority of the 2.88 million acres shown in Table 2.1 as unsuitable for agricultural development is probably suitable for forestry development of one kind or another. At present there are roughly 1.24 million acres of Hill Forest Reserves, Protected Forests and Proposed Forest Reserves as well as 242,500 acres of Swamp Forest Reserve. In addition about 0.53 million acres, classified as Interior Area Land, is still under State control; a total State ownership of roughly 2.01 million acres of forest most of which could become permanent exploitable forests. The creation, and exploitation for the local users and owners, of Non-State Forest Reserves in the Customary Right Land and the Native Area Land, is a possible way of developing the 0.62 million acres of non-agricultural land in these categories. Forestry appears the best land use even for the large areas of peat swamp, and their perpetuation as exploitable forests must be considered together with the potential from the huge permanent hill forest areas. Properly managed, the forest resources within, and adjacent to, the Study Area can serve as a raw material base for a huge highly developed and diversified timber product industry. Development of such an industry could be a catalyst for extensive economic and social development where the building of towns, roads and port facilities are important items. The utilisation of the timber resources from most of the hill forest areas has been the subject of a long term study by an F.A.O. team of specialists. Their recommendations are not yet published but they will be incorporated eventually into the overall plans for the Study Area.

4.2 Subdivision Of Forest Land

Table 2.1 shows that there is some conflict of interest for land between agriculture and forestry. About 165,000 acres of Hill Forest Reserves, Protected Forests or Proposed Forest Reserves have been assessed as possibly suitable for agriculture. It is recommended, that these areas are generally allocated for agriculture as this gives higher economic benefits and more employment. Loss of this area is not of great

significance to forestry since the 165,000 acres represent only about 6 per cent of the total possible forest area and 11 per cent of all the Forest Reserves and Protected Forests and Proposed Forest Reserves whereas the gain to agriculture would amount to an 80 per cent increase of area. Although allocation to agriculture of some of these lands would increase the managerial problems of the remaining units, it would not eliminate the forest potential of the remaining reserves, especially if planned forest exploitation of land destined for transfer is first undertaken. Of far greater significance is the utilisation of areas presently under agriculture (Native Customary Right Land and Titled Land) and the areas at present destined for agriculture (Currently Licenced Exploitable and Remnant Hill Forests) but assessed as unsuitable for agricultural development. These groups total 465,000 and 263,500 acres respectively, and development of them should be towards forestry not agriculture. The Customary Right Land, together with all the agriculturally unsuitable land within the Native Area Land, could well become Non-State Forest Reserves which would be utilised and worked by the traditional utilisers of that land. This would require that the people become mainly foresters and forest workers not agriculturists. Settled agriculture would be limited to small suitable pockets within the Forest Reserves. The Exploitable and Exploited Licenced Forest areas now assessed as unsuitable for agricultural development could perhaps best be incorporated into State Forest Reserves. These concepts raise many problems which, it is proposed, should be the subject of study by a Steering Committee Task Force. Included in the study could be the identification of criteria for delineating areas of forest land as River Catchment Reserves, which could remain under virgin jungle or be exploited on a strictly controlled regime.

Decisions on the utilisation and allocation of priorities to forest areas must be carefully undertaken, giving due consideration to existing and necessary future roads, transport terminals and towns.

CHAPTER 5
AGRICULTURAL DEVELOPMENT POTENTIAL

5.1 Introduction

An aspect of major importance in the development of agriculture in the Study Area and in Sarawak is the small population; less than one million people in the whole State, the majority of whom are subsistence farmers. The present potential local market for farm produce is, therefore, limited and major agricultural development must be aimed at export markets. The present agricultural exports are dominated by rubber and pepper. To develop other export enterprises entails the creation of production and marketing organisations all requiring considerable input of managerial skill and capital. The latter will probably have to be supplied by Government because in general the local peasant farmers are poor, and credit will be required for the production, processing and marketing functions. These requirements emphasize the need to develop a satisfactory internal transport network and adequate facilities for external shipment.

Much of the land considered possibly suitable for agricultural development is undulating, generally with slopes exceeding 12 degrees, and under the wet tropical climate of Sarawak, the land is not suitable for large scale arable agriculture (cf. Appendix II). Nevertheless considerable agricultural potential exists but reliance for future development must be mainly on perennial crops, for which the climate is suitable, with some arable cropping taking place on relatively small areas, mainly on non-peat swamps and on intensive small holdings close to urban areas.

5.2 Future Policy

In general the future agricultural policy should continue to be that presently followed by the Agriculture Department;

(a) The gradual reduction and eventual elimination of shifting hill padi cultivation;

(b) The diversification of cropping away from the reliance on rubber and pepper;

(c) The expansion and improvement of wet padi cultivation in all suitable swamp areas with the object of supplying local demand. The undertaking of irrigation schemes in these areas appears

generally unnecessary for main-season padi, and the value of irrigation for off-season crops needs further careful assessment before conclusions can be drawn;

(d) The continued encouragement for increased use of crop inputs such as improved planting material, fertilisers and crop protection chemicals;

(e) The establishment of marketing systems for new crops and general improvement of existing marketing chains;

(f) The strengthening of existing and perhaps the creation of new, public and private production agencies.

5.3 Crop Selection For Specific Areas

A major constraint in agricultural development is the lack of transport facilities for farm produce and inputs; not only long distance transport of products to and from markets but, even more important, short distance transport within production areas for moving produce to the places of storage or processing. There is no tradition of using pack animals or animal drawn vehicles in Sarawak; the dug-out canoe has been the 'donkey' and the 'bullock cart' of Sarawak agriculture. This situation suffices so long as subsistence shifting cultivation persists close to rivers and streams. However, as soon as commercial type agriculture is introduced or cultivation moves away, for whatever reason, from the rivers the situation changes. Often the movement of all farm produce and of all requirements for production must be done by human effort alone. This seriously limits the selection and location of many crops. Those that have heavy and/or bulky products cannot be recommended as a basis for development without first ensuring that reasonable short and long distance transport facilities exist or will be developed.

In this context there are three basic farming situations to be considered in the planning of agricultural development:-

(a) Areas remote from any major marketing centres and/or where transport facilities are poor and cannot be easily improved;

(b) Areas where transport, processing or marketing facilities exist and can be improved or where they can be easily created;

(c) Areas close to existing or future urban centres.

In practice, there are no distinct criteria to indicate where one

situation ends and another begins but each one tends to have different development characteristics and potential. There are crops which are particularly suitable for one or two of the situations while several crops are suitable for all three situations. The final selection of crops for any given area depends on a combination of many factors of which the most important are: environmental conditions, profitability, potential markets and marketing conditions, the prospects for adequate advisory services as well as the skill and adaptability of the farmers concerned. Although at this stage the analyses of all factors and situations in the Study Area are still preliminary it is possible to give an indication of the type of crops which are worth considering.

The possible crops for the more remote, isolated areas are those whose products need only simple processing to prepare them for market, are easily stored, are non-perishable, are of high value and are not bulky. Such products are Robusta coffee, cashew nuts, anatto seed, copra, rubber, cocoa beans and some spices. Picking, drying and bagging is all the processing that is necessary for the first three crops mentioned while the preparation of copra and the fermentation and drying of cocoa beans are simple processes requiring a minimum of equipment and skill. Small scale wet padi production in selected low lying areas would be important for home consumption. All other products except Robusta coffee would be aimed at export markets. On those holdings bordering large river systems, and therefore having easy transport facilities, the range of crops considered can be extended to include sugar cane for producing unrefined sugar for local consumption, as well as durian and rambutan fruits for local and nearby export markets.

In the second situation which includes new development areas many of the above mentioned crops would be suitable and, with planned development, those crops requiring an estate type organisation, at least as a nucleus for processing or marketing, could be grown. Of particular importance here are oil palm, selected tropical fruits, essential oils, pepper and other spices, lowland tea, tapioca and wet padi production. All the crops mentioned except padi require central processing or marketing establishments which must have an assured level of supply of a standard quality product. The crops must, therefore, be grown in sufficient concentration to ensure fulfilment of this condition. By providing transport facilities, the production area for the crops could be extended quite widely around the

centre where processing and/or marketing functions would be provided. This wider production could be on small holdings as well as on larger farms where production would be orientated mainly, but not necessarily solely, towards that undertaken by the central organisation.

An intensive, even sophisticated, small holding type of agriculture can be considered for those areas close to urban settlements where advice from the agricultural extension staff is readily available and markets exist for fresh fruits, vegetables and other perishable products. The enterprises which can be considered for these areas are the growing of: pepper and other spices, vegetables, essential oil crops, tropical fruits, sugar cane for unrefined sugar, anatto and the commercial rearing of pigs, poultry and fish.

5.4 Possible Establishment Of A Beef Industry

To establish a beef industry, for which local and potential export markets exist, a professionally managed breeding ranch is considered necessary to act as a nucleus for the industry because of the general lack of traditional animal husbandry skill of the local population. It is for the breeding and early calf life periods of beef production that highly skilled management is most necessary. A wider section of local farmers could be involved in a beef industry once the highly organised, efficiently run ranch, or ranches, produce sufficient numbers of weaners. The existing coconut plantations in the First, Second and Third Divisions are considered particularly suitable for growing out of weaners but other areas could be developed for this purpose. Essential elements in establishing a beef industry in Sarawak are a steady supply of healthy, high potential weaners to relatively concentrated fattening areas well serviced by husbandry and veterinary staff combined with an organised and efficient marketing system.

CHAPTER 6
NATIONAL PARKS

6.1 Introduction

The Sarawak Development Plan 1964-1968 rightly emphasised the need in times of accelerated agriculture expansion to preserve parts of the countryside in order to make it a pleasant place to live in. The Plan recommended the selection for preservation of suitable areas as **National Parks** under the National Parks Ordinance (1954). Since the publication of the Plan, proposals have been put forward for the creation of a number of National Parks throughout Sarawak, five of them in the Study Area. The proposals point out important features of such parks other than the desire to provide amenities and places of recreation for the local inhabitants. Stress is given to the aspects of education, of scientific research, tourism and the need to preserve intact the often unique fauna and flora of Sarawak.

6.2 The Proposed Parks

During the present studies for the Zonation Plan consideration has been given to these aspects and the proposals for the five National Parks in the Study Area **are** supported subject to possible minor boundary changes. The proposed parks are shown on the Map and are briefly discussed below.

(a) Niah National Park (8,144 acres)

A proposal to create this park, which includes the huge limestone outcrop Gunong Subis and the Great Cave, was first considered in 1961. In 1969 a decision was taken on this and the Governor in Council declared his intention to constitute the park, but it has not yet been officially gazetted. The proposal suggested that the Great Cave, the access plank walk and about 4 acres at Pangkalan Labang should be excluded from the park and be gazetted as a Historical Monument.

(b) Lambir National Park (17,170 acres)

The proposal to create this park was originally made by the Divisional Development Committee of the Fourth Division as a consequence of the Lambir Development Plan. The Park includes steep and rugged terrain within easy reach of Miri.

(c) Tanjong Similajau National Park (9,780 acres)

The area consists entirely of low hills covered with kerangas and dipterocarp forest. With the exception of Tanjong Kidurong, which is now inhabited and devoid of natural vegetation, this is the only stretch of rocky coastline between Bako National Park near Kuching and Tanjong Lobang, Miri. The area would be made accessible by a road system required to serve any future development schemes in nearby areas assessed as having possible agricultural development potential. The boundaries of the park could be adjusted following the soil surveys required for the Semi-Detailed Master Plan.

(d) Sungai Dalam National Park (1,300 acres)

This small area, previously in the Lambir Hills Forest Reserve, is retained at present as a research reserve and is not included in any plans for future exploitation. The soil is mainly sand and of limited agricultural value. The proposal to extend the Miri airport will only affect the northern edge of the park which would be easily accessible to the residents of Miri. The vegetation is of scientific interest being kerangas forest dominated by sempilor (Dacrydium beccarii var sebelatum) and rhu ronang (Casuarina nobile).

(e) Loagan Bunut National Park (12,700 acres)

Loagan Bunut is a shallow lake, liable to dry out during periods of drought, and is the largest lake of its kind in Sarawak. The area around it is mostly undisturbed peat swamp which includes all the principal peat forest types. The peat swamps of Sarawak have a unique vegetation of great scientific interest and within a relatively few years there is a danger that no peat swamp forest will remain unexploited. It is important, therefore, that this relatively small swamp should be preserved intact. The lake itself also has scientifically interesting vegetation around it and is well known for its rich migrant bird life. The fishing rights in the lake should remain unchanged.

The park would be made reasonably accessible following the construction of a proposed road extention from Long Teru to Long Lama.

CHAPTER 7

INDUSTRIAL DEVELOPMENT POSSIBILITIES

7.1 Introduction

Decisions on establishing new, or expanding existing, industrial enterprises will depend on a number of external and internal factors, the former relating to the characteristics of the industrial site, the latter to those within the enterprise itself and independant of its location.

The primary requirements for industrial areas are: good access to supply of materials, power, water, labour force and markets. Such conditions are found near transport lines and terminals (roads, ports, etc.) and near urban centres of some size. Preliminary considerations of these external factors are given in Chapter 8.

Important internal factors are resources of raw-materials, domestic and external demand, and characteristics of the labour force.

Raw-materials for future industries in the Study Area could be supplied from agriculture, forestry, fishery and mining from which products for more or less sophisticated industries could be derived.

7.2 Agro-based

The present oil palm development in the Lambir-Subis Scheme has already led to the establishment of two oil mills one of which will soon be operating. Further development of mills follow naturally on, and in accordance with, developments in the agricultural sector. Similarly with other agricultural industries where the basis for initiating them is an evaluation of the market for the more or less refined product obtained from the crops or livestock.

Besides the primary agro-based industries such as mills, smoke kilns, driers etc. the potential market for processed foods could be important. For instance future livestock enterprises could sustain a meat based industry which could also supply the extensive and expanding South-East Asian market for processed food products. This again depends on market evaluation in the agricultural sector.

7.3 Forestry Based

The forest based industries appear to have exceptional possibilities in Sarawak. The potential timber production of both hill and swamp forests is huge. Within and adjacent to the Study Area the potential of properly managed hill forests should be sufficient to sustain several large modern timber complexes in which moulding, veneer and plywood processing would be important products. Each complex could be of a size yet unknown in Sarawak each creating employment for more than 2,000 workers. The size could be similar to the existing complexes in the Jengka triangle in West Malaysia and have a log intake capacity of up to 10 million cubic feet a year. The creation of these huge industrial units would facilitate Sarawaks' entrance into the world market for processed wood products, and their size and production capacity would change the structure of the present wood-based industry throughout Sarawak. The location of such units must be carefully considered.

7.4 Fishing Based

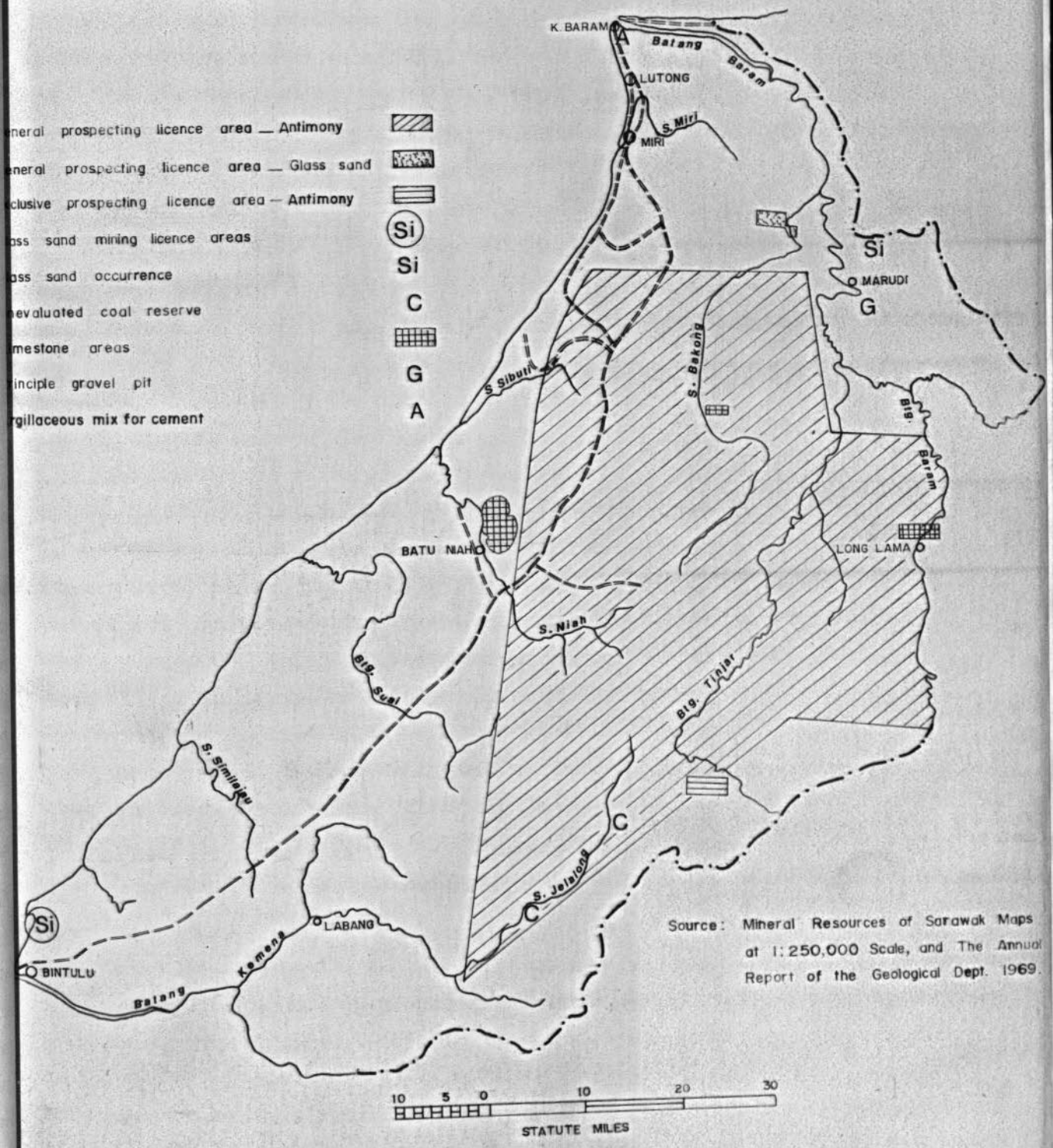
The coastal fishery in north Sarawak is not yet well developed; both markets and fishing techniques are still on rather a small scale. However, the expected fish resources of the South China Sea should be sufficient to consider establishing fish and shell fish canning/freezing industries on the coast of the Study Area. Such industries would partly fulfil an import substitute role (in 1970 about 2,400 tons of fish, worth $2,700,000, were imported to Sarawak) and partly extend the already existing export market for Sarawak fish products. The establishment or improvement of one or more fishing ports would be required, with adequate processing and marketing facilities.

7.5 Mining Based

Excluding oil and gas the mineral resources in the Study Area are not great. As illustrated in Figure 7.1 prospecting licences for certain antimony fields have been issued but the potential for a large mining industry does not appear to exist. Silica sand (for glass) is being mined just north of Bintulu but efforts to create an export market for the sand have apparently been limited. The sand is of a quality (exceptionally high in silica) suitable for sheet-glass and bottle manufacture and the known

FIGURE 7.1

MINERAL RESOURCES
(excluding oil and gas)



Source: Mineral Resources of Sarawak Maps at 1:250,000 Scale, and The Annual Report of the Geological Dept. 1969.

reserves are sufficient to warrant a large glass product factory. The present domestic market for glass products would probably make the establishment of a glass-plant a reasonable proposition.

The presence of limestone near Long Lama and the existence of the other necessary raw materials for cement production together with cheap natural gas might justify the construction of a cement plant near Kuala Baram. However, such a possibility must be contemplated in the light of the fact that construction of a plant is already planned to produce 150,000 to 200,000 tons of cement a year. The plant will be built near Kuching in 1973.

7.6 Oil and Gas

The discovery of new deposits of oil and gas off the north west coast of Sarawak has initiated plans to establish a Liquified Natural Gas (LNG) plant within the Study Area. The LNG-plant, which will probably be one of the largest in the world, will demand substantial foreign investment and know-how. Consequently the plant will not have the impact on the local economy that its size would indicate, because a major part of the value produced will accrue to the invested capital. On the other hand, it can be expected that a construction period of 2 to 3 years with more than 3,000 employees will have a strong influence on the environment although only for a limited period. About 350 workers and administrative personnel will be employed in the plant when it is operating. Its location, which will have a substantial impact on the physical structure of the Study Area, is apparently still a matter of discussion and negotiation between the State Government and the concession holder.

An expansion of the existing oil refining industry cannot be expected under the present conditions of limited domestic demand. Secondary industries utilizing by-products, gas etc. from the oil refining are not presently expected to be established.

7.7 Other Industries

Other industries, the establishment of which are not determined by the presence of local natural resources, must base their production exclusively on the potential market for their products. These industries must usually rely for their success on their ability to compete with already existing similar goods.

The market for such future industries could be both domestic and export, but to start an industry which will have to compete with internationally established manufactures is difficult and it may be better to first aim at the manufacture of goods for the domestic market, especially those goods which would be a substitute for imported goods. These would include clothing and footwear manufacture, plastic products, processed construction materials, transport equipment and miscellaneous consumer goods. However, the industries producing these goods would generally have to be based on the entire Sarawak market and consequently they could not be planned in association with the Study Area alone.

Minor industrial units supplying processed construction materials could well be built-up quite rapidly as part of the timber industrial complex and could be based on existing enterprises and skill. One such specialised industry which has proved its specific know-how is the present ship building industry in Miri and Bintulu. Here steel and wood ship builders have developed a special technique in building the shallow draft vessels that are necessary for the coastal traffic around the island of Borneo and other parts of Malaysia. To create new industries would take longer because a training period will be required to make up for the lack of skill and experience that at present might be an obstacle to the establishment of the more sophisticated manufacturing industries.

7.8 Conclusions

It appears that favourable opportunities exist for an expansion of the industrial sector in the Study Area. However, the development of land, sea and air transport networks, the provision of a large, reliable labour force and the assured supply of water, power and other requirements must become part of an overall plan which includes detailed studies of each industrial possibility.

CHAPTER 8

ACCESSIBILITY AND SETTLEMENTS

8.1 Introduction

In deciding which areas should be developed and exploited for various purposes, and what kind of development or exploitation should be undertaken for each selected area, the criteria will not only be the physical quality of the areas, but also their accessibility from traffic lines and from urban centres.

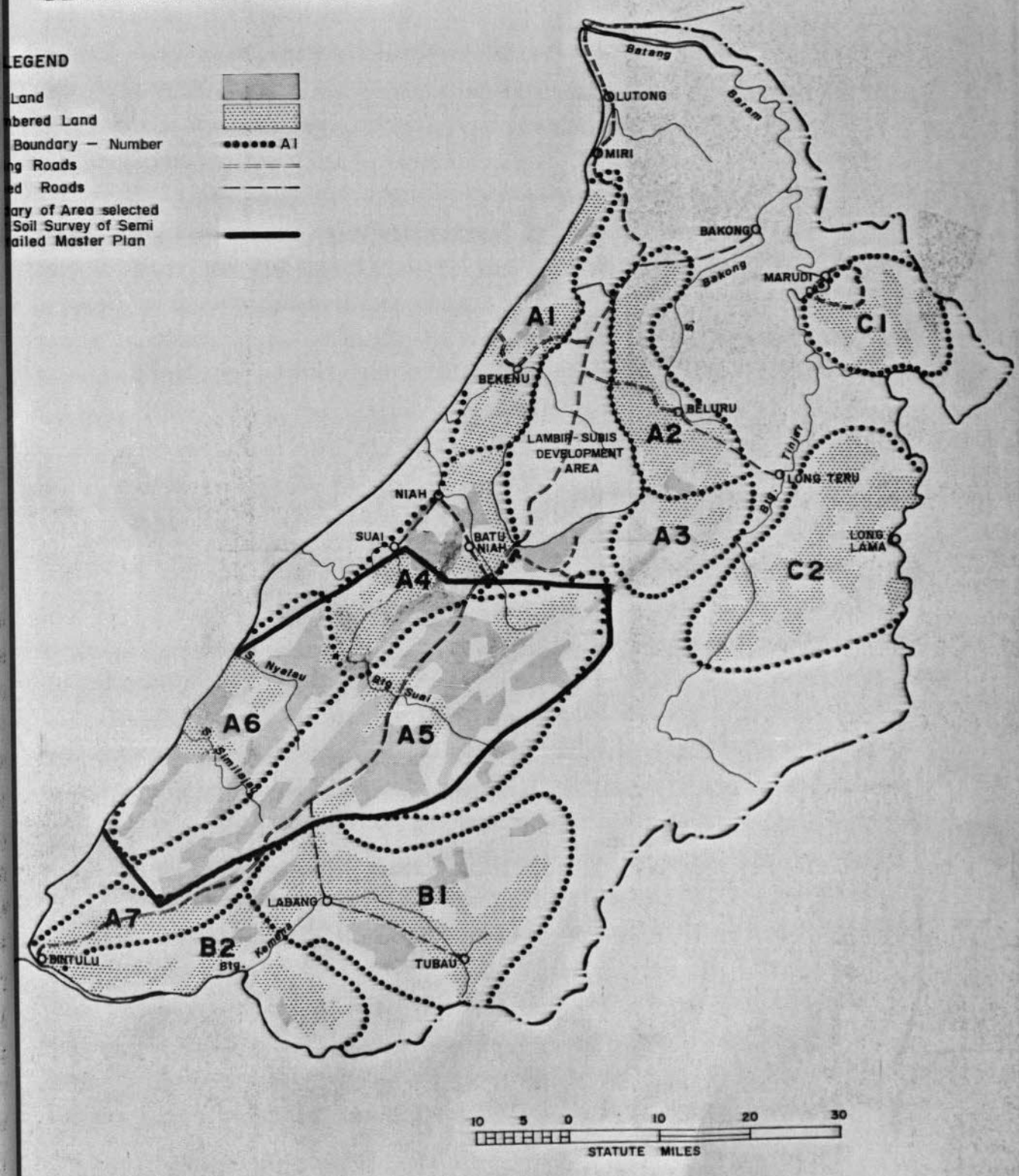
These problems will be studied thoroughly in the Perspective and Master Plans; in the present report some preliminary views are given in order to indicate the importance of these considerations to final decisions on land use and timing of development.

8.2 Accessibility

Accessibility has played an important part in the historic development of the Study Area. Most of the areas used for settled or shifting cultivation lie along or close to the rivers which are the traditional means of communication. Thus the unoccupied land, which will be largely used for future development, is generally found in areas which are not yet or have only recently been made accessible by road. Therefore, future large scale agricultural schemes will often be based on the relative accessibility of the area by road; areas with actual or planned road access being considered the more desirable. Figure 8.1, which is derived from the Zonation Plan Map, divides the area into several Blocks, based on their accessibility to the existing and presently planned road system. Category A Blocks have good to moderate, Category B Blocks moderate to poor, and Category C Blocks poor to very poor accessibility. The large areas of State Land in Blocks A4 and A5 have good road access. A road from Niah to the Suai settlement is planned to be built through the former area during the Second Malaysia Plan but the alignment of the road should be reconsidered. The other, large tracts of State Land possibly suitable for agricultural development lie within the Similajau Forest Reserve, Block A6, and between Labang and Tubau south of the Batang Kemena, Block B1. Labang and Tubau are planned to be connected by road to the Miri-Bintulu road during the Second Malaysia Plan. The largest tract of land within Block A6 can probably be made

Figure 8-1

EAS WITH POSSIBLE AGRICULTURAL DEVELOPMENT POTENTIAL



accessible by constructing a road from the point where the Miri-Bintulu road crosses the Batang Suai. The cost of this road is estimated at between M$1 and 2 million. Extension of this road to include the coastal areas of selected land seems possible.

The Native Customary Right Land between Long Teru and Long Lama, Block C2, can be considered as an area for agricultural improvement schemes because, during the Second Malaysia Plan, a road is to be built connecting Long Teru to Beluru and a possible extension from Long Teru to Long Lama is already being studied.

Considering the export aspect, the only road exit for produce from the Study Area is an unsurfaced sand road northwards to Brunei. At the moment there is no serious consideration of the Fourth Division using the Muara port in Brunei as an outward connection point. However, a number of external seaward connections of varying quality and capacity already exist within the Study Area. They can be served by low draught vessels and barges. An intensification of economic activity in the Region will call for improvements in these facilities. Areas served by exit points which can be easily improved could rank highly as locations for future development, but so far these aspects have not been investigated.

All air-traffic to and from the Study Area is through the airports at Miri, Bintulu and Marudi. Studies concerning possible future air traffic requirements have not yet been undertaken.

8.3 Settlements

The future agricultural settlement pattern will depend on the character and concentration of the activity that will take place. Two main types of settlement patterns can be outlined:-

- a concentrated estate-like type of settlement based on large scale cash crop cultivation and processing, and on wage earning labour;
- small holders living in more scattered or dispersed groups with a certain degree of self-supply of foodstuffs, building materials etc.

Generally it can be assumed that the former, at least for a time, will demand and can sustain a higher nearby urban service level than the latter. However, the final settlement pattern can comprise combinations of the two types, which can support each other in production and utilisation

of private and public services. These aspects will be further considered as the Study progresses; at the moment some considerations are presented based on a first stage assumption that the development of the more remote areas and Customary Right Land will be by small holders while the large tracts of State Land presently more accessible are used for the centralised type of development.

Large stretches of State Land possibly suitable for agricultural development have been found in the sparsely populated areas along the Miri-Bintulu road, Block A5, (Population 1970: 1,600). Other selected land, in more densely populated areas, is located close to the already operating Lambir-Subis Scheme and to the Niah/Batu Niah settlements, Block A4. (Population in Niah/Batu Niah in 1970: 5,400).

The development of the areas along the Miri-Bintulu road within Block A5 could either start from the north as a repetition or an extension of the modern agriculture which is developing within the Lambir-Subis Scheme, or development could start from the south as a possible contribution to the growth of Bintulu. However, the southern areas are located more than 25 miles from Bintulu and the town will only be able to serve these areas as a higher order service centre where administrative headquarters would be situated, higher education provided and good hospitals etc. built.

A development of the area around Niah/Batu Niah, Block A4, could be based on the existing social and physical infrastructure in this area, possibly strengthening the position of Batu Niah.

If the development within Block A5 covered, for instance 30,000 to 40,000 acres, the area might cater for about 20,000 to 25,000 people with a livelihood in agriculture. An additional population of between 10,000 and 15,000 could be required to fulfil the employment opportunities derived from the primary and secondary processing industries as well as the demand for services of the total population. This would give a total new population in the area of about 30,000 to 40,000 by 1980/85. Such a population would require a service centre at least the size of the present day Bintulu in addition to a few scattered local centres. The large service centre, besides requiring a central location in relation to the distribution of the population, would also need a reliable supply of fresh water, power, suitable building ground, etc. A possible site for such a future centre is where the Miri-Bintulu road crosses the Batang Suai. This location is within 10 miles of most of the State Land possibly suitable for agricultural

development along the Miri-Bintulu road and, as already mentioned, is a suitable junction for a road to the large areas of possible agricultural development within Similajau Forest Reserve. The orientation of the population in this area for a service centre of higher order will probably be towards Bintulu.

The 14,000 acres of State Land possibly suitable for agricultural development found in Block B1 will, if wholly or partly developed, need the supply of basic service within the area. A rise in population in this area from about 3,500 in 1970 to, for example, 7,000 in 1980, will form the basis for a service centre somewhere in the Upper Kemena, possibly at Labang or Tubau. The orientation of this population towards centres of higher order will be either towards Bintulu by road or river, or towards a centre in Block A5. The latter would be 20 miles closer by road than Bintulu.

Agricultural development of the areas west of Long Lama, Block C2, would probably imply a strengthening of Long Lama as a future service centre for the Upper Baram Region. A further strengthening of this position would be the building of a road from Long Teru to Long Lama connecting the Upper Baram Region directly to the Miri-Bintulu road. This would cut off some of the trade relations between Marudi and the Upper Baram Region with a subsequent negative effect on the growth of Marudi. The higher order service and trade connections of the Blocks A2 and C2 and the planned settlements within the Lambir-Subis Scheme will most probably be to Miri.

The development of the Lambir-Subis Scheme, with a future population of from 25,000 to 30,000 people will require a local service centre of about the same size as the one mentioned in connection with Block A5. The supply of service could be achieved either by expanding the existing service centres of Bekenu or Batu Niah or, more probably, by creating a new centre on the Miri-Bintulu road.

When considering the priority for development of various areas, the influence of Miri, as a centre offering private and public services of considerable quality, will be important. It is already a growth pole and a magnet for further development. Any additional population resulting from any development with good access to this town will not only enjoy its services but will also contribute to a further increase and refinement of the service level of the town. Therefore, it appears that Miri will be the leading service centre of the region for a considerable time regardless of any opposing effects of other development requiring new towns or the

strengthening of existing ones.

The expected increase in population in existing and possible new towns will require more urban space but, on the whole, these requirements will be small compared to the total acreage developed. Generally, therefore, there is no foreseen immediate serious conflict for land between urban and other uses except that there might be particular instances where the future urban sprawl does clash with the existing horticultural areas. Such possible conflicts call for a careful and detailed urban planning of the growing towns.

CHAPTER 9

SELECTION OF AREAS FOR SEMI-DETAILED MASTER PLAN STUDY

The Zonation Plan presented here represents part of the work required in Phase I of the Study. The work remaining in this Phase is the preparation of a Perspective Plan covering a twenty year projected development of the main sectoral activities in the Study Area. The Scope of Work states that "once the broad Zonation and Perspective Plans have been prepared, a Semi-Detailed Master Plan sufficient for twenty years requirements must be prepared for the settlement of about a quarter of a million acres, to be supplemented by detailed project plans for shorter term sector activities in the form of investible packages for about 50,000 acres". In order to comply with these requirements it is necessary to start the soil survey work immediately although the final locations for the 250,000 and 50,000 acres will not be determined until the completion of the Perspective Plan, scheduled for early 1973. However, the dilemma is not too serious because from Figure 8.1 it is clear that the majority of the State Land possibly suitable for agricultural development, (about 213,000 acres), lies in Blocks A5 and A6. These Blocks have a good or relatively good accessibility and most of the agricultural developments undertaken in the next few years are likely to be there. For these reasons it is proposed that the soil survey field work starts in those areas which include roughly 82,000 acres of Customary Right Land assessed as possibly suitable for agricultural development. Thus about 295,000 acres of land can be further studied in these Blocks.

However, during the Perspective Plan studies it may become clear that it is preferable economically, socially or politically, to develop land outside Blocks A5 and A6. For example, it may prove highly desirable to implement agricultural improvement schemes in the Customary Right Land in Blocks A2, C2, B1 or B2, in which case the survey work would have to be moved so that some of the 250,000 acres required for the Semi-Detailed Master Plan could be located accordingly. The timing of decisions which would necessitate such changes of emphasis must be made on as early a date as possible to allow the required soil surveys to be undertaken within the terms of the present study.

APPENDICES

APPENDIX I

DISCUSSION OF THE AERIAL PHOTO-INTERPRETATION LEGEND

I.1 Introduction

The legend given in this Appendix has formed the basis for the interpretation of the entire Study Area and was used to assess the possible suitability of land for agriculture.

The descriptions of forest canopy contained in this legend refer to primary forest in most cases. Tone is the shade of grey on the black and white photographs, related to the light absorption qualities of the surface, texture is the microscopic configuration of detail on the surface as seen from the air. This is described as coarse, smooth and the like; generally these terms refer to the forest canopy.

Chapter 2, Section 2.2 of this Report discusses the criteria used for assessment of the possible agricultural development potential of the Study Area. Of the mapping units listed in the legend B3, B4, C, S3 and T are regarded as having possible agricultural development potential. Within Land Type B, the Units B1 and B2 have been regarded as having no agricultural development potential because both units consist of steep to moderately steep hills with terrain which is moderately to strongly dissected. These units have sharp hill crests and long steep slopes generally in excess of 25 degrees. Slopes steeper than 25 degrees have considerable erosion hazards and the soils are generally shallow due to accelerated erosion under natural conditions (refer Appendix II). Mapping Unit B3 is identified by rounded hill tops and generally shorter slopes with a convex slope form at the top to concave at the base, slopes are averaging less than 25 degrees. Although small areas within this unit may exceed this slope limit it is considered suitable for agriculture. Land Type C is generally suitable for a limited range of crops in terms of soil and terrain, but is subjected to flooding to a greater or lesser degree. Land Types S and T are suitable in terms of terrain, but present considerable soil fertility problems, and could, therefore, only be used for a limited range of crops.

I.2 The Legend

2.1 Land Type A

Steep, very rugged terrain developed on bedrock. Structurally controlled, elevation generally above 1,000 feet.

A1 - Very steep, rugged terrain with structurally controlled valleys. Dark even tone, moderately coarse texture, white crowns are common above the upper strata of the forest canopy. Generally under primary forest.

A2 - Steep to very steep hills, less rugged than Unit A1, ridges are broad at base, slopes may be concave. Medium textured, dark grey tone. Generally under primary forest.

A3 - Valley in Land Type A, where these are predominantly flat-floored. V-shaped valleys are not differentiated.

A4 - Prominent dip-slopes with heath-like vegetation generally above 500 feet. Fine textured, small trees, dense middle canopy.

2.2 Land Type B

Hills and ridges at low elevation, generally less than 1,000 feet, developed on bedrock.

B1 - Steep hills, moderately to strongly dissected by flat-floored or V-shaped valleys too small to delineate at photo scale. The unit includes isolated areas of cleared and secondary forest. Coarse textures with dark grey tone.

B1v - Steep sided, V-shaped valleys of Unit B1.

B2 - Moderately steep hills, dissected by flat-floored valleys too small to delineate at photo scale. Areas of secondary growth and shifting cultivation are common. Coarse textures with medium dark grey tone.

B2v - Steep sided valleys of Unit B2, flat-floored.

B3 - Undulating terrain, often cultivated. Areas of secondary growth have variable texture and grey tone.

B4 - Broad and flat-floored valleys of Land Type B that are sufficiently wide or clearly defined by topography or by differences in canopy to be delineated.

2.3 Land Type C

Wide alluvial plains, predominantly non-peaty.

C1 - River valleys, identified by position along major rivers, correlating with lighter tones (if cleared), or less uniform canopy (if under primary forest) than in surrounding alluvial areas. The unit is generally bounded by Unit C2 or Land Type D.

Sub-divisions:-

C1r - Levee ridges.

C1p - Pointbars.

C1o - Ox-bows and old river channels.

C1s - Mainly mangrove vegetation identified by position at the lower reaches of major rivers. Smooth canopy, fine textures, dark grey tone.

C2 - Alluvial backswamps, generally non-peaty but in some cases the alluvium may be overlain by shallow peat. Medium coarse and fine textures with medium grey tone, commonly cleared for cultivation or under secondary growth. The uncleared areas in this unit are identified by coarser textures and irregular canopy with dark grey tones. Sometimes the unit is transitional to Unit D1.

C3 - Colluvial fans along the foot of high ridges and hills. Generally cultivated or under secondary growth. The light tones indicate better drainage conditions.

2.4 Land Type D

Wide alluvial plains, predominantly peaty. The land type is identified by distinctive pattern of canopy in primary forest and with less certainty in cultivated or cleared land, by dark tones and by topographic position.

D1 - Peaty backswamps and peat filled valleys, identified by their position.

Sub-divisions:-

D1b - Peaty backswamps. Medium coarse textures and regular canopy of dark grey tone.

D1v - Peat filled valleys. Coarse textured, irregular canopy and dark tones.

D2 - Transitional zone between D1 and D3 Units. Broken irregular

canopy which is sloping upwards towards Unit D3. Dark grey tones.

D3 - Domed peat areas. Fine to medium textures and light tones. The unit which is "pock-marked" due to fallen or dead trees has wide-spread occurrence as discrete areas along the lower and middle reaches of large rivers.

D4 - Flat peat basins. Fine to medium textures and light to medium tones, smooth canopy. Included in this unit are peat basins which have circular lineaments.

D5 - Possibly eroded peat domes within Unit D3. The canopy is lower than the surrounding D3 Unit. Dark grey tones with medium coarse textures. Possibly heath-type vegetation.

D6 - Unit cancelled.

D7 - Coastal peaty plains. Rather featureless terrain, with medium textures and dark grey tone. This unit excludes the Baram-type peat areas.

Sub-divisions:-

D7c - Coastal peaty plains lying directly behind Land Type S. Low canopy with medium even textures.

D7i - Inland section of the coastal peaty plain. Vegetation more mature, canopy shows higher trees, which often grow in clusters. Coarse textures.

2.5 Land Type S

Low beach material.

S1 - Spits and bars. Identified by their position on the present beach, often too narrow to delineate at photo scale. Light tones.

S2 - Parallel light toned beach ridges and dark toned swales lying behind the present beach. Mainly scrub vegetation.

S3 - Level, old beach situated between Miri and Lutong lying at same level as Units S1 and S2, but more mature. Dark grey tones with smooth textures. Low vegetation, usually cultivated. Watertable possibly low.

S4 - Parallel dark toned ridges. Identified by their position behind S2 on older beach, its level similar to S1 and S2.

This unit lies along rivers running parallel to the present coast line. Vegetation moderately high, generally uncultivated. Watertable is thought to be high.

2.6 Land Type T

Alluvial and marine terraces. Identified by a more or less flat topography at a raised level.

T1 - River terraces above 1,000 feet. Dense, uniform, medium to fine textures and medium grey toned canopy.

T2 - Raised beach and terraces at highest level, 300 to 1,000 feet elevation.

T3 - Raised beach and terraces between 50 to 300 feet elevation. Medium textures, medium to dark grey tones where forested, or smooth light tones where cleared. Eroded surface.

T4 - Raised beach and terraces at lower level than T3. Intermediate between S3 and T3 Units. Generally cultivated.

2.7 Miscellaneous Land Type

U - Built-up urban areas.

APPENDIX II

EROSION HAZARD

II.1 Introduction

This Appendix only discusses erosion created by the forces of rain water and the effects of this on the soils and terrain in the Study Area.

The extent to which a soil is affected by erosion processes is largely controlled by angle of slope, but other factors also play a part. The more sandy soils tend to be more easily eroded than the finer clay soils for any given slope, largely because the cohesion of the sandy soils is less than in clay soils. The kind of erosion which takes place varies to some extent with the nature of the soil; gully formation and soil slips occur commonly on sandier soils and sheet wash on finer soils.

Under natural conditions, such as under primary forest, erosion is normally a slow continuous process, insidious rather than obvious, especially on finer textured soils. Erosion can become greatly accelerated when the natural balance is disturbed, as when primary forest is removed and replaced by cultivated crops, unless specific measures are taken to minimise this. Generally, the steeper the slope the greater will be the impact of disturbance of the natural balance.

The dramatic erosion forms like gulleying and land slips occur either on very steep slopes or under particular soil and geological conditions. Land-slips in particular are a catastropic form of erosion and result in the total loss of an affected area for agricultural development. The less spectacular, more insidious erosion forms result in a gradual decrease in soil depth and the loss of topsoil which contains a large percentage of the total available plant nutrients and within which are most of the plant feeding roots. On slopes in excess of 25 degrees, even under primary forest, nearly all soils are shallower than on more gentle slopes, and the dangers of quickly reducing an already limited soil depth to a point where crop yields will be seriously reduced are great, even where erosion control is practised.

II.2 Erosion In The Study Area

Evidence from soil and terrain observations in the Study Area shows that land-slips are possible on slopes greater than 20 degrees on sandy

soils (Nyalau and Bekenu Families) and on slopes above 25 degrees on finer textured soils (Merit Family). Examples of this catastropic erosion are seen around the Lambir hills near Kampong Bakam and in parts of Lambir Rubber Planting Scheme. Both these areas are planted to rubber, and many of the slopes, especially in the Bakam area, exceed 25 degrees. These steep slopes combined with rather specific soil and geological conditions have led to land-slips which have severely damaged about 10 per cent of the planted area.

Evidence of slower but still serious erosion occurring in the Study Area was seen around Rumah Belulok near the Sungai Tru, where the effect of the decrease in soil depth is well shown. In this area, Merit soils occur on short, steep slopes of up to 35 degrees. In general, Merit soils have a compact, clay sub-soil, containing iron concretions and weathered shale fragments, which is normally at a depth of about 30 inches. Under shifting cultivation around Rumah Belulok this sub-soil now often occurs at depths of about 16 inches. Already roughly half the topsoil is lost. On a small area where the secondary growth has been cleared for pepper cultivation on a slope which is 24 degrees at the bottom but steepens to 29 degrees over its main length the oldest vines are only about five years old, yet the compact sub-soil is already exposed at the surface, and this too is eroding rapidly. This represents the loss of some 12 to 16 inches of soil in five years. This is a soil loss of about 450 tons of soil per acre per year. The figure usually taken as being the acceptible limit is 4 or 5 tons per acre per year - so this rate is 100 times greater than the maximum rate consistent with continuous farming. Although erosion control practices are not being carried out on the garden, the example illustrates the severity of erosion that can occur without the more obvious gulley and land-slips erosion features.

II.3 Slope Limitations For Agriculture

In West Malaysia, experience has resulted in setting a legal upper slope limit of 20 degrees for agricultural development. Land steeper than this is regarded, at best, as marginal and is generally not developed for agriculture. In Sarawak, no such legal limit exists, but experience within the Soil Survey Division has led to the general recommendation that slopes in excess of 25 degrees should not be used for agricultural development.

The criterion used in this Zonation Plan Study is that land whose average slope is greater than 25 degrees should not be considered for agricultural development. Even this limit may be excessive under certain soil conditions but, in general, 25 degrees appears as a reasonable limit for the conditions in Sarawak.

/al

SARAWAK/MB/FOR/3/42

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13th December, 1972

Your ref: MB/3/FOR/RJS/JSR

R.J. Spooner,
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Herts.

H.T.S.
Recd. 18-12-72
Seen by
Action RJS.

Miri-Bintulu Study

Dear Mr. Spooner,

Thank you for your letter and enclosures dated 1st December, 1972. Frank Walker has kindly lent his copy of the Zonation Plan and yesterday we discussed it together. I would like to make a number of comments, the details of which will keep until our meeting. But there are some important matters which I should like to communicate to you beforehand.

2. Two points in particular strike me about both the Plan and Mike Cooper's papers : firstly there seems remarkably little awareness that several of the proposals (I might say all) have been considered by Sarawak Government Departments in the past, and secondly the casual use of legally defined terms concerning the status of land.

3. My first point implies that there is insufficiently close contact between the project staff and Sarawak departments. I have already offered the loan of copies of documents which demonstrate how some proposals have been considered in some detail in the past, for example in the 1964-68 Fourth Division Development Plan proposals. I suggest that the Zonation Plan, or for preference the technical documents and regular reports which preceded it, should have discussed the reasons for raising the proposals again and/or the reasons why they were not pursued previously. To be very frank, I cannot see that the Zonation Plan represents a distillation of six months' work by a team of professionals, unless they have experienced very severe difficulties in communicating fruitfully with the Sarawak civil service.

4. Can we just straighten out the land classification terminology, so as to use the locally understood words? Unless there has been some amendment of the Land Code (1957), there are four major and mutually

exclusive categories and one collateral type:

.1 Mixed Zone Land can be held under title by anyone.

.2 Native Area Land can be held under title only by a native (by the Interpretations Ordinance 1953, a Chinese is not a native even if he is Sarawak-born).

.3 Interior Area Land cannot be held under title or under native customary right.

.4 Reserved Land includes Government Reserves, National Parks, Forest Reserves, Protected Forests and Communal Forests.

The collateral type is Native Customary Land, over which rights of usufruct have been acquired legally by natives. In addition there is a separate classification into alienated land, for which document of title has been issued, and State land for which no title has been issued.

5. Cooper seems to assume that Native Customary Land is legally on a par with the four major groups. As you can see, this is not so - such land is usually either Mixed Zone or Native Area Land, more rarely part of a Reserved Land area.

Further, in the Fourth Division, only a fraction of the area under shifting agriculture (SHAG) is legally Native Customary Land. The felling of virgin jungle after 1955 without the written permission of a District Officer does not establish a native customary right. To recognise, or to imply recognition, in the Zonation Plan of any other situation is to reinforce the persistent claims of the Iban to ownership of the land itself, an attitude which renders planned land use wholly unworkable.

6. Turning now to the Zonation Plan, to page iv, paragraph (2), you can see that the division is incorrect. State land can be held under Native Customary Right, and Native Area Land may be held under title or it may be unalienated and therefore State.

7. Paragraph (3)(i) State Forest Reserves are not a recognised category. Legal safeguards may be obtained by zoning them as Interior Area or as Reserved Land. Exploitable Permanent Forests are not a recognised category; they may be Forest Reserves, Protected Forests, Communal Forest, or Government Reserves with authority vested in the

P.W.D., sometimes in the local Water Board or in the Forest Department. Non-State Forest Reserves are not a recognised category ; what a motley collection of more or less mutually exclusive categories are grouped herein; I can see no value in it at all.

8. Paragraph (5) - Licensed Exploitable and Remnant Hill Forest are not recognised categories. If such classes are necessary, the terms should be defined and referred to in lower case letters to avoid confusion with legal land classes.

9. You will appreciate then that table 2.1 is incorrect.

10. Page 1 - the term 'legal encumbrance' should be used with care. Since little organised development is possible without re-zoning, almost all land is to some extent encumbered. There are encumbrances of usufruct as well as those of zonation and title. The discussion on page 5 is therefore confusing.

11. Page 4 - "the peats in the Study Area are of a different nature". *In what way?*

12. Page 7 - development aims are laid down in the Second Malaysia Plan; I think they should be quoted here. In the ensuing discussion there should be some reference back to the terms of reference and scope of work document. Some of the statements on page 8 suggest a lack of appreciation of the timescale required for tree crops (oil palm, rubber, timber). I have already referred HTS to the 1966 critique of the F.L.D.A./E.P.U. agricultural policies.

13. Page 10 - the first sentence is meaningless, as the term 'forestry' is understood in Sarawak. There are several forest and land categories which are not recognised. Why is HTS already committed to incorporating the FAO recommendations into its overall plans for the Study Area? The phrase 'conflict of interest' in paragraph 4.2 is unnecessarily emotive.

14. Page 11 - largescale elongation of Reserved Land boundaries is all right if the population is law abiding. The Iban in the Study Area are not. Interdigitation of agricultural and forest land use could lead

to the rapid increase in SHAG which has overtaken the Lambir-Subis area. The semi-taungya proposals are premature without detailed sociological studies. Such studies could be far more important than tree species technical trials. Why is there no reference to the labour problems experienced by S.D.F.C. and Sarawak Oil Palms Bhd. ? Or to the potential culling of floating labour by oil company activities?

The proposed River Catchment Reserves are surely already covered by the Land Code. The last paragraph on this page is waffle.

15. Page 12 - there are more than one million people in Sarawak, according to the 1970 census. The majority are not subsistence farmers. This chapter is rather vague; all the considerations have been raised several or many times previously. Sarawak surely wants to know what you have new to offer.

16. Page 15, paragraph 5.4 - this looks to me suspiciously like a hobby horse. It seems out of place and unrelated to other plans.

17. Page 17 - is it being seriously suggested that a road from Long Teru to Long Lama will make Loagan Bunut appreciably more accessible?

18. Page 20 - referring to the construction of an LNG plant, ".... will have a strong influence on the environment...." Just what does that mean? "An expansion of the existing oil refining...." does certainly not depend on domestic demand.

19. Page 22 et seq, chapter 8 - this is much more the content I would expect to see in a Zonation Plan, compared with the generalised principles given in chapters 4 to 7. Sarawak is not entirely ignorant of land planning, and I think that if HTS feel a need to enunciate principles, these should be brought out in the context of specific cases. I am disappointed that the Plan plumps for the easy way out, for the Master Plan area which we predicted last year, evading entirely the question of whether it is right to hack down large areas of forest for new schemes while leaving SHAGGED areas almost as under-utilised as they are at present. Be sure that the Sarawak Government won't tackle this thorny problem without external pressure, and if you are planning for the next

twenty years you might consider whether or not a tremendous perhaps unique opportunity is going by default. Maybe a more vigorous statement than page 27 is required.

20. Discussion of settlement sizes might be more meaningful if they could be related to the S.D.F.C. schemes already in existence.

21. Page 26 - horticulture? Market gardens for poultry and vegetables and fruit, not flowers, in the Miri area.

22. Page 28 - 'microscopic' should be deleted. It is wrong.

23. Turning now to Mike Cooper's papers; he is, presumably, aware that there is a silvicultural research section in the research branch of the Forest Department, and that there is a research program document for the period 1971-75. During this period, investigation 29 should provide information on the feasibility of natural regeneration in exploited Mixed Dipterocarp Forest. Referring to page 2 of his paper MB/3/ FORESTRY/GEN. - it is a brave man who suggests that he can predict the future use of plantation-grown wood. An economic survey might show the relative profitabilities from different end uses but a decision on timber or pulp is more likely to be made after the crops have been established. Incidentally, I presume that 'chips' means some sort of board product. Other statements in this paragraph suggest that a visit down the Miri-Bintulu road to see the loggers extracting timber from land development scheme areas might broaden Cooper's background knowledge.

24. The team suggested in the second paragraph on page 2 would seem to duplicate the work of the FAO Forest Industries Development project personnel. Save your money by cooperation.

25. I would rather leave my comments on Cooper's confidential paper "Notes on forestry for consideration by the task force on forestry" until after we have discussed the validity of my comments on the Zonation Plan (the Plan map is inaccurate, by the way; the letraset type overlays have been badly chosen and misapplied).

Yours sincerly,

J.R. Palmer.

c.c. R.W. Kettlewell
F.S. Walker

INTERNAL MEMO

FROM V.C. Robertson DIVISION H.T.S. DATE 21st December, 1972.	TO R.J. Spooner COPIES TO M.F.H. Cooper File Sarawak/MB/3/FOR VCR/JSR

SUBJECT:- MIRI BINTULU FOREST : Letter from J. Palmer C.F.I.

I feel the project team should see this letter. My feelings are:-

(i) Some points made are sound.

(ii) He seems to be confusing the Zonation plan with the Perspective Plan in some of his comments.

(iii) His point about reference back to earlier proposals - e.g. the 1964-65 4th Div. Plan - ought to be taken up.

(iv) So far as Native Customary land is concerned, we have not, I think, assumed it is legally on a par with the other groups, but de facto it certainly is. No one is going to kick these people off land they've been on since 1955. There are in fact much larger areas now occupied which we have in fact assumed to be unencumbered, from the legal standpoint.

(v) H.T.S. is committed to incorporating F.A.O. plans because we are required to do so.

(vi) Of course (p.4) we think sociological studies are vital. But it's no good finding out if the people would accept such a system if the system wont work.

(vii) We have not specifically recommended the obvious MP area. We have not evaded the question of -hacking down forests or leaving shifting cultivation areas as they are. What on earth is the present disuussion all about?

(viii) The silvicultural research section has no answers. All they will say is that there is some very limited, and largely unrecorded trials data, and that any planation schemes need years of trial before they can say anything about what species to grow.

INTERNAL MEMO

FROM	TO
DIVISION	COPIES TO
DATE	

SUBJECT:-

(ix) Chips mean chips. They are exported as such to Japan at present. Presumably they can be used either for board production or for pulping ? What we would learn from the saddening sight of loggers on the Miri-Bintulu road I do not know.

(x) Why does H.T.S. incorporate F.A.O. recommendations? (p.3)? Next he asks why we duplicate F.A.O. Forest Industries project work ? We do one because we are told to but only recommend additional studies if F.A.O. can't cover them.

V.C. Robertson.